COMMITTENTE:

RFI RETE FERROVIARIA ITALIANA
GRUPPO FERROVIE DELLO STATO ITALIANE

DIREZIONE INVESTIMENTI
DIREZIONE PROGRAMMI INVESTIMENTI
DIRETTRICE SUD - PROGETTO ADRIATICA

DIREZIONE LAVORI:

ITALFERR
GRUPPO FERROVIE DELLO STATO ITALIANE

APPALTATORE:

Mandataria

A.D'AGOSTINO COSTRUZIONI GENERALI

Mandanti

ReseArch CONSORZIO STABILE

ATLANTE

PROGETTAZIONE:

MANDATARIA

HUB ENGINEERING
CONSORZIO STABILE SOCIETÀ CONSORTILE A R.L.

MANDANTI

HYpro S.r.l.

PROGETTO ESECUTIVO

LINEA PESCARA - BARI
RADDOPPIO DELLA TRATTA FERROVIARIA TERMOLI - LESINA
LOTTI 2 e 3 - RADDOPPIO TERMOLI - RIPALTA

PRESCRIZIONI TECNICHE DI PROGETTO
SISTEMA ESTENSIONE RADIOCOPERTURA IN GALLERIA (GSM-P)

Firmato digitalmente da:
FACCHINI MASSIMO
Firmato il 13/03/2024 13:00
Seriale Certificato: 1254467
Valido dal 11/03/2022 al 11/03/2025
InfoCamere Qualified Electronic Signature CA

L'Appaltatore		I progettisti (il Direttore della progettazione)	
Ing. Gianguido Babini	A.A.D'AGOSTINO COSTRUZIONI GENERALI S.r.l. Il Direttore Tecnico (Ing. Gianguido Babini)	Ing. Massimo Facchini	
Data **18/12/2022**	*firma*	*Data* **18/12/2022**	*firma*

COMMESSA	LOTTO	FASE	ENTE	TIPO DOC	OPERA / DISCIPLINA	PROGR	REV	SCALA
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Rev.	Descrizione	Redatto	Data	Verificato	Data	Approvato	Data	Autorizzato/Data
A	Emissione Esecutiva	L. Cicero	Dicembre 2022	G. Cicero	Dicembre 2022	Sorbino	Dicembre 2022	
B	Aggiornamenti per RDV	L. Cicero	Giugno 2023	G. Cicero	Giugno 2023	Sorbino	Giugno 2023	

ORDINE DEGLI INGEGNERI DELLA PROVINCIA DI NAPOLI
DOTT. ING. ALLEGRETTI GIUSEPPE
ISCRITTO ALL'ALBO PROFESSIONALE
COL. N. 13896
Dicembre 2022

INDICE

1 SCOPO DEL DOCUMENTO

Il presente documento definisce gli aspetti tecnici installativi inerenti alla realizzazione degli impianti di copertura radio GSM pubblico (Tim e Vodafone) nella galleria Campomarino.

Lo scopo è quello di illustrare il progetto nonché definire la consistenza degli impianti da realizzare, di stabilire quindi tutti gli interventi necessari e fornire tutte le indicazioni utili alle quali si dovrà attenere l'Appaltatore per la realizzazione delle opere.

2 NORMATIVA DI RIFERIMENTO

- Decreto del Ministero dell'Ambiente n°381 del 10 settembre 1998, "Regolamento recante norme per la determinazione di tetti di radiofrequenza compatibili con la salute umana";
- Per gli aspetti relativi alla sicurezza per la navigazione aerea a bassa quota (Circolare Prot. SQA – 133/8373/01 del 28.03.2001), necessita portare a conoscenza degli Organi Competenti (Aeronautica Militare, ENAV, ENAC, Comando Militare competente territorialmente) gli interventi in questione;
- Legge Quadro del 22 febbraio 2001 n°36 "sulla protezione dalle esposizioni a campi elettrici, magnetici ed elettromagnetici";
- Circolare Ministero P.T. n. DCST/3/2/7900/42285/2940 del 18/2/1982" Protezione delle linee di telecomunicazione da perturbazioni esterne di natura elettrica";
- SPECIFICA TECNICA DI TCTS SR TL 08001 D del 01/09/03 "Impianti di radiopropagazione per gallerie ferroviarie";
- Norma Tecnica ES 728 B "Sicurezza Elettrica e Protezione contro le Sovratensioni per gli Impianti Elettrici Ferroviari in Bassa Tensione" 20.05.2020
- SPECIFICA TECNICA TT620 – "Impianti di radiopropagazione per gallerie ferroviarie – Estensione del GSM e GSM-R in cavo radiante" – DTC STT ST TC 08 001 A;
- •SPECIFICA TECNICA DI.TCTS.ST.TL.08.001 D Ed. 2003 Linee guida per il tracciamento e la posa in opera di sistemi di supporto per cavo radiante nelle gallerie ferroviarie e suoi Allegati;

3 FINALITÀ DEI SISTEMI DA REALIZZARE

I sistemi di radiopropagazione in galleria sono ritenuti indispensabili per migliorare le condizioni di esercizio e la regolarità della circolazione ferroviaria, soprattutto in condizioni di emergenza. Anche i servizi di manutenzione trovano particolare vantaggio per le difficili condizioni operative in cui normalmente si effettuano i necessari interventi manutentivi (interruzioni brevi, notturne, ecc.).
In condizioni di normale esercizio i sistemi di radiocopertura sono dedicati anche all'uso dei viaggiatori.
All'interno della galleria Campomarino sono da prevedere gli impianti per la radiopropagazione del segnale GSM-P degli operatori pubblici TIM e VODAFONE predisposti per le evoluzioni future delle tecnologie della telefonia mobile.

4 MODALITÀ REALIZZATIVE DEL SISTEMA DI RADIOCOPERTURA (GSM-P)

4.1 GENERALITA'

L'impianto è composto di due parti distinte, esterna ed interna alla galleria.

1. Parte esterna: la parte esterna costituisce l'interfaccia del sistema con le reti esterne e comprende i seguenti elementi:
   - Sistema di antenne verso la SRB;
   - Shelter/room;
   - Stazione di testa;
   - Impianto di alimentazione;
   - Impianto di terra;
   - Apparati di interfaccia al sistema di supervisione.

2. Parte interna: la parte interna è costituita dal sistema di rigenerazione e trasmissione del campo elettromagnetico all'interno del tunnel ed è composto dai seguenti elementi:
   - Sistema radiante, costituito da sezioni di cavo radiante;
   - Tratte di Hand-Over;
   - Cavi coassiali a R.F.;
   - Cavi di alimentazione.

Per i dettagli architetturali si rimanda agli elaborati:

- LI0202D67DXRG0001001 Architettura degli impianti di radiopropagazione in galleria.

4.2 DESCRIZIONE DEGLI IMPIANTI

In termini generali l'impianto di radiopopagazione della Galleria Campomarino sarà costituito da una stazione amplificatrice di testa (esterna all'imbocco lato Termoli e posizionata nel locale TLC di PGEP), da cavi radianti, remotizzatori ottici collegati alla stazione di testa tramite fibre del cavo a 32 F.O. monomodali per i sistemi di sicurezza in galleria, sistemi di antenne e di alimentazione elettrica, nonché da un sistema di diagnostica e supervisione locale.
In particolare, sono previsti in galleria due remotizzatori ottici.
Come specificato nella TT 598, al fine di evitare la posa di un cavo dedicato, per la connessione dei remotizzatori ottici alla stazione di testa verranno sfruttate fibre disponibili del cavo a 32 FO di rete dati di galleria.
Per ulteriori dettagli si rimanda all'elaborato grafico dell'impianto ed al seguito della trattazione.

4.2.1 SISTEMA DI ANTENNE VERSO LA SRB

Il sistema di antenne utilizzerà come supporto il palo previsto dal progetto GSM-R.
Sul suddetto palo devono essere installate le antenne necessarie per le bande GSM TIM e GSM Vodafone, per trasmissione e ricezione, e correttamente orientate verso le SRB donatrici al fine di ottenere il massimo rendimento. Le suddette antenne devono essere installate sotto quelle del GSM-R. Dovranno essere rispettate le opportune distanze tra le antenne montate sul palo per garantire il necessario disaccoppiamento.

4.2.2 SHELTER

Gli apparati GSM-P della stazione di testa (ST) verranno installati all'interno del locale tecnico TLC del PGEP Nord.

4.2.3 STAZIONE DI TESTA

La stazione amplificatrice di testa svolge la funzione di interfaccia, da un lato con le reti radiomobili da estendere in galleria tramite le antenne donatrici, dall'altro con i terminali mobili presenti in galleria, tramite il sistema radiante che realizza la copertura radio interna (antenna/cavo fessurato).
Essa è composta dai seguenti sottosistemi:

- sezione radio, moduli di amplificazione e filtraggio;
- scheda di supervisione della stazione di testa;
- sistema di alimentazione in continuità.

4.2.4 IMPIANTO DI ALIMENTAZIONE

L'alimentazione elettrica sarà realizzata in osservanza a quanto riportato nella SPECIFICA TECNICA TT620 – "Impianti di radiopropagazione per gallerie ferroviarie – Estensione del GSM e GSM-R in cavo radiante" – DTC STT ST TC 08 001 A".
Gli apparati saranno alimentati dal sistema di alimentazione in continuità previsto nel PGEP Nord.

4.2.5 IMPIANTO DI TERRA

Tutte le strutture e apparecchiature costituenti l'impianto in oggetto saranno protette in conformità alle indicazioni delle specifiche:

- TT620 – "Impianti di radiopropagazione per gallerie ferroviarie – Estensione del GSM e GSM-R in cavo radiante" – DTC STT ST TC 08 001 A
- Norma Tecnica ES 728 B "Sicurezza Elettrica e Protezione contro le Sovratensioni per gli Impianti Elettrici Ferroviari in Bassa Tensione" 20.05.2020
- SPECIFICA TECNICA RFI TC ST IS-TLC 00017A "Modalità di realizzazione dei collegamenti tra i vari componenti degli impianti di copertura radio delle gallerie ferroviarie;

4.2.6 CAVI RADIANTI E CAVI CIASSIALI R.F.

Saranno utilizzati cavi radianti di sezione 1" 5/8. Dovranno essere rispettati i livelli di campo da estendere in galleria previsti nella citata TT620.
Sarà fornito in opera cavo radiante RLKU158-50CPRH le cui caratteristiche di propagazione radioelettrica sono ottimali e performanti nel range di frequenze comprese tra i 700 e i 2100 MHz per poter garantire la piena compatibilità a possibili implementazioni future (ad esempio tecnologie 4G/LTE).
Il cavo è classificato B2ca s1a d0 a1.
L'elaborato grafico di cui al paragrafo 4.1 riporta il tracciato di posa dei cavi e le loro estensioni all'interno della galleria Campomarino.
Il cavo radiante sarà fissato alla volta della galleria alla quota indicata nelle citate specifiche; tale posa sarà esterna al PMO della nuova galleria.
mediante idonei supporti che non interferiscono dal punto di vista radioelettrico e consentono un sostegno affidabile del cavo stesso.

Si forniscono le caratteristiche di resistenza meccanica (taglio e trazione) di detti supporti.

Sarà eseguita opportuna verifica preliminare all'esecuzione dei fori per la posa dei supporti al fine di utilizzare punti idonei e materiale di fissaggio adeguato.

Tutti i collegamenti delle apparecchiature amplificatrici a radiofrequenza con i sistemi radianti saranno realizzati con dei cavi coassiali a RF con sezioni variabili in funzione delle qualità relative all'attenuazione necessarie per le esigenze degli impianti. (Cavo coax 7/8" per distanze maggiori o uguali a 20 metri e cavo coax ½" per distanze fino a 20 metri).

Tutti i cavi coassiali e radianti impiegati, in armonia con quanto previsto dalla normativa vigente, saranno con guaina esterna di tipo M non propagante incendio e a bassa emissione di fumi tossici e corrosivi (tipo "AFUMEX") e sono classificati B2ca s1a d0 a1 e con isolamento della guaina per tensioni fino a 10.000 volt.

I supporti utilizzati saranno di materiale non propagante incendio ed a bassa emissione di fumi.

Si installerà il disaccoppiatore tra il cavo radiante interno galleria e il cavo coassiale di collegamento alla stazione di testa.

4.3 SISTEMA DI SUPERVISIONE

Nella Stazione di Testa, si installerà un sistema di supervisione diagnostica in grado di acquisire, presentare localmente e trasmettere ad un Sistema di Supervisione Centrale di Tratta (Compartimentale) lo stato di funzionamento dell'impianto e dei suoi elementi principali esterni ed interni alla galleria. Il sistema di Supervisione Centrale di Tratta (Compartimentale) è a sua volta interfacciato con il sistema di supervisione centrale presso il NOC di Roma Tuscolana.
Gli impianti realizzati per la copertura della galleria della tratta in oggetto saranno integrati nel Sistema di Supervisione Centrale di Tratta esistente di Bari e remotizzati al sistema centrale di supervisione del NOC.
Il collegamento trasmissivo verso il Sistema di Supervisione Centrale sarà realizzato mediante interfacciamento della stazione Radio Base GSM-P al sito di trasporto MPLS-TP previsto al PGEP Nord.

4.4 SCHEDE TECNICHE DI IMPIANTO

Per la copertura radio GSM-Pubblico della galleria Campomarino si prevedono le seguenti installazioni di stazioni di testa:

- stazione di testa installata nel locale TLC del PGEP previsto all'imbocco Nord (lato Termoli).

La stazione di testa preleverà i segnali GSM-P di TIM e Vodafone ed estenderlo all'interno della suddetta galleria tramite cavi coassiali, cavi radianti (estesi per tutta la lunghezza della galleria e vie di fuga) ed antenne di prosieguo campo.
Nella fase di progettazione costruttiva si provvederà, anche tramite misure in loco, a rilevare nei siti destinati all'installazione degli apparati l'esistenza di livelli di segnale adeguati alla radio estensione.

5 CONSISTENZA DELLA FORNITURA

5.1 GENERALITA'

Per la realizzazione degli impianti per la copertura radio nella galleria oggetto del presente appalto è previsto che gli interventi vengano compensati a corpo; la consistenza dei lavori da compensarsi a corpo è riportata nel successivo paragrafo.
Durante la realizzazione delle opere, l'Appaltatore è tenuto al rispetto di tutte le prescrizioni contrattuali, di quelle contenute nel presente documento, nonché di tutte le specificazioni ed avvertenze contenute nei succitati Capitolati, Specifiche Tecniche, Norme e Disegni e nelle tariffe dei prezzi allegate e/o richiamate nel contratto.

5.2 CONSISTENZA DELLE VOCI A CORPO

Le voci a corpo comprendono e compensano la fornitura in opera di:

- Tutti i cavi radianti con le relative staffe in materiale dielettrico per il distanziamento e fissaggio alla volta delle gallerie completi di connettori, delle necessarie terminazioni e quanto occorre per il corretto funzionamento in opera del sistema radiante. Sono compresi tutti gli oneri relativi al trasporto, alla movimentazione e all'asporto delle bobine;
- Tutti i supporti per tutte le antenne che saranno ancorate a parete comprensivo di kit di messa a terra;
- Tutte le antenne necessarie nelle bande previste compresi i connettori, i cavi di collegamento agli apparati e tutte le prove e misure per il corretto orientamento delle stesse. Compresi tutti gli eventuali minuti materiali necessari per l'ancoraggio alle strutture di supporto;
- Le stazioni di testa complete di:
    - rack di alloggiamento apparati comprensivo di combinatori, divisori, duplexer, cavetteria, modulo di alimentazione per gestire quattro moduli di amplificazione a 900 MHz e relative interfacce verso quattro sistemi di antenna;
    - due moduli di banda a 900 MHz (TIM e Vodafone);
    - scheda di supervisione della stazione di testa, per la teletrasmissione dei dati verso il centro telesorveglianza via cavo telefonico completo di dispositivi di diramazione e modem, connettori, materiali accessori e cavi secondari in rame a 4 cp per il collegamento alle cassette FS 3/10 esistenti o armadio ATPS o via modem GPRS;
- Impianti di alimentazione realizzati con cavi energia sezione 4x4 mmq e/o sezione 4x16 mmq per le apparecchiature della stazione di testa dal punto di fornitura FS o di terzi sito entro 500 metri dalle suddette stazioni di testa;
- Impianti di alimentazione realizzati con cavi energia sezione 4x4 mmq, sezione 4x16 mmq e sezione 2x50 mmq per la distribuzione agli apparati interni alle gallerie. Sono altresì compresi i trasformatori di isolamento, il quadro elettrico e tutto il minuto materiale e quanto altro necessario per dare l'impianto di alimentazione completo e funzionante;
- Sono comprese tutte le connessioni per il collegamento al cavo radiante realizzato con due code di cavo coassiale debitamente fissate con supporti alle pareti della galleria ed i minuti materiali per eseguire il lavoro a regola d'arte;
- Tutti i cavi coassiali per i collegamenti tra le antenne e le stazioni di testa esterne, tra le stazioni di testa ed il cavo radiante. Sono altresì compresi i connettori, i dispositivi di fissaggio a parete e per il collegamento a terra delle flange dei connettori lato cavi coassiale;

Sono compensate nelle voci a corpo la fornitura in opera di canalette, cunicoli, tubi, pozzetti e quanto altro necessario per realizzare le canalizzazioni a protezione dei succitati cavi; la fornitura in opera di tutti i materiali necessari per la messa a terra di tutti i dispositivi da installare; l'apertura e la richiusura delle canalizzazioni esistenti, compreso l'eventuale reintegro della sabbia, la sostituzione dei coperchi danneggiati dei cunicoli esistenti, il disboscamento dei tracciati destinati alla posa dei cavi e la pulizia dei cunicoli a raso ricoperti di terra, sabbia, pietrisco od altro.
Saranno oggetto di compenso a corpo la fornitura di un quantitativo di materiali di scorta occorrenti per la manutenzione degli impianti.

6 DATA SHEET COMPONENTI IMPIANTO

Si allega alla presente relazione le schede tecniche che descrivono e definiscono le caratteristiche tecniche minime da tenere in considerazione nella definizione e scelta dei materiali che verranno installati.
A seguire:

- Allegato A - Antenne
- Allegato B - I ripetitori -Prodotti JMA
- Allegato C - I cavi coassiali e radianti -Prodotti RFS

NEXUM
the best way to connect

Allegato A:
Progetto radio-copertura Campomarino

Datasheet antenne

Nexum Srl
Sede Legale: Via Monte Titano, 16 – 47923 Rimini (RN)
Sede Amm.va: Via Sigismondo, 75 – 47921 Rimini (RN)
Sede Operativa: Via Ottorino Respighi,8 - 47043 Gatteo a Mare (FC)
Web: www.nexum.it – E-Mail info@nexum.it
Tel. +39 0541381410 Fax +39 0541310214
P.IVA / C.F. / Numero d'iscrizione CCIAA (Rimini): 03721280406

Antenna donatrice
TRS-3917

DIRECTIVE PANEL ANTENNA

TRS-3917
TRS-3918

GSM-R - GSM

Gain 15 - 16,5 dBi

- *High gain and strong attenuation of side lobes,*
- *Specific for outdoor use for its compact size*
- *Designed for particularly harsh environments*
- *Panel antenna with high gain in all band; extremely strong structure, High Front/Back ratio*

ELECTRICAL DATA	TRS-3917	TRS-3918
Frequency Range *[MHz]*	870-960	870-960
Polarization	Vertical	Vertical
VSWR	≤ 1,37	≤ 1,37
Impedance	50 Ω	50 Ω
Connector	7/16 " Female	7/16 " Female
Gain	16,5 *dBi*	15 *dBi*
Front to Back Ratio	≥ 22 *dB*	≥ 22 *dB*
Front to Side Ratio	≥ 25 *dB*	≥ 25 *dB*
Half Power beam width -3dB	Vertical 32° Horizontal 24°	Vertical 33° Horizontal 30°
Max power In *(at 50° C)*	100 *W*	100 *W*
Intermodulation IM3 (2 x 43 dBm carrier)	<155 *dBc*	<155 *dBc*

MECHANICAL DATA	TRS-3917	TRS-3918
Dimension *[mm]*	1000 x 500 x 220	1000 x 500 x 220
Weight	9 *Kg*	9 *Kg*
Wind Surface *[m²]* Lateral Front	 0,10 0,44	 0,10 0,44
Wind load *[at 160 Km/h]* Lateral Front	 120 *N* 480 *N*	 135 *N* 360 *N*
Colour	White (Other on request)	White (Other on request)
Radome	Fiberglass	Fiberglass
Protection	IP 65	IP 65
Light Protection (1)	All part are Grounded	All part are Grounded
Mounting (2) (INOX bracket)	Ø 60-100 *mm*	Ø 60-100 *mm*
Special Braket	Avaible on request	Avaible on request

ENVIRONMENTAL DATA	
High Temperature operation	+ 80 °C
Low Temperature operation	- 60 °C

(1) The metal parts including the mounting kit and the inner conductors are DC grounded

(2) The antenna can be mounted on a tubular shaft with a diameter from 60 to 80 mm with supplied terminals; for larger diameter supports, accessory brackets are available on request

(3) Avaible on request MECANICAL UP/DOWN TILT

NEXUM the best way to connect

MADE IN ITALY

Antenna di copertura fine tunnel
TRS-2190

DIRECTIVE YAGI ANTENNA

TRS-2190

LTE800 - GSM-R - GSM

Gain 15 dBi

- *Cross-band system*
- *Bandwidth coverage extended to LTE 8OO*
- *Available with Radome FIRE RETARDANT*
- *Equipped with rigid radome and Anti-condense valve*
- *Specific for links in railroad tunnels, highways and subways*

ELECTRICAL DATA	TRS-2190
Frequency Range *[MHz]*	790-960
Polarization (1)	Vertical or ±45
VSWR	≤ 1,35
Impedance	50 Ω
Connector	7/16" Female
Gain	15 *dBi*
Front to Back Ratio	≥ 25 *dB*
Half Power beam width -3dB	Vertical 31° Horizontal 33°
Max power In *(at 50° C)*	100 W
Intermodulation IM3 (2 x 43 dBm carrier)	<155 dBc

ENVIRONMENTAL DATA	
High Temperature operation	+ 80 °C
Low Temperature operation	- 60 °C

MECHANICAL DATA	TRS-2190
Dimension *[mm]*	1000 x 170 x 120
Weight	3 *Kg*
Wind Surface *[m²]*	0,170
Wind load *[at 180 Km/h]*	180 *N*
Colour	Grey RAL 7001
Radome (2)	Stabilized PP *FIRE RETARDANT* or Fiberglass
Protection (3)	IP-65
Light Protection (4)	All part are Grounded
Mounting On Pipe (5) (INOX bracket)	Ø 50-80 *mm*
Material	Weatherproof Aluminum, Cu Alloy PTFE, INOX

(1) Specify the polarization when ordering

(2) Specify the Radome when ordering, otherwise it will depend on stock availability

(3) When applied anti-condensation valve the protection degree IP 56

(4) The metal parts including the mounting kit and the inner conductors are DC grounded

(5) The antenna can be mounted on a tubular shaft with a diameter from 50 to 80 mm with supplied terminals; for larger diameter supports, accessory brackets are available on request

NEXUM the best way to connect

Antenna a pannello per spazi confinati
MPM – 70

DIRECTIVE PANEL ANTENNA

MPM-65
MPM-70

LTE800 - GSM – LTE1800 - UMTS

Gain 7 – 12 dBi

- *Multiple high gain system integrates LTE 800 GSM LTE 1800 and UMTS systems.*
- *High efficiency, strong attenuation of the lateral lobes.*
- *Extremely strong ABS radome.*
- *Easy transport, assembly and positioning on pole.*

ELECTRICAL DATA	MPM-65		MPM-70			
Frequency Range *[MHz]*	1710-1880	1920-2170	790-860	870-960	1710-1880	1920-2170
Polarization	Vertical or Horizontal		Vertical or Horizontal			
VSWR	≤ 1,28		≤ 1,28			
Impedance	50 Ω		50 Ω			
Connector	7/16" Female		7/16" Female			
Gain (1)	12 *dBi*		7,5 *dBi*	7 *dBi*	12 *dBi*	
Front to Back Ratio	≥ 25 *dB*	≥ 27 *dB*	≥ 22 *dB*	≥ 24 *dB*	≥ 25 *dB*	≥ 27 *dB*
Half Power beam width -3dB (2)	Vertical 35° Horizontal 63°	Vertical 32° Horizontal 58°	Vertical 120° Horizontal 54°	Vertical 118° Horizontal 52°	Vertical 35° Horizontal 63°	Vertical 32° Horizontal 58°
Max power In *(at 50° C)*	65 *W*		100 *W*		65 *W*	
Intermodulation IM3 (2 x 43 dBm carrier)	<150 *dBc*		<150 *dBc*			

MECHANICAL DATA	MPM-65	MPM-70
Dimension *[mm]*	320 x 150 x 110	320 x 150 x 110
Weight	1,5 *Kg*	1,5 *Kg*
Wind Surface *[m²]* Lateral Front	 0,016 0,051	 0,016 0,051
Wind load *[at 160 Km/h]* Lateral Front	 34 *N* 148 *N*	 34 *N* 148 *N*
Colour	White (Other on request)	White (Other on request)
Radome	ABS	ABS
Protection	IP 67	IP 67
Mounting (3) (INOX bracket)	Ø 40-60 *mm*	Ø 40-60 *mm*

ENVIRONMENTAL DATA	
High Temperature operation	+ 80 °C
Low Temperature operation	- 60 °C

(1) For more detailed information on the Gain in each band, see the attached sheet

(2) For more detailed information on the Radiation pattern in each band, see the attached sheet

(3) The antenna can be mounted on a tubular shaft with a diameter from 40 to 60 mm with supplied terminals; for larger diameter supports, accessory brackets are available on request

MADE IN ITALY

NEXUM
the best way to connect

Allegato A:
Progetto radio-copertura Campomarino

Datasheet ripetitori JMA

Nexum Srl
Sede Legale: Via Monte Titano, 16 – 47923 Rimini (RN)
Sede Amm.va: Via Sigismondo, 75 – 47921 Rimini (RN)
Sede Operativa: Via Ottorino Respighi,8 - 47043 Gatteo a Mare (FC)
Web: www.nexum.it – E-Mail info@nexum.it
Tel. +39 0541381410 Fax +39 0541310214
P.IVA / C.F. / Numero d'iscrizione CCIAA (Rimini): 03721280406

La stazione di Testa
Teko DAS Platform
Master unit

TEKO DAS Platform
The most advanced Distributed Antenna System in the Industry

Multi-Operator System

The JMA Wireless TEKO DAS platform is a multi-band, multi-operator architecture that provides a wide range of flexible and reliable solutions for cellular coverage and capacity distribution.
Today's venues need to consider multi-operator solutions to satisfy all their visitors, employees and fans and their multiple devices requiring cellular service. Our DAS platform saves time and money by delivering multiple operators, bands, and technologies to the remote units all on a single strand of fiber optic cable.

Multiple bands and power levels for flexible deployment options

Remote Units (RUs) are connected to the TEKO Master Unit via a single mode optical fiber to distribute multiple frequency bands and multiple Carriers/MNOs to each Remote Unit, or to multiple RUs to configure multipath (e.g. MIMO) configurations.

Remote Units are self-contained and provide signal distribution to a range of both indoor and outdoor antennas and are available from Low Power to Very High Power designs.

RF Signal Quality and Performance

Our TEKO DAS platform ensures high signal quality with amplifiers that are technology-agnostic.
We're known for our best-in-class EVM (Error vector magnitude) performance, low PIM passive intermodulation, and low noise figure. Future wireless networks demand quality signal and performance to maximize coverage and capacity for their users.

Multi-Technology Support (LTE, 5G)

The JMA Wireless platform is 5G-ready, with many features that make it the DAS of choice when considering support for future networks. Our Digital Electricity advantage and passive optical network functions allow for the powering, deployment, and use of Internet-of-Things sensors and devices.
We are keenly focused on new wireless access methods, to give you the LTE speed necessary in today's fast-paced world.

Modular Venue Design Flexibility

The JMA Wireless conceptual design is technically superior because it ensures a future-proof architecture, thanks to system modularity, enabling the easy addition of carriers and frequency bands, and a "pay as you grow" option. Our smallest-footprint-in-the-market saves rack space, lowers build costs, and allows our customers to tackle challenging environments such as tunnels, underground areas, and high-capacity venues.

TEKO DAS Platform - EU/MENA

Operating Frequency Bands

Operating Frequency Bands Summary Table

TEKO Band Code	TEKO Triplexers Band Code	3GPP Band	Downlink (DL) and uplink (UL) operating frequencies
7	/	28	758-803 MHz (DL); 703-748 MHz (UL)
7C	/	28 (EU/MENA sub-band)	758-788MHz (DL); 703-733MHz (UL)
LTE800	8	20	791–821 MHz (DL); 832–862 MHz (UL)
GSMR	/	/	921–925 MHz (DL); 876–880 MHz (UL)
EGSM	9	8	925–960 MHz (DL); 880–915 MHz (UL)
DCS	18	3	1805–1880 MHz (DL); 1710–1785 MHz (UL)
UMTS	21	1	2110–2170 MHz (DL); 1920–1980 MHz (UL)
LTE2600	26	7	2620–2690 MHz (DL); 2500–2570 MHz (UL)
23T	23T	40	2300–2400 MHz (DL/UL)
35I	/	42 and 43 sub-bands of n77(n78)	3400–3800 MHz (DL/UL)
/	LO (Low Bands)	/	< 1GHz
/	HI (High Bands)	/	> 1GHz

Active POI

TEKO active POI modules are flexible single-band/single-operator RF interfaces connected to the signal source (BS, Off-Air Repeater) via coaxial cable. They are equipped with remote-controlled attenuators for Downlink (DL) and Uplink (UL) RF levels adjustment via the DAS supervision module and management tools. The active POI provides automatic power limiting with alerts automatically monitoring operator input power and attenuating (with alarms) to maintain RF coverage and balance across multiple POI inputs.

Specifications

MODELS	TAPOI-7-F-4 TAPOI-GSMR-F-4 TAPOI-LTE800-F-4 TAPOI-EGSM-F-4 TAPOI-DCS-F-4 TAPOI-UMTS-F-4	TAPOI-LTE2600-F-4
Uplink/Downlink isolation in UL and DL bands	50dB	
Nominal impedance	50Ω	
Return Loss	14dB	
Nominal Input Power	15–33dBm (lower power can be accepted depending on system design)	
Absolute Maximum Input Power (no damage)	35dBm average (45dBm peak)	
Input Power Threshold (adjustment range)	0–35dBm (RMS); 10–45dBm (Peak)	
Attenuation range	0–31dB (DL); 0–43dB (UL)	
Ripple (DL/UL)	±1dB	
Downlink Insertion loss @ min. attenuation	7dB [1]	8dB [2]
Uplink Insertion loss @ min. attenuation	9dB (duplex port) 10dB (simplex port)	11dB (duplex port) 12dB (simplex port)
Connectors to the Base Station	4.3-10 (f) duplex (UL+DL) or 4.3-10 (f) (DL) + SMA(f) UL	
Power Consumption	3W	
Operating temperature range	-20°C to +55°C (-4°F to +131°F)	
Weight	≈ 1.3kg (2.9lb)	
Dimensions	3U / 7TE	

[1] For Input Power from 26dBm to 33dBm a minimum Downlink (DL) attenuation setting is required; the Downlink Insertion Loss changes as detailed in the below table:

Input Power	Minimum DL Attenuation Setting	Downlink Insertion Loss
26dBm	1dB	8dB
27dBm	2dB	9dB
28dBm	3dB	10dB
29dBm	4dB	11dB
30dBm	5dB	12dB
31dBm	6dB	13dB
32dBm	7dB	14dB
33dBm	8dB	15dB

[2] For Input Power from 26dBm to 33dBm a minimum Downlink (DL) attenuation setting is required; the Downlink Insertion Loss changes as detailed in the below table:

Input Power	Minimum DL Attenuation Setting	Downlink Insertion Loss
26dBm	1dB	9dB
27dBm	2dB	10dB
28dBm	3dB	11dB
29dBm	4dB	12dB
30dBm	5dB	13dB
31dBm	6dB	14dB
32dBm	7dB	15dB
33dBm	8dB	16dB

Please refer to the Operating Frequency Bands Summary Table for DL/UL operating frequencies

NEXUM
the best way to connect

All values are typical at 25°C (77°F)

Active DAS Tray Point of Interface

TEKO Active DAS Tray Point of Interface modules (TDTPOI) are flexible, single-band, high-power RF interfaces used in Optical DAS to directly (no external directional coupler nor load needed) interface up to two Base Stations, either duplex or simplex, with or without diversity, SISO or MIMO 2x2.
FDD and TDD DAS Trays are available.


FDD DAS Tray

FDD DAS Tray Specifications

MODELS	TDTPOI-7-D; TDTPOI-LTE800-D; TDTPOI-EGSM-D; TDTPOI-DCS-D; TDTPOI-UMTS-D; TDTPOI-LTE2600-D	
Input/Output	2xBS	MIMO
Uplink/Downlink isolation	70dB in DL band	
BS port isolation (Downlink)	50dB	
Nominal impedance	50Ω	
Return Loss	16dB	
Nominal Input Power	31–48dBm [3] [4] lower power can be accepted depending on system design	
Absolute Maximum Input Power (no damage)	49dBm @ 40°C (+104°F), 47dBm @ 55°C (+131°F) [5]	
Power Limiter	Possibility to disable RF or attenuate by 10dB or ALC in case of overpower (independently on each BS path)	
PIM @ 2x43dBm on BS port	< -153dBc	
Input Power Threshold (adjustment range)	26–49dBm (RMS) independently on each BS path	
Attenuation range	0–60dB (DL) with 0.25dB step (up to 32dB on each BS DL path independently) 0–50dB (UL) with 0.25dB step (up to 25dB on each BS UL path independently)	
Ripple (DL/UL)	± 0.5dB	
DL Insertion loss @ min. attenuation	21dB	18dB
UL Insertion loss @ min. attenuation	0dB (with preamp. on) 15dB (with preamp. off)	0dB (with preamp. on) 15dB (with preamp. off)
Connectors to the Base Station	2 x 7/16(f) duplexed DL+UL 2 x SMA(f) simplex UL 2 x SMA(f) UL diversity	2 x 7/16(f) duplexed DL+UL 2 x SMA(f) simplex UL
Connectors to the DAS and monitor	2 x SMA (f) DL1, DL2 DAS 2 x SMA (f) UL1, UL2 DAS 4 x SMA (f) monitor (coupling: -30dB ± 1dB)	2 x SMA (f) DL1, DL2 DAS 2 x SMA (f) UL1, UL2 DAS 4 x SMA (f) monitor (coupling: -30dB ± 1dB)
Power Consumption	10W	
Operating temperature range	-20°C to +55°C (-4°F to +131°F) [4]	
Weight	≈ 3.6kg (7.9lb)	
Dimensions	3U / 21TE	

[3] 15dB minimum attenuation setting with power higher than 46dBm, 10dB minimum attenuation setting with 46 to 41dBm, 5dB minimum attenuation setting with 41 to 36dBm, 0dB minimum attenuation setting with power lower than 36dBm
[4] 31–46dBm @ 55°C (+131°F), derate linearly from +40°C to +55°C (+104°F to +131°F)
[5] With 15dB minimum attenuation setting, 46dBm with 10dB minimum attenuation setting, 41dBm with 5dB minimum attenuation setting, 36dBm with 0dB minimum attenuation setting
Please refer to the Operating Frequency Bands Summary Table for DL/UL operating frequencies

NEXUM the best way to connect

All values are typical at 25°C (77°F)

TDD DAS Tray

DAS Trays for LTE-TDD technology are available to pick up the TDD reference signal from the Base Station. The TDTPOI-35I-D-LL module provides the RF interface towards a mid-band MIMO base station.

TDD DAS Tray (23T left., 35I right)

Specifications

MODELS	TDTPOI-23T-D		TDTPOI-35I-D-LL
Operating frequency band	2300–2400 MHz		3400–3800 MHz
Input/Output	2xBS	MIMO	MIMO
Nominal impedance	50Ω		
Return Loss	16dB		
Nominal Input Power	31–48dBm [6][7] lower power can be accepted depending on system design		20–36dBm [8] lower power can be accepted depending on system design
Absolute Maximum Input Power (no damage)	49dBm @ 40°C (+104°F), 47dBm @ 55°C (+131°F) [9]		40dBm @ 55°C (+131°F) [10]
Power Limiter	Possibility to disable RF or attenuate by 10dB or ALC in case of overpower (independently on each BS path)		
Input Power Threshold (adjustment range)	26–49dBm (RMS) independently on each BS path		20–36dBm (RMS) independently on each BS path
Attenuation range	0–60dB (DL) with 0.25dB step (up to 32dB on each BS DL path independently) 0–50dB (UL) with 0.25dB step (up to 25dB on each BS UL path independently)		
Ripple (DL/UL)	± 0.5dB		± 0.75dB
DL Insertion loss @ min. attenuation	21dB	18dB	8dB
UL Insertion loss @ min. attenuation	0dB (with preamp. on) 15dB (with preamp. off)	0dB (with preamp. on) 15dB (with preamp. off)	0dB (with preamp. on) 15dB (with preamp. off)
Connectors to the Base Station	2 x 7/16(f) duplexed DL+UL 2 x SMA(f) simplex UL 2 x SMA(f) UL diversity	2 x 7/16(f) duplexed DL+UL 2 x SMA(f) simplex UL	2 x 7/16(f) duplexed DL+UL 2 x SMA(f) simplex UL
Connectors to the DAS and monitor	2 x SMA (f) DL1, DL2 DAS 2 x SMA (f) UL1, UL2 DAS 4 x SMA (f) monitor (coupling: -30dB ± 1dB)		2 x SMA (f) DLA, DLB DAS 2 x SMA (f) ULA, ULB DAS 4 x SMA (f) monitor (coupling: -30dB ± 1dB)
Connectors to the TSYNC	1 x SMB(m) TDD SYNC IN 2 x SMA(f) BTSA, BTSB monitor ports (coupling: -45dB ± 2dB)		1 x SMB(m) TDD SYNC IN 2 x SMA(f) BTSA, BTSB monitor ports (coupling: -45dB ± 2dB)
Power Consumption	10W		
Operating temperature range	-20°C to +55°C (-4°F to +131°F) [7]		-20°C to +55°C (-4°F to +131°F)
Weight	≈ 3.6kg (7.9lb)		
Dimensions	3U / 21TE		

[6] 15dB minimum attenuation setting with power higher than 46dBm, 10dB minimum attenuation setting with 46 to 41dBm, 5dB minimum attenuation setting with 41 to 36dBm, 0dB minimum attenuation setting with power lower than 36dBm

[7] 31–46dBm @ 55°C (+131°F), derate linearly from +40°C to +55°C (+104°F to +131°F)

[8] 15dB minimum attenuation setting with power higher than 39.5dBm, 10dB minimum attenuation setting with 36 to 31dBm, 5dB minimum attenuation setting with 31 to 26dBm, 0dB minimum attenuation setting with power lower than 26dBm

[9] With 15dB minimum attenuation setting, 46dBm with 10dB minimum attenuation setting, 41dBm with 5dB minimum attenuation setting, 36dBm with 0dB minimum attenuation setting

[10] With 15dB minimum attenuation setting, 36dBm with 10dB minimum attenuation setting, 31dBm with 5dB minimum attenuation setting, 26dBm with 0dB minimum attenuation setting

Digital Donor Front End

TEKO TDFE - Digital Donor Front End module - provides the RF interface towards the signal source: it is connected to a Donor Antenna picking-up the signal from distant macro cell towers.
Modular Off-air Repeaters can be set-up by proper combination of Digital Donor Front Ends and TEKO Service Front Ends. Digital Donor Front Ends can also be used to drive Optical Systems.

Specifications

MODELS	TDFE-LTE800	TDFE-EGSM TDFE-EGSM-W	TDFE-DCS	TDFE-UMTS	TDFE-LTE2600	TDFE-EGSM-F (Full features model)
Operating band	LTE800	EGSM	DCS	UMTS	LTE2600	EGSM
Number of variable sub-bands	Up to 2	Up to 2	Up to 2	Up to 2	Up to 2	Up to 9
Variable sub-band bandwidth	200kHz to 25MHz (100kHz step) - 1 sub-band (please contact JMA/TEKO Sales Office for wider bandwidth) 200kHz to 14.2MHz (100kHz step) - 2 sub-bands					200kHz to 35MHz
Processed Band	30MHz	30MHz (TDFE-EGSM) 35MHz (TDFE-EGSM-W)	30MHz	30MHz	30MHz	35MHz
Attenuation range on each sub-band (relative to set RF gain)	0–30dB (0.5dB step) independent on each sub-band					0–30dB (0.5dB step) independent on each sub-band
Connector to the Donor Antenna	N (f)					N (f)
Cooling	Active (with fans)					Active (with fans)
Power supply	28–30Vdc					28–30Vdc
Power Consumption	37W typical; 42W max					75W
Operating temperature range	-5°C to +55°C (+23°F to +131°F)					-5°C to +55°C (+23°F to +131°F)
Weight	≈ 3.5kg (7.7lb)					≈ 5.8kg (12.8lb)
Dimensions	3U / 21TE					3U / 21TE
Depth	≈ 250mm (9.84in) handles and front connectors excluded					≈ 330mm (12.99in) handles and front connectors excluded

Please refer to the Operating Frequency Bands Summary Table for UL/DL operating frequencies

All values are typical at 25°C (77°F)

TEKO CPRI / DAS Platform Point of Interface

The TEKO CPRI Point of Interface (PoI) is an integrated, low-power, digital RADIO that terminates a CPRI link from an XRAN Adaptive Baseband server. The TEKO CPRI PoI can terminate one/two MIMO carriers or two/four SISO carriers depending on the specific carrier allocation. The CPRI PoI performs analog-to-digital (A/D) and digital-to-analog (D/A) conversion and provides low-power analog output/input.

The TCPRI PoI is composed of two boards:

- a digital board, converting the digital baseband signals from the XRAN Adaptive Baseband server into radio frequency (RF) signals;
- an RF board, distributing RF signals from the digital board to the TEKO DAS Platform.

Specifications

MODELS		**TCPRIPOI-7-M; TCPRIPOI-8-M; TCPRIPOI-9F-M; TCPRIPOI-18-M; TCPRIPOI-21-M; TCPRIPOI-26-M**
Input/Output		MIMO 2x2
Nominal impedance		50Ω
Return Loss (DL/UL)		16dB
Nominal Output Power		20dBm (rms)
Peak to Average Ratio (PAR)		9.2dB [11]
Downlink attenuation range		0–30dB
Uplink attenuation range	with preamp. off	0–25dB
	with preamp. on	0–20dB
Noise Figure	with preamp. off	10dB
	with preamp. on	5dB
ALC (rms)	with preamp. off	-19dBm
	with preamp. on	-37dBm
Coupling (monitor ports)		-20dB ± 1dB (DL)
		-10dB ± 1dB (UL)
Connectors to the BBU		4 x SFP+
Connectors to the DAS Platform and monitor		2 x SMA (f) DL1, DL2 2 x SMA (f) UL1, UL2 4 x SMA (f) monitor 1 x SMB (m) for TDD reference signal
Power Consumption		48W
Operating temperature range		-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling
Weight		≈ 2.1kg (4.6lb)
Dimensions		3U / 14TE

[11] Estimated @99.99%

Please refer to the Operating Frequency Bands Summary Table for DL/UL operating frequency bands

NEXUM the best way to connect

All values are typical at 25°C (77°F)

TEKO DAS Platform - EU/MENA

Master Unit Components

Service Front End

TEKO Service Front End (TSFE) is the Master Unit RF interface towards a Service Antenna: it is driven by TEKO Digital Donor Front End Modules to provide wireless signal to the area to be covered (rack-mounted repeaters). In Optical Systems the Service Front End can be used to extend coverage to the area close to the Master Unit site.

Specifications

MODELS	TSFE-LTE800-V	TSFE-EGSM-V	TSFE-DCS-V	TSFE-UMTS-V	TSFE-LTE2600-V
Operating band	LTE800	EGSM	DCS	UMTS	LTE2600
Downlink RF Output Power [12] GSM/EDGE	/	39dBm (1 carrier)	42dBm (1 carrier)	/	/
		36dBm (2 carriers)	39dBm (2 carriers)		
		33dBm (4 carriers)	36dBm (4 carriers)		
		30dBm (8 carriers)	33dBm (8 carriers)		
Downlink RF Output Power [12] WCDMA LTE	43dBm (1 carrier)	43dBm (1 carrier)	43dBm (1 carrier)	43dBm (1 carrier)	41dBm (1 carrier)
	40dBm (2 carriers)	40dBm (2 carriers)	40dBm (2 carriers)	40dBm (2 carriers)	38dBm (2 carriers)
	37dBm (4 carriers)	37dBm (4 carriers)	37dBm (4 carriers)	37dBm (4 carriers)	35dBm (4 carriers)
	34dBm (8 carriers)	34dBm (8 carriers)	34dBm (8 carriers)	34dBm (8 carriers)	32dBm (8 carriers)
Connector to the Service Antenna	7/16 (f)				
Cooling	Active (with fans)				
Power supply	28–30Vdc				
Power consumption	280W	230W	300W	300W	230W
Operating temperature range	-5°C to +55°C (+23°F to +131°F)				
Weight	≈ 11kg (24.3lb)	≈ 11kg (24.3lb)	≈ 9kg (19.8lb)	≈ 9kg (19.8lb)	≈ 10kg (22lb)
Dimensions	19"-2U rack / depth: 360mm (14.17in)				

Very-high-power rack-mounted repeaters

Populating the TEKO Master Unit with digital Donor Front End (DFE) and service front-end modules, multi-band, multi-operator coverage solutions can be configured. The modularity of the TEKO platform allows easy adaptability to new technologies or extending the solutions to additional operators as needed.

Specifications

Modular Repeater Configuration	TDFE-LTE800 + TSFE-LTE800-V	TDFE-EGSM or -EGSM-W + TSFE-EGSM-V	TDFE-DCS+ TSFE-DCS-V	TDFE-UMTS+ TSFE-UMTS-V	TDFE-LTE2600+ TSFE-LTE2600-V
Operating Bands	LTE800	EGSM	DCS	UMTS	LTE2600
Downlink Output Power [12] GSM/EDGE	/	39dBm (1 carrier)	42dBm (1 carrier)	/	/
		36dBm (2carriers)	39dBm (2carriers)		
		33dBm (4carriers)	36dBm (4 carriers)		
		30dBm (8carriers)	33dBm (8carriers)		
Downlink Output Power [12] WCDMA LTE	43dBm (1carrier)	43dBm (1carrier)	43dBm (1carrier)	43dBm (1carrier)	41dBm (1 carrier)
	40dBm (2carriers)	40dBm (2carriers)	40dBm (2 carriers)	40dBm (2 carriers)	38dBm (2 carriers)
	37dBm (4carriers)	37dBm (4carriers)	37dBm (4 carriers)	37dBm (4 carriers)	35dBm (4 carriers)
	34dBm (8carriers)	34dBm (8carriers)	34dBm (8carriers)	34dBm (8carriers)	32dBm (8 carriers)
Uplink RF Output Power [12] GSM/EDGE	26dBm (1carrier)	23dBm (1carrier)	25dBm (1carrier)	27dBm (1carrier)	26dBm (1carrier)
WCDMA	23dBm (2carriers)	20dBm (2carriers)	22dBm (2carriers)	24dBm (2carriers)	23dBm (2carriers)
LTE	20dBm (4carriers)	17dBm (4carriers)	19dBm (4carriers)	21dBm (4carriers)	20dBm (4carriers)
	17dBm (8carriers)	14dBm (8carriers)	16dBm (8carriers)	18dBm (8carriers)	17dBm (8carriers)
Downlink RF gain TDFE Donor antenna port to TSFE Service antenna port [13]	63–93dB (0.5dB step)	63–93dB (0.5dB step)	63–93dB (0.5dB step)	63–93dB (0.5dB step)	61–91dB (0.5dB step)
Uplink RF gain TSFE Service antenna port to TDFE Donor antenna port [13]	63–93dB (0.5dB step)	63–93dB (0.5dB step)	63–93dB (0.5dB step)	63–93dB (0.5dB step)	61–91dB (0.5dB step)

[12] RF output power measured at antenna port. GSM/EDGE carriers compliant with GSM 05.05; WCDMA carriers TM1-64DPCH-60% clipping, 8.5dB PAR, compliant with 3GPP TS 25.143 (EGSM/DCS bands: different factory-setting of ALC threshold needed); LTE: compliant with 3GPP specifications (TS 36.141), 8.5dB PAR, 60% clipping (EGSM/DCS bands: different factory-setting of ALC threshold needed)

[13] With 'DFE+SFE+(other modules)' System automatic gain preset selected (OMT web pages).

Please refer to the Donor Front End specifications for sub-bands settings and to the Operating Frequency Bands Summary Table for UL/DL operating frequencies

All values are typical at 25°C (77°F)

TEKO DAS Platform - EU/MENA

Master Unit Components

RF distribution and filtering, and Time Synchronization

Our passive components provide RF distribution and filtering.
The two-way and four-way TEKO splitter/combiner (TSC) can be used to manage either up to four RF interface modules, operating in the same band, or up to four optical modules.
Several models of triplexers are available to distribute signals operating over up to three different bands. The TPENTA-E pentaplexer is able to distribute signals operating over up to five different bands.
TEKO TRI-23T26TR Triplexer and TMBC-35WTR Master Band Combiner distribute the TDD reference signal, while filtering and distributing FDD/TDD signals.

Two-way (TSC2W) and four-way (TSC4W) Combiner/Splitter

MODELS	TSC2W-U	TSC2W-X	TSC4W-U	TSC4W-X
Operating frequency band	617–2850MHz	2300–4200MHz	617–2850MHz	2300–4200MHz
Insertion loss	4dB	4dB	7dB	7dB
Return Loss	16dB			
Isolation	16dB			
Operating temperature range	-20°C to +55°C (-4°F to +131°F)			
Weight	≈ 0.2kg (0.4lb)	≈ 0.2kg (0.4lb)	≈ 0.4kg (0.9lb)	≈ 0.4kg (0.9lb)
Dimensions	3U / 7TE			

Triplexer

MODELS		TRI-182126; TRI-LO1821; TRI-LO1826; TRI-LO2126; TRI-23T26TR				
Operating bands	JMA/TEKO code	LO (any low band)	18	21	23T	26
	3GPP band	/	3	1	40	7
Insertion loss		3.5dB	3.5dB	4dB	3.7dB	4dB
Isolation between DL input ports		30dB				
Return Loss		16dB				
Operating temperature range		-20°C to +55°C (-4°F to +131°F)				
Weight		≈ 0.4kg (0.9lb)				
Dimensions		3U / 7TE				

Triplexer with four-way combiner/splitter

MODELS		TRI-SC4W-182126; TRI-SC4W-LO1821; TRI-SC4W-LO1826; TRI-SC4W-LO2126			
Operating bands	JMA/TEKO code	LO (any low band)	18	21	26
	3GPP band	/	3	1	7
Insertion loss		10dB	10dB	11dB	12dB
Isolation between DL input ports		30dB			
Return Loss		13dB			
Operating temperature range		-20°C to +55°C (-4°F to +131°F)			
Weight		≈ 0.8kg (1.8lb)			
Dimensions		3U / 14TE			

Pentaplexer operating in the LTE800, EGSM900, DCS1800, UMTS2100, and LTE2600 bands

MODEL	TPENTA-E
Insertion loss	4dB
Return Loss	16dB
Isolation	30dB
Operating temperature range	-20°C to +55°C (-4°F to +131°F)
Weight	≈ 0.6kg (1.3lb)
Dimensions	3U / 14TE

Please refer to the Operating Frequency Bands Summary Table for UL/DL operating frequencies
All values are typical at 25°C (77°F)

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TEKO DAS Platform - EU/MENA

Master Unit Components

Master Band Combiner

MODEL	TMBC-35WTR
Operating band	3300–4200MHz
Insertion loss	1.5dB
Return Loss	15dB
Isolation	30dB
Operating temperature range	-20°C to +55°C (-4°F to +131°F)
Weight	≈ 0.6kg (1.3lb)
Dimensions	3U / 7TE

TDD Synchronizer and Reference Module

MODEL	TSYNC; TSYNC-N
Operating frequency band	2300–3980 MHz
Nominal Input Power	0 to -20dBm
Connectors	5 x SMA(f) 4 x SMB(m)
Power Consumption	6W
Operating temperature range	-20°C to +55°C (-4°F to +131°F)
Weight	≈ 0.6kg (1.3lb)
Dimensions	3U / 7TE

TEKO DAS Platform - EU/MENA

Master Unit Components

Optical Transmitter/Receiver

TEKO Optical Transmitter/Receiver Modules (TTR) are the optical interface between Master Unit and Remote Units: they provide RF-to-optical/optical-to-RF conversion.
Each TTRU Optical Transmitter/Receiver Module can manage up to four Remote Units (maximum configuration).
The TEKO platform utilizes single fiber connectivity to each Remote Unit utilizing WDM or optional DWDM.
The TTRX24W-S-M, ultra-wide band optical transceiver, provides the optical interface towards up to two MIMO remote units.


TTRU4W-S-M


TTRX24W-S-M

Specifications

MODELS		TTRU1W-S-M	TTRU2W-S-M	TTRU4W-S-M	TTRX24W-S-M
RF Pass-Band (Frequency Range)		380–2700MHz			3300–4000MHz
RF input impedance		50Ω			
Operating wavelength	TX	1310nm			
	RX	1490nm–1570nm (WDM)			
Nominal Optical Input Power		+6dBm up to –4dBm			
Configuration Options		1:1 configuration: 1 Tx, 1 Rx	1:2 configuration: 1Tx split by 2,2 Rx	1:4 configuration: 1Tx split by 4,4 Rx	2:4 configuration: 2Tx split by 2,4 Rx
Optical Link Budget		10dB (AGC)	10dB (AGC)	7dB (AGC)	7dB (AGC)
Optical Output Power		6dBm	6dBm	3dBm	3dBm
DL Adjustable Attenuation		0–15dB (0.5dB step)			
UL Adjustable Attenuation	common	0–10dB (0.5dB step)			
	each receiver	0–10dB (0.5dB step)			
MECHANICAL AND ELECTRICAL SPECIFICATIONS					
Optical connectors [14]		1 x SC/APC	2 x SC/APC	4 x SC/APC	4 x SC/APC
Fiber Type		Single mode SMR 9/125			
RF Connectors		SMA (f)			
RF Return Loss		10dB			
Monitor Ports		SSMB (m)			
Power Consumption		22W			21W
Operating temperature range		-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling			
Weight		≈ 1.6kg (3.5lb)			
Dimensions		3U / 14TE			

[14] E-2000 APC 8° available upon request

NEXUM
the best way to connect

All values are typical at 25°C (77°F)

Point To Point link

Master and Secondary Point to Point Modules (TTRUPTPM and TTRUPTPS) provide an optical Point to Point (PTP) link for Master Unit subrack remotization. RF interface modules can be connected to distant Optical Transmitters/Receivers via a single fiber optic strand, then serving multiple Remote Units. PTP Modules perform the RF-to-Optical/Optical-to-RF conversion allowing the bidirectional transmission of signals over the connecting optical fiber. This provides a significant reduction in the number of fiber optics running long distances.
The PTP link requires the RF interface subracks to be equipped with Master Point to Point modules and the remote optical subracks to be equipped with Secondary Point to Point modules. The TTRUPTPSTx-S Secondary Point to Point modules include the 4-way splitter/combiner to manage up to four Optical Transmitter/Receiver Modules. TTRUPTPSTx-S-1 models do not include the 4-way splitter/combiner, and allow driving just one Optical Module.
The supervision of the remotized subrack and of the connected remote units is handled by the PTP Secondary itself. The DAS Supervision Module communicates with the Secondary Point to Point module built-in Supervision unit via the single-mode optical fiber connecting Master and Secondary Point to Point modules. PTP Modules with separate UL/DL optical connectors are used together with TEKO dense wavelength multiplexer/demultiplexer to increase the optical link transmission capacity, furtherly reducing the amount of fiber required and the associated leasing costs.

Specifications

MASTER MODELS	**TTRUPTPMW-S**	**TTRUPTPMN23-S; TTRUPTPMN27-S; TTRUPTPMN31-S; TTRUPTPMN35-S; TTRUPTPMN39-S**
RF Pass-Band (Frequency Range)	617–2700MHz	
Operating DWDM ITU channels [15]	/	Ch23, Ch25, Ch27, Ch29, Ch31, Ch33, Ch35, Ch37, Ch39, Ch41
DL Adjustable Attenuation	0–15dB (0.5dB step)	
UL Adjustable Attenuation IN	0–10dB (0.5dB step)	
UL Adjustable Attenuation OUT	0–15dB (0.5dB step)	
Number of Optical Connectors (Type)	1 (SC/APC)	2 (SC/APC)
Power Consumption	15W	
Operating temperature range	-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling	
Weight	≈ 1.2kg (2.6lb)	
Dimensions	3U / 14 TE	
SECONDARY MODELS	**TTRUPTPSW-S** **TTRUPTPSW-S-1**	**TTRUPTPSN25-S; TTRUPTPSN29-S; TTRUPTPSN33-S; TTRUPTPSN37-S; TTRUPTPSN41-S;** **TTRUPTPSN25-S-1; TTRUPTPSN29-S-1; TTRUPTPSN33-S-1; TTRUPTPSN37-S-1; TTRUPTPSN41-S-1**
RF Pass-Band (Frequency Range)	617–2700MHz	
Operating DWDM ITU channels [15]	/	Ch23, Ch25, Ch27, Ch29, Ch31, Ch33, Ch35, Ch37, Ch39, Ch41
UL Adjustable Attenuation	0–15dB (0.5dB step)	
DL Adjustable Attenuation IN	0–10dB (0.5dB step)	
DL Adjustable Attenuation OUT	0–15dB (0.5dB step)	
Number of Optical Connectors (Type)	1 (SC/APC)	2 (SC/APC)
Power Consumption	15W	
Operating temperature range	-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling	
Weight	≈ 1.5kg (3.3lb)	
Dimensions	3U / 14 TE	
OVERALL PTP LINK	**TTRUPTPMx-S + TTRUPTPSx-S**	**TTRUPTPMx-S + TTRUPTPSx-S-1**
Optical Link Budget	10dB (AGC)	10dB (AGC)
RF Link Gain	0dB @ default attenuation settings [16]	7dB @ default attenuation settings [16]

[15] DWDM Channels Operating Wavelength, Signal Path, and Center Wavelength accuracy:

Operating DWDM ITU channels		**/**	**23**	**25**	**27**	**29**	**31**	**33**	**35**	**37**	**39**	**41**
Signal Path		UL/DL	DL	UL	DL	UL	DL	UL	DL	UL	DL	UL
Center wavelength accuracy (nm)		/	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
MASTER MODELS		**TTRUPTPMW-S**	**TTRUPTPMN23-S**		**TTRUPTPMN27-S**		**TTRUPTPMN31-S**		**TTRUPTPMN35-S**		**TTRUPTPMN39-S**	
Operating wavelength (nm)	TX	1310	1558.98	/	1555.75	/	1552.52	/	1549.32	/	1546.12	/
	RX	1550.92	/	1557.36	/	1554.13	/	1550.92	/	1547.72	/	1544.53
SECONDARY MODELS		**TTRUPTPSW-S** **TTRUPTPSW-S-1**	**TTRUPTPSN25-S** **TTRUPTPSN25-S-1**		**TTRUPTPSN29-S** **TTRUPTPSN29-S-1**		**TTRUPTPSN33-S** **TTRUPTPSN33-S-1**		**TTRUPTPSN37-S** **TTRUPTPSN37-S-1**		**TTRUPTPSN41-S** **TTRUPTPSN41-S-1**	
Operating wavelength (nm)	TX	1550.92	/	1557.36	/	1554.13	/	1550.92	/	1547.72	/	1544.53
	RX	1310	1558.98	/	1555.75	/	1552.52	/	1549.32	/	1546.12	/

[16] TTRUPTPMx-S default attenuation 0dB DL / 5dB UL. TTRUPTPSx-S and TTRUPTPSx-S-1 default attenuation 0dB DL / 10dB UL

All values are typical at 25°C (77°F)

Dense Wavelength Multiplexers and Demultiplexers

TEKO Dense Wavelength Multiplexer and Demultiplexer allow multiple optical channels to be transmitted simultaneously over a single optical fiber, thus increasing the optical link capacity. Up to ten wavelength channels can be trasmitted over a single optical fiber, with different wavelengths used for downlink (DL) and uplink (UL) signals transmission.
A pair of multiplexer/demultiplexer is required at each end of the optical fiber: at the Master Unit side the Multiplexer/Demultiplexer TFO-MUX-x-n acts as a multiplexer for the Downlink path, combining DL signals from multiple fibers into one beam of light, to be transmitted over the optical fibre. At the remote side the Multiplexer/Demultiplexer TFO-DEMUX-x-n splits the beam of light, carrying DL signals, into its wavelength components and routes them into individual fibers. In the UL path the TFO-DEMUX-x-n acts as a Multiplexer, joining UL signals together and the TFO-MUX-x-n acts as a Demultiplexer, splitting UL signals apart.
TEKO Mux and Demux are available in 10, 8, 6 or 4 channels:

- TFO-MUX-10-n and TFO-DEMUX-10-n, with n=number of MUX/DEMUX equipped (1 or 2)
- TFO-MUX-8-n and TFO-DEMUX-8-n, with n= number of MUX/DEMUX equipped (1 to 3)
- TFO-MUX-6-n and TFO-DEMUX-6-n, with n= number of MUX/DEMUX equipped (1 to 4)
- TFO-MUX-4-n and TFO-DEMUX-4-n, with n= number of MUX/DEMUX equipped (1 to 4)

Specifications

MODELS	TFO-MUX-10-n TFO-DEMUX-10-n	TFO-MUX-8-n TFO-DEMUX-8-n	TFO-MUX-6-n TFO-DEMUX-6-n	TFO-MUX-4-n TFO-DEMUX-4-n
Operating DWDM ITU channels [17]	Ch41, Ch39, Ch37, Ch35, Ch33, Ch31, Ch29, Ch27, Ch25, Ch23	Ch37, Ch35, Ch33, Ch31, Ch29, Ch27, Ch25, Ch23	Ch37, Ch35, Ch33, Ch31, Ch29, Ch27	Ch37, Ch35, Ch33, Ch31
Center wavelength accuracy	0.1nm			
Insertion Loss (MUX + DEMUX)	5dB	4dB	3dB	3dB
Optical Connectors	11 SC/APC x n, with n=number of MUX/DEMUX equipped (1 or 2)	9 SC/APC x n, with n=number of MUX/DEMUX equipped (1 to 3)	7 SC/APC x n, with n=number of MUX/DEMUX equipped (1 to 4)	5 SC/APC x n, with n=number of MUX/DEMUX equipped (1 to 4)
Operating temperature range	0°C to +55°C (+32°F to +131°F)			
Weight	≈ 2kg (4.4lb)			
Dimensions	19"-1U sub-rack			

[17] DWDM Channels Operating Wavelength:

DWDM channel	Ch23	Ch25	Ch27	Ch29	Ch31	Ch33	Ch35	Ch37	Ch39	Ch41
Operating Wavelength	1558.98nm	1557.36nm	1555.75nm	1554.13nm	1552.52nm	1550.92nm	1549.32nm	1547.72nm	1546.12nm	1544.53nm

Capacity management

The TEKO platform components for capacity management provide complete flexibility, enabling the JMA TEKO architecture to be designed for reutilization of sectors across the campus or metro areas and support a reduction in head-end eNodeB equipment by up to 25%. As an example, sector remapping can be cycled to balance weekend demands from business week demands.

TCM3-4 Capacity Manager 3x4

Operating frequency band	617–2690MHz
Insertion loss	5dB typical
Power Consumption	< 1W
Operating temperature range	-20°C to +55°C (-4°F to +131°F)
Weight	≈ 0.2kg (0.4lb)
Dimensions	3U / 14TE

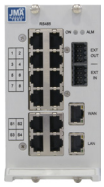
TSW4 Configurable RF switch 1:4

Operating frequency band	380–2690MHz
Insertion loss	3dB typical
Power Consumption	< 1W
Operating temperature range	-20°C to +55°C (-4°F to +131°F)
Weight	≈ 0.1kg (0.22lb)
Dimensions	3U / 7TE

All values are typical at 25°C (77°F)

Supervision Module

The Supervision Module (TSPV) is able to manage an entire TEKO DAS. The TEKO supervisory intelligence provides automated identity of the deployed system elements, including identity of all the modules installed within Master Unit sub-racks and Remote Units. The result is a typical system in a venue can be discovered within a couple minutes, allowing engineers to move more swiftly through the commissioning process.
The TEKO Supervision module provides web-based administration and SNMP v3 support with event-based configurations that significantly simplify remote administration (web browser, tablets) and enables integration with SNMP v3 Management tools.


TSPV-E; TSPV-EBB


TSPV-ELMBB

Specifications

MODELS	TSPV-E	TSPV-EBB	TSPV-ELMBB
External alarms input	4 inputs available		
Dry contacts output	4 outputs available		
Maximum number of monitored active sub-racks	13		
Maximum number of Remote Units supervised	144		
Local/remote control interface	2 x RJ45 Ethernet		2 x RJ45 Ethernet - wireless modem (18)
Battery Backup Autonomy	/	4min	4min
Power Consumption	10W		
Operating temperature range	-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling		
Weight	≈ 1kg (2.2lb) optional built-in modem and battery backup included		
Dimensions	3U / 14TE		

(18) Modem operating frequency bands:
GSM/GPRS/EDGE: 900/1800MHz; WCDMA: 1, 8 3GPP bands; LTE: 1, 3, 7, 8, 20 3GPP bands

External alarm module

The Alarm Board (TEA) is an optional I/O Module that can be equipped in order to increase the number of supported external alarms.

Specifications

MODELS	TEA-I16
External alarms input	16 inputs available
Power Consumption	3W
Operating temperature range	-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling
Weight	≈ 0.4kg (0.9lb)
Dimensions	3U / 7TE

TEKO Platform Supervision and Control

Alarm forwarding	SNMP trap, SMS, e-mail. Software configurable dry contacts can be connected to BS
Remote Unit Control	Signalling and supervision over fiber from Master Unit to Remote Unit and vice versa
Local Maintenance Terminal	Graphical user interface via Ethernet to any laptop (Web page browser)
OMC connection	Via LAN connection or embedded wireless modem (GSM/GPRS/EDGE/WCDMA/LTE) SNMP Interface towards NMS supported

All values are typical at 25°C (77°F)

TEKO DAS Platform - EU/MENA

Master Unit Components

Power Supply components

The TEKO DAS Platform includes:

- AC/DC and DC/DC Power Supply modules (TPSU/AC and TPSU/48), to be equipped inside active subracks.
- Space efficient AC/DC and DC/DC Power Supply subracks: SUB-PSUN-MU, hosting 1 to 3 **TPSU/AC-30-1K** modules; SUB-PSUN-MU/48, hosting 1 to 3 **TPSU/48-30-1K** modules.

The most suitable solution can be selected, according to the system total power consumption and the installation requirements. Hot-plug 1+1 redundancy is supported to offer higher reliability.

Specifications

MODELS	SUB-PSUN-MU	SUB-PSUN-MU/48	TPSU/AC	TPSU/48
Input Voltage	85–264Vac (50–60Hz) derate 10% < 100Vac	-72 to -36Vdc	85–264Vac (50–60Hz)	-72 to -36Vdc
Maximum Output Power	900W each TPSU/AC-30-1K (derated by 10% when used in parallel operation to prevent overload) 2430W max configuration (3 x TPSU/AC-30-1K)	950W each TPSU/48-30-1K 2850W max configuration (3 x TPSU/48-30-1K)	100W each, up to 2 in parallel 90W each, 3-4 in parallel 80W each, more than 4 in parallel	
Efficiency	84% typical	> 90%	85% typical	92% typical
Operating temperature range	0°C to +70°C (+32°F to +158°F) 50°C to 60°C, derate 2% / °C; 60°C to 70°C, derate 2.5% / °C	-5°C up to +55°C (+23°F to +131°F)	-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling	
Cooling	Active with fans (variable speed; air flow front to back)		/	
Weight	≈ 9kg (19.8lb) max. configuration ≈ 2kg (4.41lb) each TPSU/AC-30-1K	≈ 9kg (19.8lb) max. configuration ≈ 2kg (4.41lb) each TPSU/48-30-1K	≈ 0.9kg (2lb)	
Dimensions	19"-1U rack, depth 376mm (14.8in) handles included		3U - 7TE	

19” sub-rack for the AC or DC remote PSU modules and DC distribution

A power supply distribution system is available for the remote powering of TEKO 48VDC remote units with up-to-2W output power. The Power Supply distribution system is composed of both a Power Supply Unit (PSU) and a Power Distribution Unit (PDU), housed in a 19”-2U sub-rack. The power supply unit can be equipped with up to 4 Power Supply modules (either AC/DC or DC/DC). Hot-plug N+1 redundancy feature is supported to offer higher reliability. The voltage from the power supply modules is made available to the 32 ports on the distribution unit front panel.

SUB-RPSU hosting 4 TRPSU

Specifications: power supply distribution system

MODELS	SUB-RPSU-MU/AC	SUB-RPSU-MU/48
Number of Vdc Output Ports	32	
DC Output Voltage	58Vdc	
Max. Current absorption (each port)	4.5A	
Supervision and Control	Over-current and over-voltage protection on each port Overall over-current protection	
Operating temperature range	-5°C up to +55°C (+23°F up to +131°F) with proper forced-air cooling	
Weight	≈ 3.7kg (8.2lb)	
Dimensions (HxWxD)	82x483x421.5mm (3.23x19x16.59in) handles and connectors included	

Specifications: power supply modules

MODELS	TRPSU/AC-58-1.2K AC/DC Power Supply Module	TRPSU/48-58-2K DC/DC Power Supply Module
Input Voltage	100–120 to 200–277 Vac	-72 to -40Vdc
DC Output Voltage	58Vdc	
Maximum Output Power	1.2kW @110-120Vac each 1.9kW @200-270Vac each	1.9kW each
Cooling	Active with fans (variable speed; front-to-back air flow)	
Operating temperature range	-5°C to +55°C (+23°F to +131°F)	
Weight	≈ 2.3kg (5.1lb)	≈ 2.1kg (4.6lb)
Dimensions (HxWxD)	41.4 x 101.6 x351mm (1.63 x 4.00 x 13.82in)	41.4 x 101.6 x 351.8mm (1.63 x 4.00 x 13.85in)

All values are typical at 25°C (77°F)

Fan rack

A forced-air cooling sub-rack is available to ensure the air flow required for proper cabinet installed equipment operation.

Specifications

MODEL	TFAN-19-1U-4F-28V
Air flow	5m^3/min (180cfm)
Power supply	28Vdc
Power Consumption	10W
Operating temperature range	-5°C to +55°C (+23°F to +131°F)
Weight	≈ 1.8kg (3.97lb)
Dimensions	19"-1U rack / depth: 270mm (10.63in)

Active sub-racks

Active sub-racks are provided with a backplane that allows the management and power supply of active modules.
Deep active sub-racks (mod. SUB-TRX-PSU-D) are required to host full features Digital Donor Front End modules

Specifications

MODELS	SUB-TRX-PSU5N	SUB-TRX-PSU-D
Operating temperature range	-5°C to +55°C (+23°F to +131°F) with proper forced-air cooling	
Dimensions	19”-3U rack / depth: 270mm (10.63in)	19"-3U rack / depth: 360mm (14.17in)

All values are typical at 25°C (77°F)

L’unità remota JMA
VHP_1-BAND_TRU9FWV-W-02EU

TEKO DAS Platform - EU

Single-band, very-high-power remote units

MODELS: TRU9FWV/AC-WS TRU9FWV/AC-WE TRU9FWV/48-WS TRU9FWV/48-WE

The TRU9FWV/AC and TRU9FWV/48 single-band very-high-power remote units, operating in the R-GSM band (GSM-R plus EGSM), belong to the TEKO platform, the most advanced distributed antenna system (DAS) in the industry.

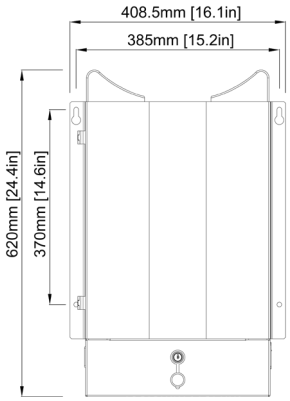
The TEKO platform is a versatile, modular, multi-technology platform designed to offer flexible and reliable wireless coverage and capacity for both indoor and outdoor environments.

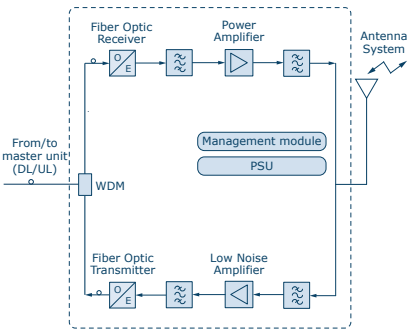
TEKO remote units have been expressly conceived for high quality of service and easy set-up:

- Automatic Gain Control (AGC) on the optical link with the Master Unit, for constant gain independently from optical losses;
- Feedforward Power Amplifiers expressly designed for IMD reduction over the entire bandwidth;
- High-efficiency Power Amplifiers, for reduced power consumption;
- Automatic Level Control (ALC) in the UL path independent for each band, for maximum quality of service;
- RF Antenna Combiners expressly designed for Multi-Operator functioning, providing high insulation and low passive intermodulation (PIM);
- Detection of VSWR Alarm, for maximum quality of service;
- Wavelength Division Multiplexing (WDM) for Tx/Rx communications with the Master Unit over the same optical fiber;
- Point-to-point and cascade connection with the Master Unit, for maximum flexibility of installation;
- Optical remote link up to 20km (12.4miles);
- New and innovative mechanical design, for easy installation and professional visual impact;
- IP66 rating, even on the models with forced ventilation.

TEKO remote units are available in a wide range of different executions as for:

- Single-Band – Multi-Band,
- Operating frequencies from 380 to 2700MHz, complying with all the most important international standards for Mobile Communications and Public Safety,
- Different power classes.





Block diagram of the single-band remote unit

Multi Power Options

TEKO remote units are available in different power classes using multi-carrier amplifiers that can be driven simultaneously by the same Master Unit. This provides a flexible solution to distribute capacity or extend coverage into different locations (indoor and outdoor) at the same time, for example in tunnels, undergrounds, airports, high rise buildings, shopping malls and campuses.

TEKO DAS Platform - EU

Single-band, very-high-power remote units

Distributed Antenna System with R-GSM very-high-power remotes

Multi-carrier optical DAS specifications		
Uplink operating frequency band		876–915 MHz
Downlink operating frequency band		921–960 MHz
Downlink output power [1]	1 carrier	43dBm
	2 carriers	40dBm
	4 carriers	37dBm
	16 carriers	31dBm
Spurious emissions and intermodulation products		< -36dBm (in the frequency band 9 kHz–1 GHz) < -30dBm (in the frequency band 1 GHz–12.75GHz)
Adjacent channel power		-48dBc (WCDMA)
UL setting 1 (0 dB digital attenuation)	Noise Figure	6dB
	IIP3	-17dBm
UL setting 2 (5 dB digital attenuation)	Noise Figure	7dB
	IIP3	-12dBm
UL setting 3 (10 dB digital attenuation)	Noise Figure	10.5dB
	IIP3	-7dBm
UL setting 4 (15 dB digital attenuation)	Noise Figure	15dB
	IIP3	-3dBm
Downlink RF gain, in Master Unit Tx		49dB
Uplink RF gain, out Master Unit Rx		47dB
Pass band ripple		± 1.5dB
Total processing delay (each path)/1m fiber		0.5µs

Remote unit specifications				
Commercial Code	**TRU9FWV/AC-WS**	**TRU9FWV/AC-WE**	**TRU9FWV/48-WS**	**TRU9FWV/48-WE**
Optical output power	6dBm			
Optical connector	SC-APC	E-2000 APC 8°	SC-APC	E-2000 APC 8°
Fiber type	Single mode SMR 9/125			
Optical link budget	10dB (AGC)			
Nominal optical input power	+6dBm up to –4dBm			
RF connector	7/16 (f)			
RF return loss	14dB			
Operating wavelength	1550.92 nm ± 0.4 [2]			
Operating temperature range	-20°C up to +55°C (-4°F up to +131°F) / -40°C (-40°F) upon request			
Cooling	Active (with fans)			
Power supply	85–264Vac (50-60Hz)		-72 to -36Vdc	
Power consumption	370W		330W	
Dimensions	approx 620x408.5x263mm (24.41x16.08x10.35in); max volume - heat sinks, handles, and connectors included			
Weight	approx 36kg (79.37lb)			
IP rating	IP66			

DAS supervision and control	
Commands	RF on/off · RF attenuation on each DL and UL path · 4 external control ports
Supervision and alarms	Summary · Power Supply · Optical UL and DL failure · RF UL and DL failure · VSWR · Temperature · Composite output power · 4 external alarm inputs
Remote Control	Signalling and supervision over fiber from Master Unit to Remote Unit and vice versa

[1] Downlink output power measured at antenna port. WCDMA carriers TM1-64DPCH 60% clipping, 8.5dB PAR, compliant with 3GPP TS 25.143; LTE: compliant with 3GPP specifications (TS 36.143), 8.5dB PAR, 60% clipping; GSM/EDGE carriers comply with GSM 05.05 (spurious emissions and intermodulation products) for downlink composite output power ≤ 39dBm.

[2] Other wavelengths for cascading available upon request: 1554.13 nm ± 0.4; 1552.52 nm ± 0.4; 1549.32 nm ± 0.4; 1547.72 nm ± 0.4

All values are typical at 25°C (77°F) and 0dBm received optical power unless otherwise specified

Allegato A:
Progetto radio-copertura Campomarino

Datasheet Cavi Coassiali e Radianti
Radio Frequency System (RFS)

Nexum Srl
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Sede Amm.va: Via Sigismondo, 75 – 47921 Rimini (RN)
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Cavo radiante RLKU158-50CPR
Connettori 7-16 femmina per cavo 1-5/8’’

PRODUCT DATASHEET

RLKU158-50CPRH

1-5/8" RADIAFLEX® RLKU Cable, A-series

- RADIAFLEX® functions as a distributed antenna to provide communications in tunnels, mines and large building complexes and is the solution for any application in confined areas.
- Slots in the copper outer conductor allow a controlled portion of the internal RF energy to be radiated into the surrounding environment. Conversely, a signal transmitted near the cable will couple into the slots and be carried along the cable length.
- RADIAFLEX® is used for both one-way and two-way communication systems and because of its broadband capability, a single radiating cable can handle multiple communication systems simultaneously.
- This RADIAFLEX® radiating cable utilize a low-loss cellular polyethylene foam dielectric and a smooth copper outer conductor which offers a superior electrical performance together with good bending properties.

FEATURES / BENEFITS

- Ultra wideband from 30 MHz to 2700 MHz
- For applications in tunnels and buildings
- Low coupling loss variations
- Lowest insertion loss and excellent coupling performance to minimize count of active equipment
- Best-in-class, RF ultra wideband radiating cable, accomodating all current and future commercial radio and private radio service from 30 MHz to 2700 MHz

Technical features

GENERAL SPECIFICATIONS		
Size		1-5/8
ELECTRICAL SPECIFICATIONS		
Max. Operating Frequency	MHz	2700
Cable Type		RLKU
Impedance	Ohm	50 +/- 2
Velocity, percent	%	89
Capacitance	pF/m (pF/ft)	76 (23.2)
Inductance, uH/m (uH/ft)	µH/m (µH/ft)	0.19 (0.058)
DC-resistance inner conductor, ohm/km (ohm/1000ft)	Ω/km (Ω/1000ft)	1.62 (0.49)
DC-resistance outer conductor, ohm/km (ohm/1000ft)	Ω/km (Ω/1000ft)	1.47 (0.45)
Stop bands	MHz	540-610
Frequency Selection	MHz	600, 900, 1800/1900, 2200, 2400, 2500, 2700

NEXXUM the best way to connect

RLKU158-50CPRH

1-5/8" RADIAFLEX® RLKU Cable, A-series

MECHANICAL SPECIFICATIONS

Jacket		CPR, EN50575 : 2014 + A1:2016 classified cable
Jacket Description		Halogen free, non corrosive, flame and fire retardant, low smoke, polyolefin + flame barrier tape above outer conductor for lowest cable loss
Slot Design		Groups of vertical slots at short intervals
Inner Conductor Material		Corrugated Copper Tube
Outer Conductor Material		Overlapping Copper Strip
Diameter Inner Conductor	mm (in)	17.6 (0.69)
Diameter Outer Conductor	mm (in)	44.2 (1.74)
Diameter over Jacket Nominal	mm (in)	48.2 (1.9)
Minimum Bending Radius, Single Bend	mm (in)	700 (28)
Cable Weight	kg/m (lb/ft)	1.01 (0.68)
Tensile Force	N (lb)	1200 (270)
Indication of Slot Alignment		Guides opposite to slots
Recommended / Maximum Clamp Spacing	m (ft)	1.5 (5)
Minimum Distance to Wall	mm (in)	80 (3.15)

TESTING AND ENVIRONMENTAL

Jacket Testing Methods		Test methods for fire behaviour of cable : IEC 60754-1/-2 smoke emission: halogen free, non corrosive IEC 61034 low smoke IEC 60332-1 flame retardant IEC 60332-3-24 fire retardant UL1666, ASTM E 662, NES711 and NES713 CPR: EN50575:2014 + A1:2016 class B2ca s1a d0 a1

TEMPERATURE SPECIFICATIONS

Storage Temperature	°C(°F)	-70 to 85 (-94 to 185)
Installation Temperature	°C(°F)	-15 to 60 (5 to 140)
Operation Temperature	°C(°F)	-40 to 85 (-40 to 185)

RLKU158-50CPRH

1-5/8" RADIAFLEX® RLKU Cable, A-series

ATTENUATION AND POWER RATING

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%, dB	Coupling Loss 95%, dB
75	0,55 (0,17)	70 (75)	78 (82)
150	0,81 (0,25)	70 (75)	78 (82)
700	2,00 (0,61)	69 (71)	71 (74)
800	2,17 (0,66)	67 (71)	68 (73)
870	2,29 (0,70)	67 (72)	69 (74)
900	2,32 (0,71)	68 (72)	70 (75)
960	2,43 (0,74)	66 (70)	69 (73)
1700	3,57 (1,09)	65 (69)	70 (74)
1800	3,70 (1,13)	62 (66)	65 (70)
1900	3,95 (1,20)	62 (66)	65 (70)
2000	4,15 (1,27)	63 (67)	67 (72)
2100	4,41 (1,34)	62 (66)	66 (71)
2200	4,62 (1,41)	62 (66)	66 (71)
2400	5,18 (1,58)	63 (68)	67 (71)
2600	5,80 (1,77)	61 (65)	64 (68)
2700	5,96 (1,82)	63 (66)	67 (70)

External Document Links

Construction Products Regulation (CPR) classification and product related information available on RFS webpage.

Notes

- Coupling loss as well as longitudinal attenuation of RADIAFLEX® cables are measured by the free space method according to IEC 61196-4.
- Coupling loss values are measured with a radial (below 540 MHz) or parallel (above 610 MHz) orientated dipole antenna.
- The coupling loss values given in brackets are average values of all three spatial orientations (radial, parallel and orthogonal) of dipole antenna.
- Coupling loss values are given with a tolerance of +5 dB and longitudinal loss values with a tolerance of +5%. Note: Measured values below nominal are better. They are not limited by any tolerance-range.
- In case of a conflict of operational and stop band, please contact RFS for further assistance.
- As with any radiating cable, the performance in building or tunnel environments may deviate from figures based on free space method.

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PRODUCT DATASHEET

716F-RA158-016

7-16 DIN Female Connector for 1-5/8" RADIAFLEX® cable

These single-piece high performance coaxial cable connectors are designed specifically to provide the highest quality connector-cable interface while simplifying and speeding up the attachment of connectors to RADIAFLEX® cables. The connectors provide outstanding value to users because they permit quick, easy and reliable installation at any location, thereby allowing the operator flexibility while saving installation time and money. They attach to prepared cable in one piece assuring error-free attachment. All connectors are fully tested for mechanical and electrical compliance specifications. They are available in all popular cable sizes in both type N and 7-16 DIN interface.

FEATURES / BENEFITS

- Single-piece design for Fast and Easy Installation - Reliable and simple attachment avoids unnecessary connector adjustments and provides outstanding performance. Saves time and provides cost savings.
- Robust Mechanical Design - Low and consistent IM performance.
- Excellent Electrical Performance - Low VSWR
- Totally Waterproof - Assures safe, long term operation in the harshest of environments.

RADIAFLEX connector

External Document Links

Application Note

Installation Instruction

Notes

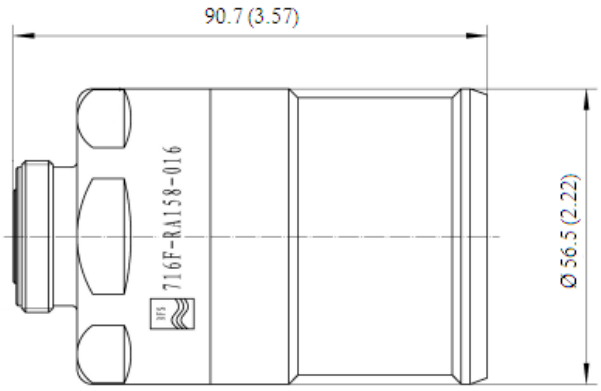
Technical features

GENERAL SPECIFICATIONS		
Transmission Line Type		Coaxial Cable
Cable Size		1-5/8
Cable Type		Radiating
Model Series		all RLF, RLK and RAY158-50A-Series
Connector Interface		7-16 DIN
Connector Type		Straight
Sealing Method		Shrinking Sleeve
Gender		Female
ELECTRICAL SPECIFICATIONS		
Nominal Impedance, ohms	Ohm	50
Maximum Frequency	GHz	3.0
MECHANICAL SPECIFICATIONS		
Length	mm (in)	90.7 (3.57)
Outer Diameter	mm (in)	56.5 (2.22)
Body Material		Brass / Plating: Tri metal
Inner Contact Material		Copper / Plating: Silver
Inner Contact Attachment		Spring Finger / Plating: silver
Outer Contact Attachment		Spring loop / Plating: silver
TESTING AND ENVIRONMENTAL		
Waterproof Level		IP68

NEXUM the best way to connect

716F-RA158-016

7-16 DIN Female Connector for 1-5/8" RADIAFLEX® cable



Materiali per il Fissaggio in galleria del cavo radiante

SFS-158-01

Smart Fixing Solution for RADIAFLEX® 1 5/8"

Clic Clamp, 1-5/8" RADIAFLEX polyamide black, halogen free
fire class UL94HB

FEATURES / BENEFITS

Safe and efficient installation of RADIAFLEX® cable with clic-clamps. Simple mounting by using wall plugs and screws. Simply push in by hand, clamp will grip and lock by applying slight pressure.

External Document Links | Notes

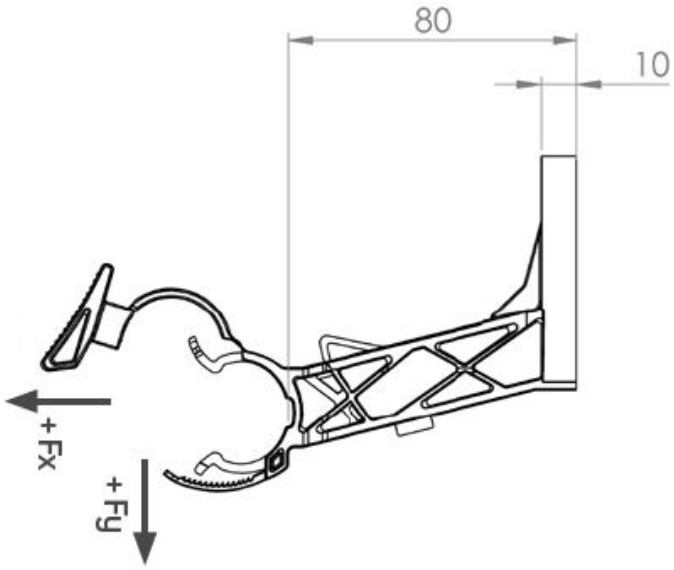
Technical features

GENERAL SPECIFICATIONS		
Product Line		Radiating Cable Accessories
Product Type		Hanger
Hanger Type		SFS clamp
Transmission Line Type		RLF* RLK* RLV* RAY*158-50*A RCF158-50*A
Cable Type		Radiating Cable
Color		Black
MECHANICAL SPECIFICATIONS		
Cable Size		1-5/8
Number of Cable / Waveguide Runs		1
Material		Polyamide
TESTING AND ENVIRONMENTAL		
Fire Class		UL94 HB
TEMPERATURE SPECIFICATIONS		
Installation Temperature	°C (°F)	-20 to 80 (-4 to 176)
Operation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Storage Temperature	°C (°F)	-50 to 85 (-58 to 185)
PACKAGING INFORMATION		
Package Quantity		80
Weight per piece	kg (lb)	0.077 (0.17)

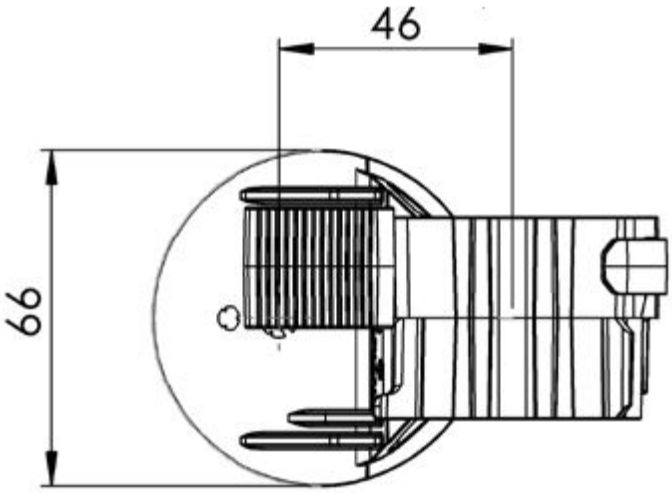
NEXUM the best way to connect

SFS-158-01

Smart Fixing Solution for RADIAFLEX® 1 5/8"



Fx = 300 N ; Fy = 300 N



PRODUCT DATASHEET

SFS-FIX-644-02

Metal plug for smart fixing solution family

For the simple and fast installation of ceiling suspensions

FEATURES / BENEFITS

- Quick assembly due to smooth hammering in
- Spreads forward, no need to hold the workpiece
- Spreading via cone and tongue
- Drill hole diameter 6 mm
- Large retaining head for clean assembly
- ETA-17/1004 Multiple loading of non-load-bearing systems in cracked concrete
- Fire resistance F120

Technical features

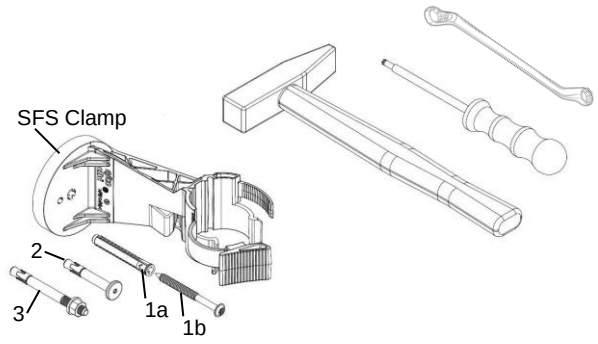
STRUCTURE		
Product Line		Radiating Cable Accessories
Product Type		Installation Hardware
Installation Hardware Type		Metal Plug
Transmission Line Type		Radiating Cables (all sizes)
MECHANICAL SPECIFICATIONS		
Material		Stainless Steel (A4)
Length	mm (in)	44 (1.732)
Drill Hole Depth	mm (in)	40 (1.575)
Drill Hole Size	mm (in)	6 (0.236)
PACKAGING INFORMATION		
Package Quantity		200

External Document Links

Notes

This installation instruction has been written for qualified, skilled personnel. Please study them carefully before starting any work. RFS disclaims any responsibility for the result of improper or unsafe installation. All national safety and environmental regulations must be followed during installation. To avoid risk of injury, RFS strongly recommends wearing personal protection during the installation process.

Fixation of the clamps (3 Options)



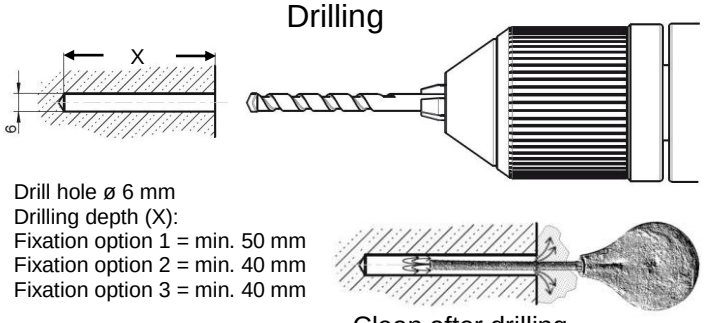
Clamps and Fixation Hardware (Options):
SFS Clamps: SFS-12-01, SFS-78-01, SFS-114-01, SFS-158-01

Fixation Options:

1) Plastic dowel : SFS-PLUG-6-01
   Screw for plastic dowel: SFSA-SC650-02
2) Metal Plug with head: SFS-FIX-644-02
3) Metal Plug with nut: SFS-FIX-649-02

Tools:
Hammer (for all options)
Torx Wrench T-25 (optional for Fixation Hardware 1)
Wrench size 10 mm (optional for Fixation Hardware 3)

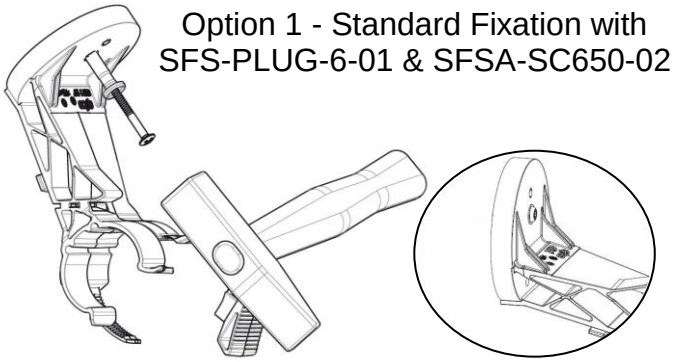
Drilling



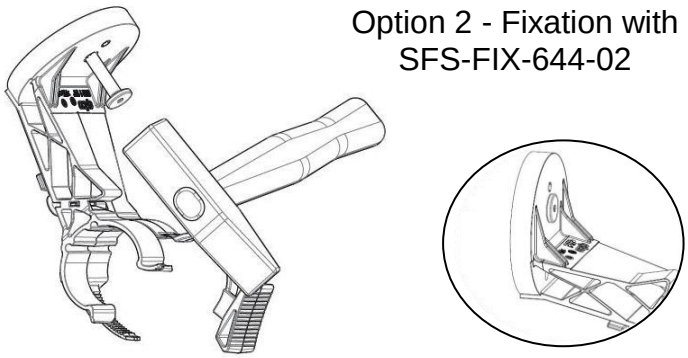
Drill hole ø 6 mm
Drilling depth (X):
Fixation option 1 = min. 50 mm
Fixation option 2 = min. 40 mm
Fixation option 3 = min. 40 mm

Clean after drilling

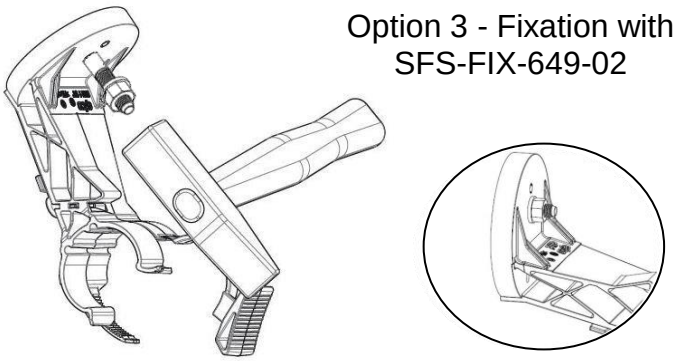
Option 1 - Standard Fixation with SFS-PLUG-6-01 & SFSA-SC650-02



Option 2 - Fixation with SFS-FIX-644-02

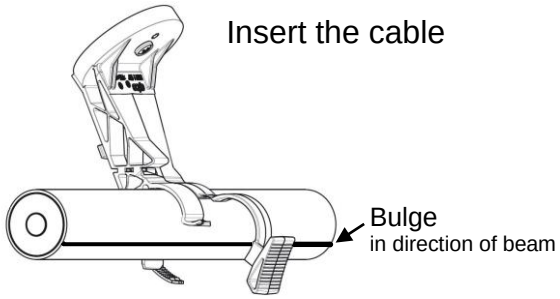


Option 3 - Fixation with SFS-FIX-649-02

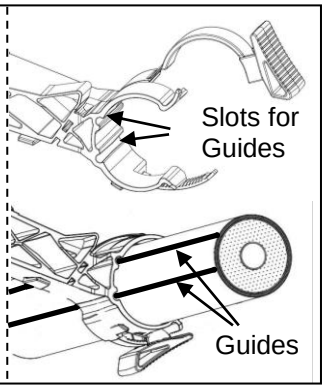


Fixation of the cables

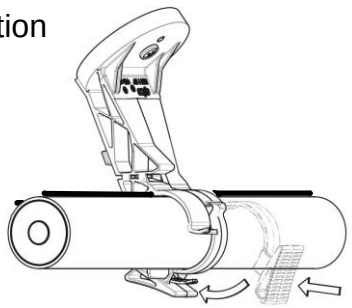
Insert the cable



Note the position of Bulge or Guides on the cable jacket



Fixation



Fix the cable by pressing in the strap

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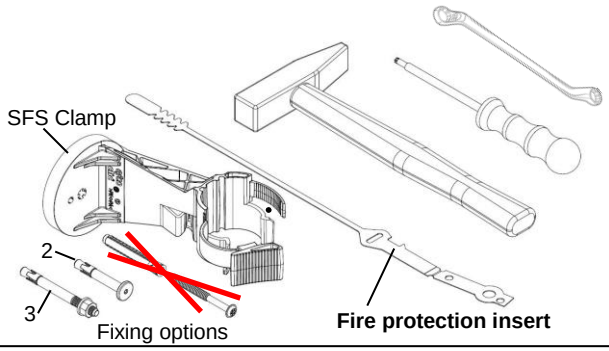
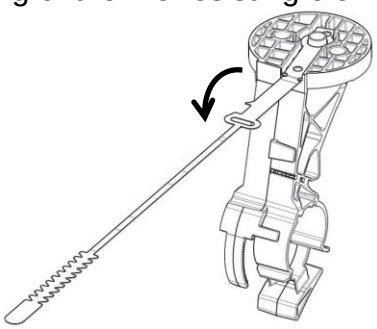
Installation with Fire protection inserts – Recommended in a distance of ~10

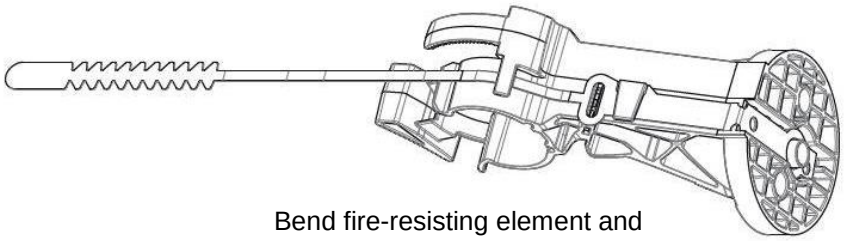


Fire protection inserts for fixing options 2 & 3 (shown on page 1)

- SFS-12-F for SFS-12-01 clamp (1/2”) L = 247 mm (9,72 in)
- SFS-78-F for SFS-78-01 clamp (7/8”) L = 300 mm (11,81 in)
- SFS-114 for SFS-114-01 clamp (1 1/4”) L = 330 mm (12,99 in)
- SFS-158-F for SFS-158-01 clamp (1 5/8”) L = 335 mm (13,18 in)

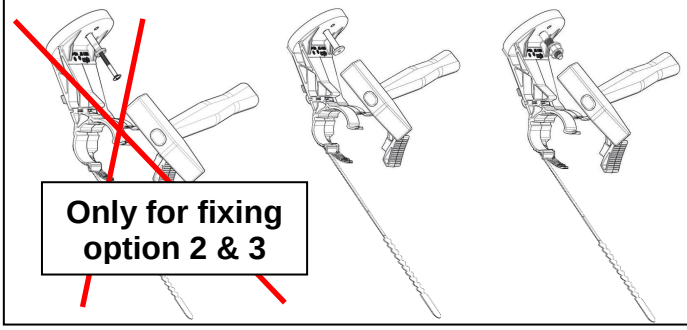
Mounting of the fire resisting element





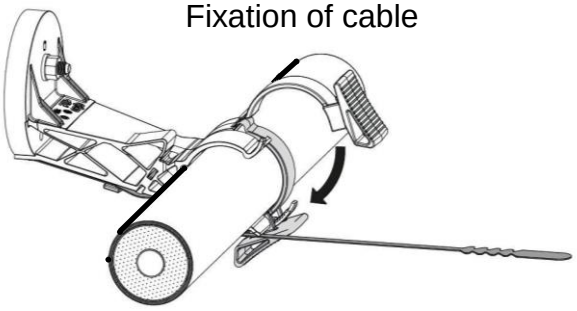
Bend fire-resisting element and insert into the slot of the clamp

Fixation – Same way as shown on page 1



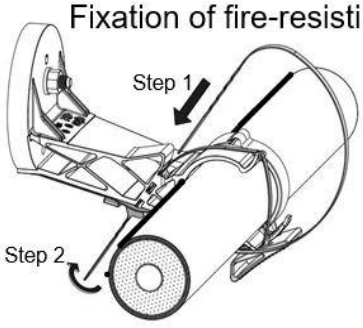
Only for fixing option 2 & 3

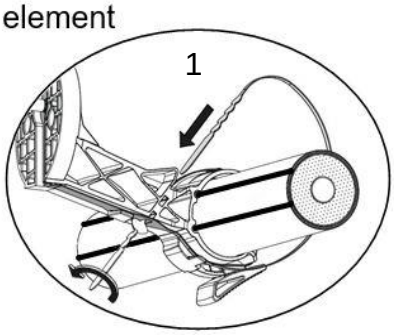
Fixation of cable

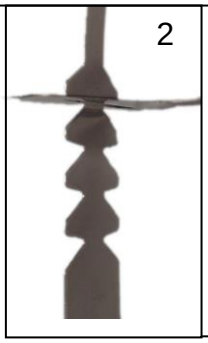


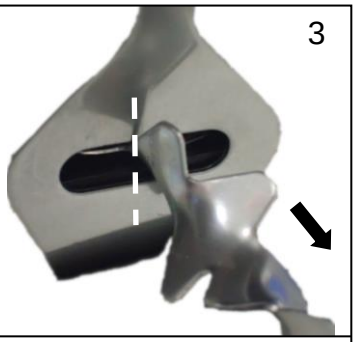
Insert the cable and fix it by pressing in the strap

Fixation of fire-resisting element









1) Enter the fire-resisting element into the foreseen slot, tighten it firmly and twist it by 360° to fix it
2) Use the last gap of metal strip and make sure it stands vertical (90°) to the slot when tighten
3) The metal strip must be tighten closed and stand of straight away from the clamp

Cavi coassiale da 1/2'' e i materiali associati

716M-LCF12-C03

7-16 DIN Male Connector for 1/2" Coaxial Cable, OMNI FIT™ standard, O-ring sealing

NEXUM the best way to connect

OMNI FIT™ high performance connectors are designed for use with both CELLFLEX® (copper) and CELLFLEX® Lite (aluminum) cables. They are designed specifically to provide the highest quality connector-cable interface while simplifying and speeding up connector attachment. The 7-16 connector is the most rugged RF connection meeting all requirements even under the most severe environmental conditions.

716M-LCF12-C03

FEATURES / BENEFITS

- Cost effective two-piece design for safe and easy installation
- Compatible with copper and aluminium cable types i.e. one connector for both outer conductor materials eliminates the risk of faulty connector installation and helps to keep inventory down
- Robust mechanical design for low and consistent intermodulation performance i.e. keeps the mobile network performance up reduces the number of dropped calls and avoids revenue losses
- Superior electrical performance for consistent and repeatable VSWR i.e. ensure network system performance
- Waterproof to IP 68 i.e. no downtime risk, secures revenue
- RoHS (EU) and CRoHS (China) compliant i.e. can be used on a global basis

External Document Links

Application Note

Installation instruction

Notes

Technical features

GENERAL SPECIFICATIONS

Transmission Line Type		Coaxial Cable		
Cable Size		1/2		
Cable Type		Foam Dielectric		Radiating
Model Series		LCF12-50 Series	ICA12-50 Series	RCF12-50 Series
Connector Interface		7-16 DIN		
Connector Type		OMNI FIT™ Standard		
Sealing Method		O-ring		
Gender		Male		

ELECTRICAL SPECIFICATIONS

Nominal Impedance, ohms	Ohm	50
3rd Order IM Product @ 2x20 Watts	dBc	-157 ; typical -160
Maximum Frequency	GHz	6.0
VSWR, Return Loss	VSWR (dB)	0 < f ≤ 1.0 GHz: 1.03 (36.6) 1.0 < f ≤ 2.7 GHz: 1.04 (34.1) 2.7 < f ≤ 3.7 GHz: 1.08 (28.3) 3.7 < f ≤ 5.0 GHz: 1.15 (23.1) 5.0 < f ≤ 6.0 GHz: 1.25 (19.1)

MECHANICAL SPECIFICATIONS

Plating Outer/Inner		Trimetal/Silver
Length	mm (in)	52.8 (2.08)
Outer Diameter	mm (in)	36 (1.42)
Inner Contact Attachment		Spring Finger
Outer Contact Attachment		Spring C-Ring

716M-LCF12-C03

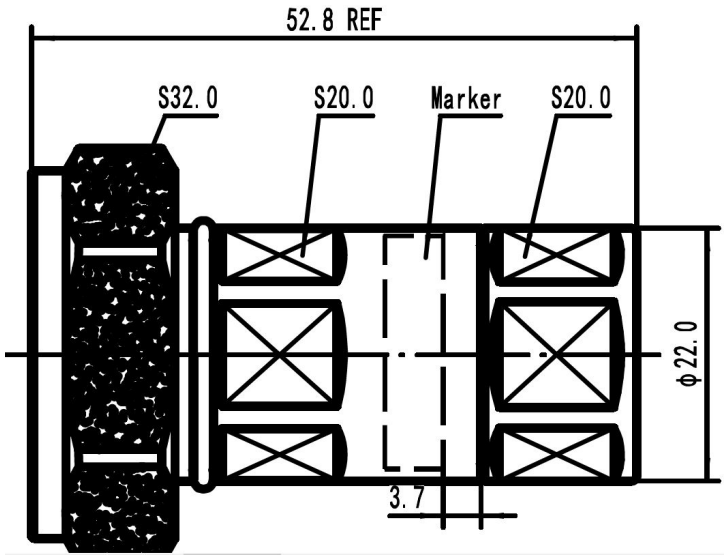
7-16 DIN Male Connector for 1/2" Coaxial Cable, OMNI FIT™ standard, O-ring sealing

ACCESSORIES

Wrench size front	mm (in)	20 (13/16)
Wrench size rear	mm (in)	20 (13/16)
Trimming Tool		TRIM-SET-L12-C02

TESTING AND ENVIRONMENTAL

Waterproof Level		IP68



716M-LCF12-C03 Outline drawing

GKSPEED20-12P

High speed grounding kit for CELLFLEX® LCF 12

This Grounding Kit has been developed by RFS for the CELLFLEX® cable series. The Grounding Kit body facilitates a proper attachment to the coaxial cable, ensuring that the performance of the coaxial cable is not being compromised. The tin plated copper mesh provides a secure, low resistance contact to the cable outer conductor. The installation only takes a few minutes. No additional sealing with mastic and electrical tape required.

GKSPEED20-78P shown for illustration

FEATURES / BENEFITS

- Compatible with both copper and aluminium cable types i.e. one Grounding Kit for both outer conductor materials eliminates the risk of faultyGrounding Kit installation and helps to keep inventory down.
- This kit has been verified by independent labs to withstand the damaging effects of lightning current in excess of 50kA 8/20µs. The copper wire provides the most practical and effective low inductance transfer of lightning induced current to ground.
- No influence on the electrical transmission characteristics of the coaxial cable.
- Robust mechanical design.
- UV resistant according to DIN EN ISO 4892-2 (Plastics - Methods of exposure to laboratory light sources - Part 2 Xenon-arc-lamps).
- Ozone resistant according to DIN 53509 (Testing of rubber - Determination of resistance to ozone cracking).
- Compliant to RoHS (EU 2002/95/EC) and CRoHS (China SJ/T11363-2006) i.e. usable on a global basis.

External Document Links

Installation Instruction

Notes

Datasheet also applies to GKSPEED20-12GRP (gray) except for grounding wire color

Technical features

STRUCTURE

Product Line		Coaxial Cable Accessories Hybrid Cable Accessories
Type of Grounding Kit		High Speed
Transmission Line Type		LCF12, HB012
Cable Type		Coaxial Foam Dielectric, Hybrid
Cable Size		1/2"
Number of Cable / Waveguide Runs		1
Material		Grounding Kit Body: Stainless steel, with vulcanised EPDM (Ethylene-Propylene-Caoutchouc) Screws: Stainless steel with safety washers Contact element: Tin-plated copper mesh

ACCESSORIES

Recommended Tool		JSTRIP-12-3 (not for Power Cable)

MECHANICAL SPECIFICATIONS

Lug Attachment Method		Factory Attached
Lug Style Size		1-hole Ø 10.2mm (13/32") crimp-on, tin-plated
Grounding Wire Length	m (in)	0.5 (20)
Grounding Wire Size	mm^2	16mm_2 (7x7 strand)
Grounding Wire Color		Black
Grounding Body Color		Black
Sealing Class		IP68

GKSPEED20-12P

High speed grounding kit for CELLFLEX® LCF 12

TEMPERATURE SPECIFICATIONS

Operation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Storage Temperature	°C (°F)	-50 to 85 (-58 to 185)

PACKAGING INFORMATION

Package Quantity		1
Weight per piece	kg (lb)	0.3 (0.66)

GKSPEED20-78P shown for illustration

PRODUCT DATASHEET

LCF12-50JFN

1/2" CELLFLEX® Low-Loss Foam-Dielectric Coaxial Cable

CELLFLEX® 1/2" low loss flexible cable; flame retardant/ halogen free jacket

FEATURES / BENEFITS

- **Low Attenuation**
  The low attenuation of CELLFLEX® coaxial cable results in highly efficient signal transferin your RF system.
- **Complete Shielding**
  The solid outer conductor of CELLFLEX® coaxial cable creates a continuous RFI/EMI shield that minimizes system interference.
- **Low VSWR**
  Special low VSWR versions of CELLFLEX® coaxial cables contribute to low system noise.
- **Outstanding Intermodulation Performance**
  CELLFLEX® coaxial cable's solid inner and outer conductors virtually eliminate intermods. Intermodulation performance is also confirmed with state-of-the-art equipment at the RFS factory.
- **High Power Rating**
  Due to their low attenuation, outstanding heat transfer properties and temperature stabilized dielectric
  materials, CELLFLEX® cable provides safe long term operating life at high transmit power levels.
- **Wide Range of Application**
  Typical areas of application are: feedlines for broadcast and terrestrial microwave antennas, wireless cellular, PCS and ESMR base stations, cabling of antenna arrays, and radio equipment interconnects.
- **Meets or Exceeds: IEC 60754-1, -2; IEC 60332-1-1, -2;IEC 61034-1, -2; IEC 60332-3-24 (formerly IEC 60332-3-C)**

1/2" CELLFLEX® Low-Loss Foam Dielectric Coaxial Cable

External Document Links

Notes

Phase stabilized versions available upon request.

Phase stabilized versions available upon request.

Technical features

APPLICATIONS

Applications		OEM jumpers, Main feed transitions to equipment, GPS lines, Riser-rated In-Building, CPR classified cable

STRUCTURE

Size		1/2
Jacket Option		Black
Inner Conductor Diameter	mm (in)	4.8 (0.19)
Inner Conductor Material		Copper-Clad Aluminum Wire
Dielectric Diameter	mm (in)	11.3 (0.44)
Dielectric Material		Foam Polyethylene
Outer Conductor Diameter	mm (in)	13.8 (0.54)
Outer Conductor Material		Corrugated Copper
Jacket Diameter	mm (in)	15.8 (0.62)
Jacket Material		Polyethylene, PE, Metalhydroxite Filling
Cable Type		Foam-Dielectric, Corrugated

NEXUM
the best way to connect

LCF12-50JFN

1/2" CELLFLEX® Low-Loss Foam-Dielectric Coaxial Cable

TESTING AND ENVIRONMENTAL

Fire Performance		Flame Retardant, LS0H
Flame Retardant Jacket Specifications		Meets/Exceeds: IEC 60754-1, -2; IEC 60332-1-1, -2; IEC 61034-1, -2; IEC 60332-3-24 (formerly IEC 60332-3-C); UL 1581; UL 1666; NFPA 130; NEC type CATVR; EN45545-2(GER production); CPR: https://products.rfsworld.com/userfiles/cpr/rfs-products-cpr-compliance.pdf
Installation Temperature	°C(°F)	-25 to 60 (-13 to 140)
Storage Temperature	°C (°F)	-70 to 85 (-94 to 185)
Operation Temperature	°C(°F)	-50 to 85 (-58 to 185)

ELECTRICAL SPECIFICATIONS

Impedance	Ω	50 +/- 1
Maximum Frequency	GHz	8.8
Velocity	%	87
Capacitance	pF/m (pF/ft)	76 (23.2)
Inductance	uH/m (uH/ft)	0.19 (0.058)
Peak Power Rating	kW	38
RF Peak Voltage	Volts	1950
Jacket Spark	Volt RMS	8000
Inner Conductor dc Resistance	Ω/1000 m (Ω/1000 ft)	1.62 (0.5)
Outer Conductor dc Resistance	Ω/1000 m (Ω/1000 ft)	3.55 (1.08)
Return Loss (VSWR) Performance		Standard or Premium
Min. Return Loss (Max. VSWR)	dB (VSWR)	Standard 20 (1.222), Premium 24 (1.135)/ 23 (1.152)
Phase Stabilized		Phase stabilized and phase matched cables and assemblies are available upon request.
Temperature & Power		Standard

MECHANICAL SPECIFICATIONS

Cable Weight, Nominal	kg/m (lb/ft)	0.201 (0.135)
Minimum Bending Radius, Single Bend	mm (in)	70 (3)
Minimum Bending Radius, Repeated Bends	mm (in)	125 (5)
Bending Moment	Nm (lb-ft)	6.5 (4.79)
Tensile Strength	N (lb)	1050 (236)
Recommended / Maximum Clamp Spacing	m (ft)	0.6 / 1 (2 / 3.25)

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LCF12-50JFN

1/2" CELLFLEX® Low-Loss Foam-Dielectric Coaxial Cable

NEXXUM the best way to connect

ATTENUATION @ 20°C (68°F) AND POWER RATING @ 40°C (104°F)

Frequency, MHz	dB per 100m	dB per 100ft	Power, kW
1	0.21	0.07	35.30
1.5	0.26	0.08	28.80
2	0.30	0.09	25
10	0.68	0.21	11.10
20	0.96	0.29	7.83
30	1.18	0.36	6.37
50	1.53	0.47	4.91
88	2.04	0.62	3.68
100	2.18	0.66	3.45
108	2.27	0.69	3.31
150	2.69	0.82	2.80
174	2.90	0.88	2.59
200	3.12	0.95	2.41
300	3.85	1.17	1.95
400	4.48	1.37	1.68
450	4.77	1.45	1.57
500	5.04	1.54	1.49
512	5.11	1.56	1.47
600	5.56	1.69	1.35
700	6.03	1.84	1.24
750	6.26	1.91	1.20
800	6.48	1.98	1.16
824	6.58	2.01	1.14
894	6.88	2.10	1.09
900	6.91	2.10	1.09
925	7.01	2.14	1.07
960	7.15	2.18	1.05
1000	7.31	2.23	1.03
1250	8.25	2.52	0.91
1400	8.78	2.68	0.86
1500	9.12	2.78	0.82
1700	9.77	2.98	0.77
1800	10.10	3.07	0.75
2000	10.70	3.26	0.70
2100	11	3.35	0.68
2200	11.30	3.44	0.67
2400	11.80	3.61	0.63
2500	12.10	3.69	0.62
2600	12.40	3.78	0.61
2700	12.70	3.86	0.59

LCF12-50JFN

1/2" CELLFLEX® Low-Loss Foam-Dielectric Coaxial Cable

3000	13.40	4.09	0.56
3500	14.70	4.47	0.51
4000	15.80	4.83	0.47
5000	18	5.50	0.42
6000	20.70	6.30	0.37
7000	22	6.70	0.34
8000	23.80	7.26	0.32
8800	25.20	7.69	0.30

RSB-12

RSB-Clip

RSB -Clip Stainless Steel Hanger . Quantity of cable gripping tabs for the various cable type may be different.

FEATURES / BENEFITS

The RSB-Clip is designed for the installation of feeder cables from sizes 1/4"up to 1-5/8". The clip is a universal clamp device and can be used in many mounting configuration. The RSB-Clip is made of stainless steel. The hanger is resistant against all environmental influences. Due to the mechanical construction, a cable deformation is impossible. Therefore, a deterioration of the electrical properties is avoided.

External Document Links

Notes

Technical features

GENERAL SPECIFICATIONS

Product Line		Coaxial Cable Accessories Radiating Cable Accessories Hybrid Cable Accessories
Product Type		Hanger
Hanger Type		RSB-Clip
Transmission Line Type		LCF12 ALFU12 RLKW12 RLKU12 RCF12 HCA12-50 RHCA12-50 HB012
Cable Type		Coaxial Foam Dielectric Radiating Cable Hybrid

MECHANICAL SPECIFICATIONS

Cable Size		1/2
Number of Cable / Waveguide Runs		1
Material		Stainless Steel
Drill Hole Size	mm (in)	8 (0.315)

ACCESSORIES

Spare Part / Useful Accessories		Cleat : RSB-310 Anchor bar fixation : RSB-315

TEMPERATURE SPECIFICATIONS

Installation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Operation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Storage Temperature	°C (°F)	-50 to 85 (-58 to 185)

PACKAGING INFORMATION

Package Quantity		10

NEXXUM the best way to connect

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716F-LCF78-C03

7-16 DIN Female Connector for 7/8" Coaxial Cable, OMNI FIT™ standard, O-ring sealing

NEXUM
the best way to connect

OMNI FIT™ high performance connectors are designed for use with both CELLFLEX® (copper) and CELLFLEX® Lite (aluminum) cables. They are designed specifically to provide the highest quality connector-cable interface while simplifying and speeding up connector attachment. The 7-16 connector is the most rugged RF connection meeting all requirements even under the most severe environmental conditions.

716F-LCF78-C03

FEATURES / BENEFITS

- Cost effective two-piece design for safe and easy installation
- Compatible with copper and aluminium cable types i.e. one connector for both outer conductor materials eliminates the risk of faulty connector installation and helps to keep inventory down
- Robust mechanical design for low and consistent intermodulation performance i.e. keeps the mobile network performance up reduces the number of dropped calls and avoids revenue losses
- Superior electrical performance for consistent and repeatable VSWR i.e. ensure network system performance
- Waterproof to IP 68 i.e. no downtime risk, secures revenue
- RoHS (EU) and CRoHS (China) compliant i.e. can be used on a global basis

External Document Links

Application Note

Installation Instruction

Notes

Technical features

GENERAL SPECIFICATIONS

Transmission Line Type		Coaxial Cable		
Cable Size		7/8		
Cable Type		Foam Dielectric	Ultraflexible	Radiating
Model Series		LCF78-50 Series	RCF78-50 Series	
Connector Interface		7-16 DIN		
Connector Type		OMNI FIT™ Standard		
Sealing Method		O-ring		
Gender		Female		

ELECTRICAL SPECIFICATIONS

Nominal Impedance, ohms	Ohm	50
3rd Order IM Product @ 2x20 Watts	dBc	-157 ; typical -160
Maximum Frequency	GHz	6.0
VSWR, Return Loss	VSWR (dB)	0 < f ≤ 1.0 GHz: 1.03 (36.6) 1.0 < f ≤ 2.7 GHz: 1.04 (34.1) 2.7 < f ≤ 3.7 GHz: 1.08 (28.3) 3.7 < f ≤ 5.0 GHz: 1.15 (23.1) 5.0 < f ≤ 6.0 GHz: 1.25 (19.1)

MECHANICAL SPECIFICATIONS

Plating Outer/Inner		Trimetal/Silver
Length	mm (in)	52.5 (2.07)
Outer Diameter	mm (in)	35.5 (1.4)
Inner Contact Attachment		Spring Finger
Outer Contact Attachment		Spring O-Ring

716F-LCF78-C03

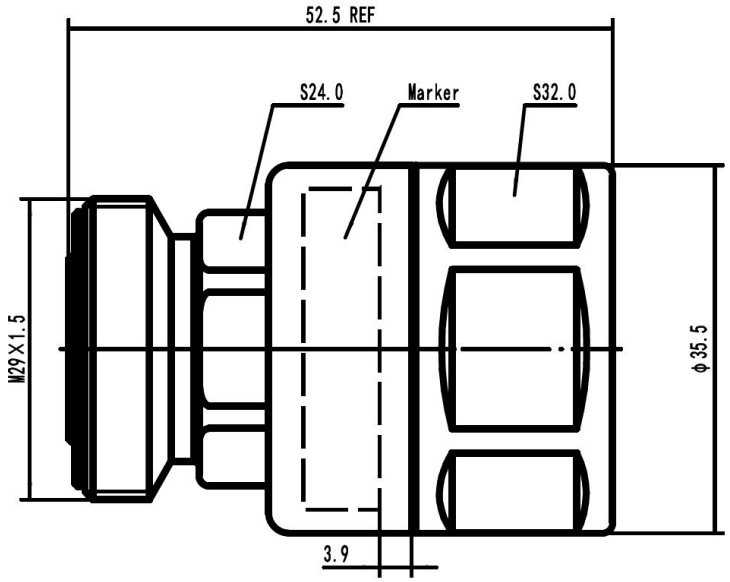
7-16 DIN Female Connector for 7/8" Coaxial Cable, OMNI FIT™ standard, O-ring sealing

ACCESSORIES

Wrench size front	mm (in)	24 (15/16)
Wrench size rear	mm (in)	32 (1-1/4)

TESTING AND ENVIRONMENTAL

Waterproof Level		IP68



716F-LCF78-C03 Outline drawing

716M-LCF78-C03

7-16 Male Connector for 7/8" Coaxial Cable, OMNI FIT™ standard, O-ring sealing

NEXXUM the best way to connect

OMNI FIT™ high performance connectors are designed for use with both CELLFLEX® (copper) and CELLFLEX® Lite (aluminum) cables. They are designed specifically to provide the highest quality connector-cable interface while simplifying and speeding up connector attachment. The 7-16 connector is the most rugged RF connection meeting all requirements even under the most severe environmental conditions.

716M-LCF78-C03

FEATURES / BENEFITS

- Cost effective two-piece design for safe and easy installation
- Compatible with copper and aluminium cable types i.e. one connector for both outer conductor materials eliminates the risk of faulty connector installation and helps to keep inventory down
- Robust mechanical design for low and consistent intermodulation performance i.e. keeps the mobile network performance up reduces the number of dropped calls and avoids revenue losses
- Superior electrical performance for consistent and repeatable VSWR i.e. ensure network system performance
- Waterproof to IP 68 i.e. no downtime risk, secures revenue
- RoHS (EU) and CRoHS (China) compliant i.e. can be used on a global basis

External Document Links

Installation Instruction

Notes

Technical features

GENERAL SPECIFICATIONS

Transmission Line Type		Coaxial Cable	
Cable Size		7/8	
Cable Type		Foam Dielectric	
Model Series		LCF78-50 Series	RCF78-50 Series
Connector Interface		7-16	
Connector Type		OMNI FIT™ Standard	
Sealing Method		O-ring	
Gender		Male	

ELECTRICAL SPECIFICATIONS

Nominal Impedance, ohms	Ohm	50
3rd Order IM Product @ 2x20 Watts	dBc	-157 ; typical -160
Maximum Frequency	GHz	6.0
VSWR, Return Loss	VSWR (dB)	0 < f ≤ 1.0 GHz: 1.03 (36.6) 1.0 < f ≤ 2.7 GHz: 1.04 (34.1) 2.7 < f ≤ 3.7 GHz: 1.08 (28.3) 3.7 < f ≤ 5.0 GHz: 1.15 (23.1) 5.0 < f ≤ 6.0 GHz: 1.25 (19.1)

MECHANICAL SPECIFICATIONS

Plating Outer/Inner		Trimetal/Silver
Length	mm (in)	57.9 (2.28)
Outer Diameter	mm (in)	36 (1.42)
Inner Contact Attachment		Spring Finger
Outer Contact Attachment		Spring C-Ring

716M-LCF78-C03

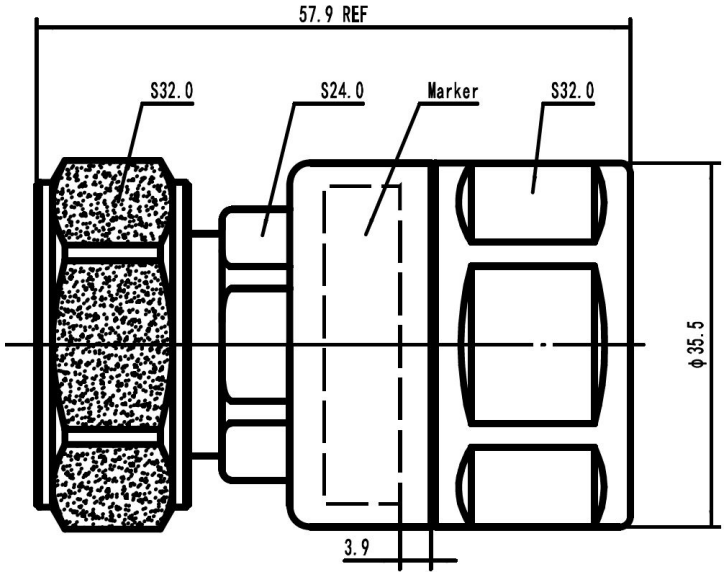
7-16 Male Connector for 7/8" Coaxial Cable, OMNI FIT™ standard, O-ring sealing

ACCESSORIES

Wrench size front	mm (in)	24 (0.95)
Wrench size rear	mm (in)	32 (1.26)
Trimming Tool		TRIM-SET-L78-C02

TESTING AND ENVIRONMENTAL

Waterproof Level		IP68



716M-LCF78-C03 Outline drawing

GKSPEED20-78P

High speed grounding kit for CELLFLEX® LCF 78

This Grounding Kit has been developed by RFS for the CELLFLEX® cable series. The Grounding Kit body facilitates a proper attachment to the coaxial cable, ensuring that the performance of the coaxial cable is not being compromised. The tin plated copper mesh provides a secure, low resistance contact to the cable outer conductor. The installation only takes a few minutes. No additional sealing with mastic and electrical tape required.

GKSPEED20-78P shown

FEATURES / BENEFITS

- Compatible with both copper and aluminium cable types i.e. one Grounding Kit for both outer conductor materials eliminates the risk of faulty Grounding Kit installation and helps to keep inventory down.
- This kit has been verified by independent labs to withstand the damaging effects of lightning current in excess of 100kA 8/20µs. The copper wire provides the most practical and effective low inductance transfer of lightning induced current to ground.
- No influence on the electrical transmission characteristics of the coaxial cable.
- Robust mechanical design.
- UV resistant according to DIN EN ISO 4892-2 (Plastics - Methods of exposure to laboratory light sources - Part 2 Xenon-arc-lamps).
- Ozone resistant according to DIN 53509 (Testing of rubber - Determination of resistance to ozone cracking).
- Compliant to RoHS (EU 2002/95/EC) and CRoHS (China SJ/T11363-2006) i.e. usable on a global basis.

External Document Links

Installation Instruction

Notes

Datasheet also applies to GKSPEED20-78GRP (grey), GKSPEED20YG-78P (yellow/green) except for grounding wire color

Technical features

STRUCTURE

Product Line		Coaxial Cable Accessories Hybrid Cable Accessories
Type of Grounding Kit		High Speed
Transmission Line Type		LCF78, UCF78, HB078
Cable Type		Coaxial Foam Dielectric, Hybrid
Cable Size		7/8"
Number of Cable / Waveguide Runs		1
Material		Grounding Kit Body: Stainless steel, with vulcanised EPDM (Ethylene-Propylene-Caoutchouc) Screws: Stainless steel with safety washers Contact element: Tin-plated copper mesh

ACCESSORIES

Recommended Tool		JSTRIP-78-2

MECHANICAL SPECIFICATIONS

Lug Attachment Method		Factory Attached
Lug Style Size		1-hole Ø 10.2mm (13/32") crimp-on, tin-plated
Grounding Wire Length	m (in)	0.5 (20)
Grounding Wire Size	mm^2	16mm_2 (7x7 strand)
Grounding Wire Color		Black
Grounding Body Color		Black
Sealing Class		IP68

GKSPEED20-78P

High speed grounding kit for CELLFLEX® LCF 78

TEMPERATURE SPECIFICATIONS

Operation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Storage Temperature	°C (°F)	-50 to 85 (-58 to 185)

PACKAGING INFORMATION

Package Quantity		1
Weight per piece	kg (lb)	0.3 (0.66)

GKSPEED20-78P

LCF78-50JFNA

7/8" CELLFLEX® Premium Attenuation Low-Loss Foam-Dielectric Coaxial Cable

CELLFLEX®7/8" premium attenuation low loss flexible cable

FEATURES / BENEFITS

- **Ultra Low Attenuation**
  The further reduced attenuation of CELLFLEX® premium attenuation coaxial cable results in extremly efficient signal transfer in your RF system, especially at high frequencies.
- **Complete Shielding**
  The solid outer conductor of CELLFLEX® coaxial cable creates a continuous RFI/EMI shield that minimizes system interference.
- **Low VSWR**
  Special low VSWR versions of CELLFLEX® coaxial cables contribute to low system noise.
- **Outstanding Intermodulation Performance**
  CELLFLEX® coaxial cable's solid inner and outer conductors virtually eliminate intermods. Intermodulation performance is also confirmed with state-of-the-art equipment at the RFS factory.
- **High Power Rating**
  Due to their low attenuation, outstanding heat transfer properties and temperature stabilized dielectric materials, CELLFLEX® cable provides safe long term operating life at high transmit power levels.
- **Wide Range of Application**
  Typical areas of application are: feedlines for broadcast and terrestrial microwave antennas, wireless cellular, PCS and ESMR base stations, cabling of antenna arrays, and radio equipment interconnects.
- **Meets or Exceeds: IEC 60754-1, -2; IEC 60332-1-1, -2;IEC 61034-1, -2; IEC 60332-3-24 (formerly IEC 60332-3-C)**

7/8" CELLFLEX® Low-Loss Foam Dielectric Coaxial Cable

External Document Links | Notes

Technical features

APPLICATIONS

Applications		Indoor	Wireless Communication	TV & Radio	HF Defense	Microwave	Mobile Radio	Cable Solutions

STRUCTURE

Size		7/8
Jacket Option		Black
Inner Conductor Diameter	mm (in)	9.1 (0.358)
Inner Conductor Material		Copper Tube
Dielectric Diameter	mm (in)	21.5 (0.846)
Dielectric Material		Foam Polyethylene
Outer Conductor Diameter	mm (in)	25.2 (0.992)
Outer Conductor Material		Corrugated Copper
Jacket Diameter	mm (in)	27.8 (1.094)
Jacket Material		Polyethylene, PE, Metalhydroxite Filling
Cable Type		Foam-Dielectric, Corrugated

LCF78-50JFNA

7/8" CELLFLEX® Premium Attenuation Low-Loss Foam-Dielectric Coaxial Cable

TESTING AND ENVIRONMENTAL

Fire Performance		Flame Retardant, LS0H
Flame Retardant Jacket Specifications		Meets/Exceeds: IEC 60754-1, -2; IEC 60332-1-1, -2; IEC 61034-1, -2; IEC 60332-3-24 (formerly IEC 60332-3-C); UL 1581; UL 1666;NFPA130 (ed. 2014) Ch.12 (NFPA70) via UL-1685/FT4/IEEE1202; NEC type CATVR; CPR: https://products.rfsworld.com/userfiles/cpr/rfs-products-cpr-compliance.pdf
Installation Temperature	°C(°F)	-15 to 60 (5 to 140)
Storage Temperature	°C (°F)	-70 to 85 (-94 to 185)
Operation Temperature	°C(°F)	-50 to 85 (-58 to 185)

ELECTRICAL SPECIFICATIONS

Impedance	Ω	50 +/- 1
Maximum Frequency	GHz	5
Velocity	%	88
Capacitance	pF/m (pF/ft)	74 (22.5)
Inductance	uH/m (uH/ft)	0.185 (0.056)
Peak Power Rating	kW	85
RF Peak Voltage	Volts	2920
Jacket Spark	Volt RMS	8000
Inner Conductor dc Resistance	Ω/1000 m (Ω/1000 ft)	2.04 (0.62)
Outer Conductor dc Resistance	Ω/1000 m (Ω/1000 ft)	2 (0.61)
Return Loss (VSWR) Performance		Standard and Premium
Min. Return Loss (Max. VSWR)	dB (VSWR)	Standard 20 (1.222), Premium 24 (1.135)/ 23 (1.152)
Phase Stabilized		Phase stabilized and phase matched cables and assemblies are available upon request.
Temperature & Power		Standard

MECHANICAL SPECIFICATIONS

Cable Weight, Nominal	kg/m (lb/ft)	0.39 (0.26)
Minimum Bending Radius, Single Bend	mm (in)	120 (5)
Minimum Bending Radius, Repeated Bends	mm (in)	250 (10)
Bending Moment	Nm (lb-ft)	13 (10)
Tensile Strength	N (lb)	1440 (324)
Recommended / Maximum Clamp Spacing	m (ft)	0.8 / 1 (2.75 / 3.25)

NEXXUM the best way to connect

LCF78-50JFNA

7/8" CELLFLEX® Premium Attenuation Low-Loss Foam-Dielectric Coaxial Cable

NEXUM the best way to connect

ATTENUATION @ 20°C (68°F) AND POWER RATING @ 40°C (104°F)

Frequency, MHz	dB per 100m	dB per 100ft	Power, kW
0.5	0.08	0.02	91
1	0.11	0.03	74.20
1.5	0.14	0.04	60.70
2	0.16	0.05	52.40
10	0.36	0.11	23.30
20	0.51	0.16	16.40
30	0.63	0.19	13.40
50	0.81	0.25	10.30
88	1.09	0.33	7.69
100	1.16	0.35	7.22
108	1.21	0.37	6.93
150	1.43	0.44	5.86
174	1.55	0.47	5.41
200	1.66	0.51	5.05
300	2.06	0.63	4.07
400	2.40	0.73	3.49
450	2.55	0.78	3.29
500	2.70	0.82	3.10
512	2.73	0.83	3.07
600	2.98	0.91	2.81
700	3.23	0.99	2.59
750	3.36	1.02	2.49
800	3.48	1.06	2.41
824	3.53	1.08	2.37
894	3.69	1.13	2.27
900	3.71	1.13	2.26
925	3.76	1.15	2.23
960	3.84	1.17	2.18
1000	3.93	1.20	2.13
1250	4.44	1.35	1.89
1400	4.73	1.44	1.77
1500	4.91	1.50	1.71
1700	5.27	1.61	1.59
1800	5.44	1.66	1.54
2000	5.77	1.76	1.45
2100	5.93	1.81	1.41
2200	6.09	1.86	1.38
2400	6.40	1.95	1.31
2500	6.55	2	1.28
2600	6.70	2.04	1.25

LCF78-50JFNA

7/8" CELLFLEX® Premium Attenuation Low-Loss Foam-Dielectric Coaxial Cable

2700	6.84	2.09	1.23
3000	7.27	2.22	1.15
3500	7.95	2.42	1.05
4000	8.60	2.62	0.97
4900	9.69	2.95	0.87
5000	9.81	2.99	0.85

RSB-78

RSB-Clip

The RSB Clip RSB-78 is designed for the installation of CELLFLEX® foam-dielectric cables of 7/8"" size. The clip is a universal clamp device and can be used in many mounting configurations. When replacing a cable the clip can be opened without any tools. After replacing the cable the clips are easily closed again. The RSB is the abbreviation of Rostfreier Stahlbügel and means stainless steel hanger. The hanger is resistant against all environmental influences. Due to it's mechanical construction cable deformation is impossible and deterioration of the electrical properties is avoided.

FEATURES / BENEFITS

External Document Links

Application Note RSB Clip

Installation Instruction

Notes

Technical features

GENERAL SPECIFICATIONS

Product Line		Coaxial Cable Accessories Hybrid Cable Accessories
Product Type		Hanger
Hanger Type		RSB-Clip
Transmission Line Type		LCF78 UCF78 RLF78, RLFW78 RAY78, RAYB78 RLKU78 RLKW78 RCF78 HB078 HCA78
Cable Type		Coaxial Foam Dielectric Air Dielectric

MECHANICAL SPECIFICATIONS

Cable Size		7/8
Number of Cable / Waveguide Runs		1
Material		Stainless Steel
Drill Hole Size	mm (in)	8 (0.315)

ACCESSORIES

Spare Part / Useful Accessories		Cleat : RSB-310 Anchor bar fixation : RSB-315

TEMPERATURE SPECIFICATIONS

Installation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Operation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Storage Temperature	°C (°F)	-50 to 85 (-58 to 185)

PACKAGING INFORMATION

Package Quantity		10

NEXXUM the best way to connect

Altri Materiali

PRODUCT DATASHEET

716F-716F

Coaxial Adapter 7-16 female - female

Coaxial Adapter, 7-16 Female/Female

FEATURES / BENEFITS

External Document Links

Notes

Technical features

STRUCTURE		
Product Line		Coaxial Cable Components
Product Type		Coaxial Adapter
MECHANICAL SPECIFICATIONS		
Connector A		7-16 DIN Female
Center Contact Connector A		Phosphor Bonze, silver plated
Outer Contact Connector A		Brass, Tri metal alloy plated
Connector B		7-16 DIN Female
Center Contact Connector B		Phosphor Bonze, silver plated
Outer Contact Connector B		Brass, Tri metal alloy plated
Dielectric		PTFE
Sealing class		IP68, connected
ELECTRICAL SPECIFICATIONS		
Frequency Range - MHz		DC - 6000
VSWR, Return Loss	VSWR (dB)	0-2000 MHz: 1.04 (34.15) 2000-3000 MHz: 1.06 (30.71) 3000-6000 MHz: 1.10 (26.44)
Insertion Loss, dB (Max)	dB	0.05
3rd Order IM Product @ 2x20 Watts	dBc	-163
TEMPERATURE SPECIFICATIONS		
Operation Temperature	°C (°F)	-45 to 85 (-49 to 185)
PACKAGING INFORMATION		
Package Quantity		1

NEXXUM
the best way to connect

PRODUCT DATASHEET

TER-DE-3800-5W

Load, 716 male, 5 Watt

The 716-TER Series are coaxial loads which operate from DC up to 3.8 GHz.The products are ideally suited for termination of unused ports in distributed antenna systems or in RADIAFLEX® radiating cables systems.

FEATURES / BENEFITS

- **Ideal for all kind of DAS applications**
- **Finned termination for optimized heat disspation**
- **Low VSWR**

Technical features

GENERAL SPECIFICATIONS		
Product Type		Load
Techn. Application		Indoor
ELECTRICAL SPECIFICATIONS		
Frequency Range	MHz	DC-3.800
Impedance	Ohm	50
Max. VSWR / Return Loss, dB	VSWR/dB	/20.8
Total Input Power	W	5
MECHANICAL SPECIFICATIONS		
Input Connector Type		716 male
Diameter	mm (in)	35 (1.38)
Length	mm (in)	68.1 (2.68)
TEMPERATURE SPECIFICATIONS		
Temperature Range	°C (°F)	-25 to 65 (-13 to 149)
Environmental Class		Indoor

External Document Links

Notes

Derated power by -1.5%/°C above 50°C

NEXUM
the best way to connect

JUMPER-S12F-FFP

CELLFLEX® Factory-Fit Jumper Assembly, 1/2" Superflexible Foam, with flame retardant jacket

Radio Frequency Systems' CELLFLEX® Factory-Fit Jumpers feature specially designed connectors which are soldered-on in a strictly controlled industrial process to ensure industry leading performance for today's high-performance wireless systems. The connector design and manufacturing process has been optimized to produce premium VSWR and IM levels. Injection molded boots provide reliable and repeatable additional sealing level and strain relief. Our facilities produce and stock all popular lengths as required by the industry, and can deliver custom lengths with premium VSWR and IM levels on request.

7M7FS12F-0400FFP for EXAMPLE

FEATURES / BENEFITS

- **Stable premium VSWR, outstanding and consistent intermodulation performance - 4.3-10 side not relying on coupling torque**
  Improves network performance, reduces the number of dropped calls and avoids revenue loss.
- **Waterproof to IP 68**
  No downtime risk, secures revenue.
- **Smaller connector footprint for 4.3-10**
  Enables tighter spacing of connections for antennas and RRHs.
- **Available with standard ""J"" or flame retardant ""JFN"" jacket types**
  Usable in all applications.
- **Compliant to RoHS (EU) and CRoHS (China)**
  Usable on a global basis.

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Technical features

STRUCTURE

Cable Type		1/2" Superflexible Foam
Jumper Type		Factory-Fit (Premium)
Dielectric		Foam Polyethylene
Gasket		Silicone rubber
Jacket		JFN: halogen free, non corrosive, flame retardant, low smoke, polyolefin, Test methods for fire behaviour of cable :, IEC 60754-1/-2 halogen free, non corrosive, IEC 61034 low smoke emission, IEC 60332-1 flame retardant

MECHANICAL SPECIFICATIONS

Minimum Bend Radius	mm (in)	32 (1.25)

TESTING AND ENVIRONMENTAL

Sealing class		IP68

TEMPERATURE SPECIFICATIONS

Installation Temperature	°C (°F)	-25 to 60 (-13 to 140)
Operation Temperature	°C (°F)	-50 to 85 (-58 to 185)
Storage Temperature	°C (°F)	-70 to 85 (-94 to 185)

ELECTRICAL SPECIFICATIONS

Intermodulation, 3rd Order	dBc	≤ -159 static & dynamic (-161 typical)
Peak Power Rating	kW	8.1
RF Peak Voltage	Volts	900

JUMPER VSWR 0 - 10 M

Frequency [MHz]	Straight / Straight [dB] (VSWR)	Right Angle / Right Angle [dB] (VSWR)
0 - 1000	>28.3 (≤1.08)	>28.3 (≤1.08)
>1000-1700	>28.3 (≤1.08)	>26.4 (≤1.10)

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>1700-2200	>28.0 (≤1.08)	>26.4 (≤1.10)
>2200-2700	>26.4 (≤1.10)	>24.9 (≤1.12)
>2700-3800	>23.1 (≤1.15)	>20.8 (≤1.20)
>3800-5000	>20.8 (≤1.20)	>19.1 (≤1.25)
>5000-6000	>17.7 (≤1.30)	>17.7 (≤1.30)

JUMPER VSWR 10 - 20 M

Frequency [MHz]	Straight / Straight [dB] (VSWR)	Right Angle / Right Angle [dB] (VSWR)
0 - 1000	>28.3 (≤1.08)	>28.3 (≤1.08)
>1000-1700	>26.4 (≤1.10)	>24.0 (≤1.14)
>1700-2200	>26.4 (≤1.10)	>24.0 (≤1.14)
>2200-2700	>24.9 (≤1.12)	>24.0 (≤1.14)
>2700-3800	>23.1 (≤1.15)	>19.1 (≤1.25)
>3800-5000	>19.1 (≤1.25)	>18.2 (≤1.28)
>5000-6000	>17.7 (≤1.30)	>16.0 (≤1.38)

COMBINATIONS

Model Name	Connector 1	Connector 2
7M7MS12F-XXXXFFP	7-16 Male	7-16 Male
7M7FS12F-XXXXFFP	7-16 Male	7-16 Female
7M7MRS12F-XXXXFFP	7-16 Male	7-16 Male Right Angle
7M43MS12F-XXXXFFP	7-16 Male	4.3-10 Male
7M43FS12F-XXXXFFP	7-16 Male	4.3-10 Female
7M43MRS12F-XXXXFFP	7-16 Male	4.3-10 Male Right Angle
7MNMS12F-XXXXFFP	7-16 Male	N-Male
7MNFS12F-XXXXFFP	7-16 Male	N-Female
7MNMRS12F-XXXXFFP	7-16 Male	N-Male Right Angle
7F7FS12F-XXXXFFP	7-16 Female	7-16 Female
7F7MRS12F-XXXXFFP	7-16 Female	7-16 Male Right Angle
7F43MS12F-XXXXFFP	7-16 Female	4.3-10 Male
7F43FS12F-XXXXFFP	7-16 Female	4.3-10 Female
7F43MRS12F-XXXXFFP	7-16 Female	4.3-10 Male Right Angle
7FNMS12F-XXXXFFP	7-16 Female	N-Male
7FNFS12F-XXXXFFP	7-16 Female	N-Female
7FNMRS12F-XXXXFFP	7-16 Female	N-Male Right Angle
7MR7MRS12F-XXXXFFP	7-16 Male Right Angle	7-16 Male Right Angle
7MR43MS12F-XXXXFFP	7-16 Male Right Angle	4.3-10 Male
7MR43FS12F-XXXXFFP	7-16 Male Right Angle	4.3-10 Female
7MR43MRS12F-XXXXFFP	7-16 Male Right Angle	4.3-10 Male Right Angle
7MRNMS12F-XXXXFFP	7-16 Male Right Angle	N-Male
7MRNFS12F-XXXXFFP	7-16 Male Right Angle	N-Female
7MRNMRS12F-XXXXFFP	7-16 Male Right Angle	N-Male Right Angle
43M43MS12F-XXXXFFP	4.3-10 Male	4.3-10 Male
43M43FS12F-XXXXFFP	4.3-10 Male	4.3-10 Female

JUMPER-S12F-FFP

CELLFLEX® Factory-Fit Jumper Assembly, 1/2" Superflexible Foam, with flame retardant jacket

43M43MRS12F-XXXXFFP	4.3-10 Male	4.3-10 Male Right Angle
43MNMS12F-XXXXFFP	4.3-10 Male	N-Male
43MNFS12F-XXXXFFP	4.3-10 Male	N-Female
43MNMRS12F-XXXXFFP	4.3-10 Male	N-Male Right Angle
43F43FS12F-XXXXFFP	4.3-10 Female	4.3-10 Female
43F43MRS12F-XXXXFFP	4.3-10 Female	4.3-10 Male Right Angle
43FNMS12F-XXXXFFP	4.3-10 Female	N-Male
43FNFS12F-XXXXFFP	4.3-10 Female	N-Female
43FNMRS12F-XXXXFFP	4.3-10 Female	N-Male Right Angle
43MR43MRS12F-XXXXFFP	4.3-10 Male Right Angle	4.3-10 Male Right Angle
43MRNMS12F-XXXXFFP	4.3-10 Male Right Angle	N-Male
43MRNFS12F-XXXXFFP	4.3-10 Male Right Angle	N-Female
43MRNMRS12F-XXXXFFP	4.3-10 Male Right Angle	N-Male Right Angle
NMNMS12F-XXXXFFP	N-Male	N-Male
NMNFS12F-XXXXFFP	N-Male	N-Female
NMNMRS12F-XXXXFFP	N-Male	N-Male Right Angle
NFNFS12F-XXXXFFP	N-Female	N-Female
NFNMRS12F-XXXXFFP	N-Female	N-Male Right Angle
NMRNMRS12F-XXXXFFP	N-Male Right Angle	N-Male Right Angle
43FNXMS12F-XXXXFFP	4.3-10 Female	NEX10 Male
43MNXMS12F-XXXXFFP	4.3-10 Male	NEX10 Male
43MRNXMS12F-XXXXFFP	4.3-10 Male Right Angle	NEX10 Male
7FNXMS12F-XXXXFFP	7-16 Female	NEX10 Male
7MNXMS12F-XXXXFFP	7-16 Male	NEX10 Male
7MRNXMS12F-XXXXFFP	7-16 Male Right Angle	NEX10 Male
NFNXMS12F-XXXXFFP	N-Female	NEX10 Male
NMNXMS12F-XXXXFFP	N-Male	NEX10 Male
NMRNXMS12F-XXXXFFP	N-Male Right Angle	NEX10 Male
XXXX in the model name is the length; as well for jumper with boots acc. to nomenclature	(Boot examples below)	(Boot examples below)
43MB43MBS12F-XXXXFFP	4.3-10 Male + Boot	4.3-10 Male + Boot
7MB7MBS12F-XXXXFFP	7-16 Male + Boot	7-16 Male + Boot
NMBNMBS12F-XXXXFFP	N-Male + Boot	N-Male + Boot

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JUMPER-S12F-FFP

CELLFLEX® Factory-Fit Jumper Assembly, 1/2" Superflexible Foam, with flame retardant jacket

RFS JUMPER MODEL NOMENCLATURE

Connector A	Connector B	Cable Type	Jacket Type		Cable Length	Performance Type
7M	43M	S12	F	-	0100	FFP

7M & 43M CONNECTORS A & B

7M	7-16 Male
7F	7-16 Female
7MR	7-16 Male Right Angle
43M	4.3-10 Male
43F	4.3-10 Female
43MH	4.3-10 Male Handscrew
43MP	4.3-10 Male Push Pull
43MR	4.3-10 Male Right Angle
NM	N-Type Male
NF	N-Type Female
NMR	N-Type Male Right Angle
NXM	NEX10 Male
NXMP	NEX10 Male Push Pull
7MB	7-16 Male with Weatherboots
43MB	4.3-10 Male with Weatherboots
NMB	N-Type Male with Weatherboots

S12 CABLE TYPE

L38	3/8" Low Loss Coax
L12	1/2" Low Loss Coax
S14	1/4" Superflexible Coax
S38	3/8" Superflexible Coax
S12	1/2" Superflexible Coax

F JACKET TYPE

F	JFN Flame Retardant
Blank	PE

0100 CABLE LENGTH*

0100	1 meter
0200	2 meter
0250	2.5 meter
1000	10 meter
1500	15 meter
030	3 feet
060	6 feet
100	10 feet
150	15 feet
200	20 feet

FFP JUMPER PERFORMANCE

FFP	Factory-Fit Premium
FFPB	Factory-Fit Premium; Bird-Proof Option
FFS	Factory-Fit Standard
UPM	Ultra PIM Performance

NOTES:
* 4 digits indicate meter length, 3 digits indicate feet lengt
Others lengths available on request

External Document Links
Cable SCF12-50JFN
Handling instruction
Jumper Brochure

Notes

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