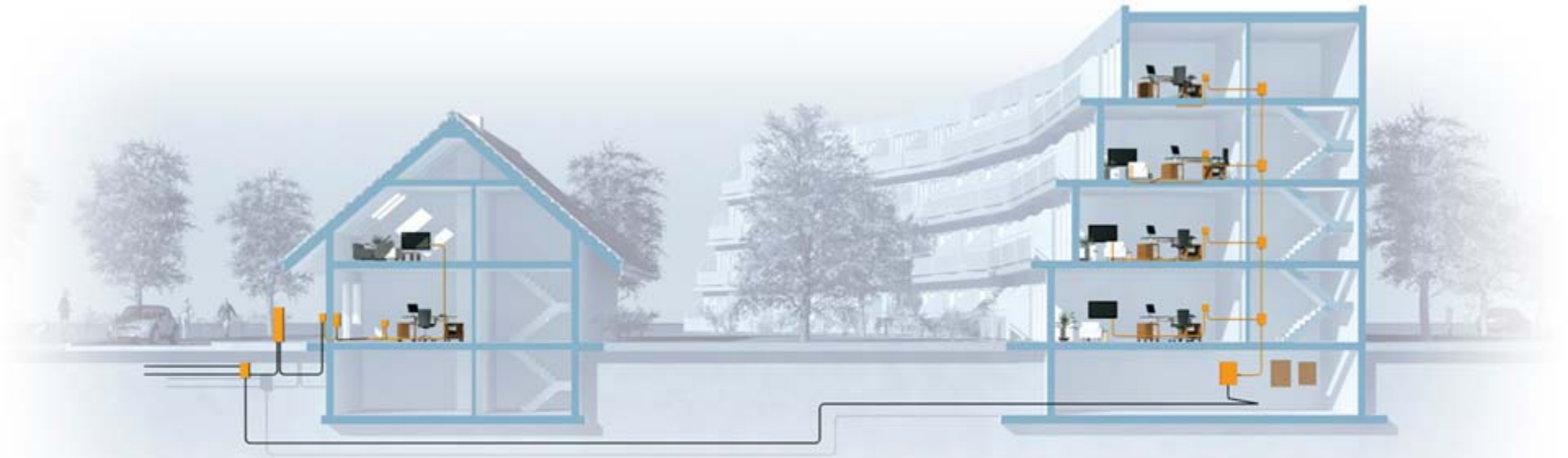
FTTH in MDU environments



Sam Leeman
Fiber Systems Manager

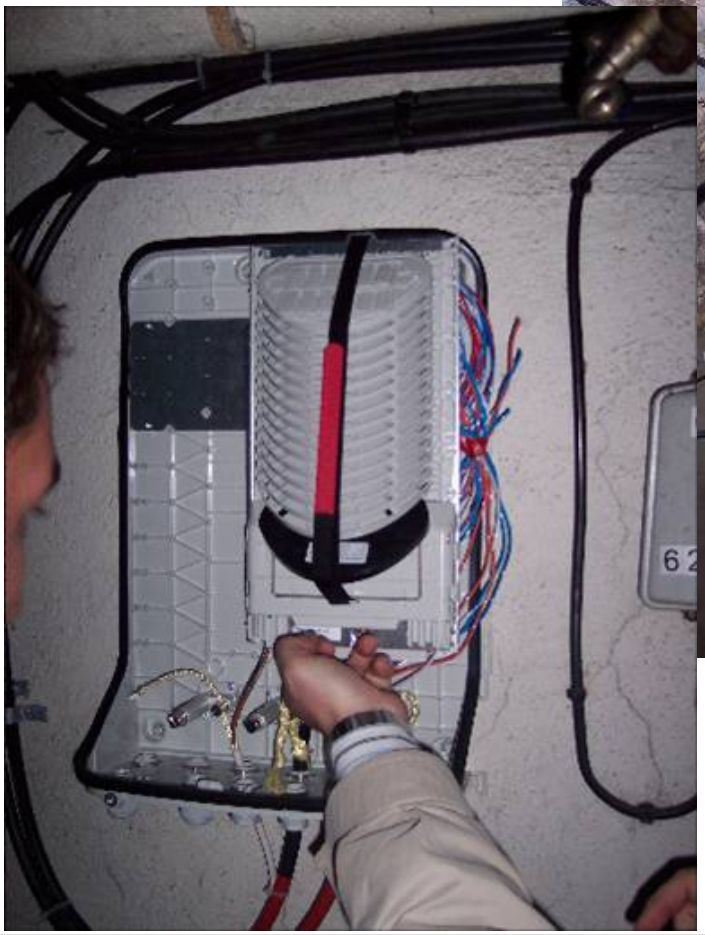
December 2, 2010

home - EnLighten
FTTH Solutions

Tyco Electronics

FTTH inside MDUs: some examples

- Buiding distributors

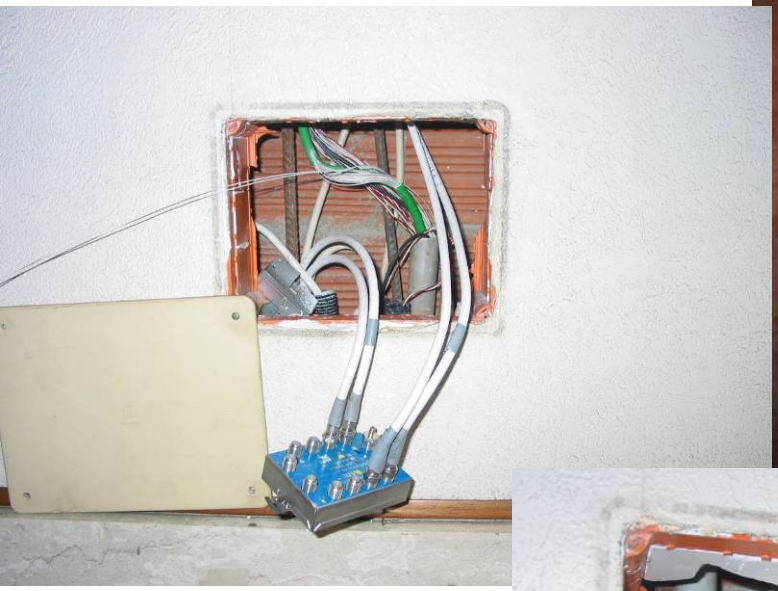


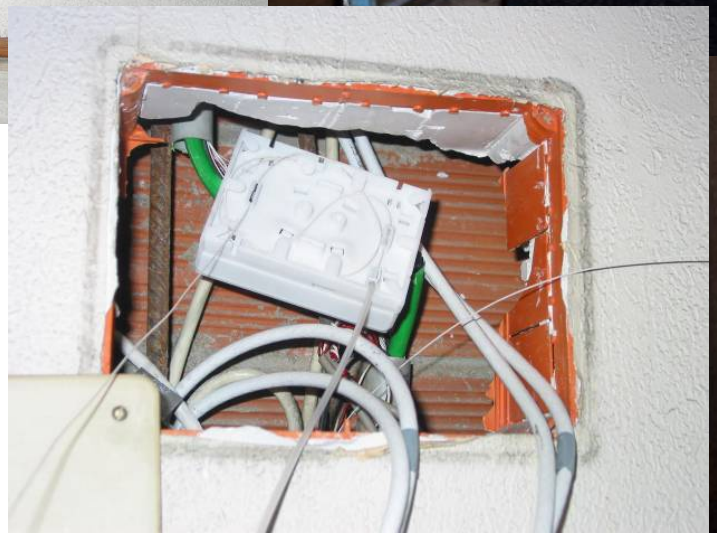
FTTH inside MDU's: some examples

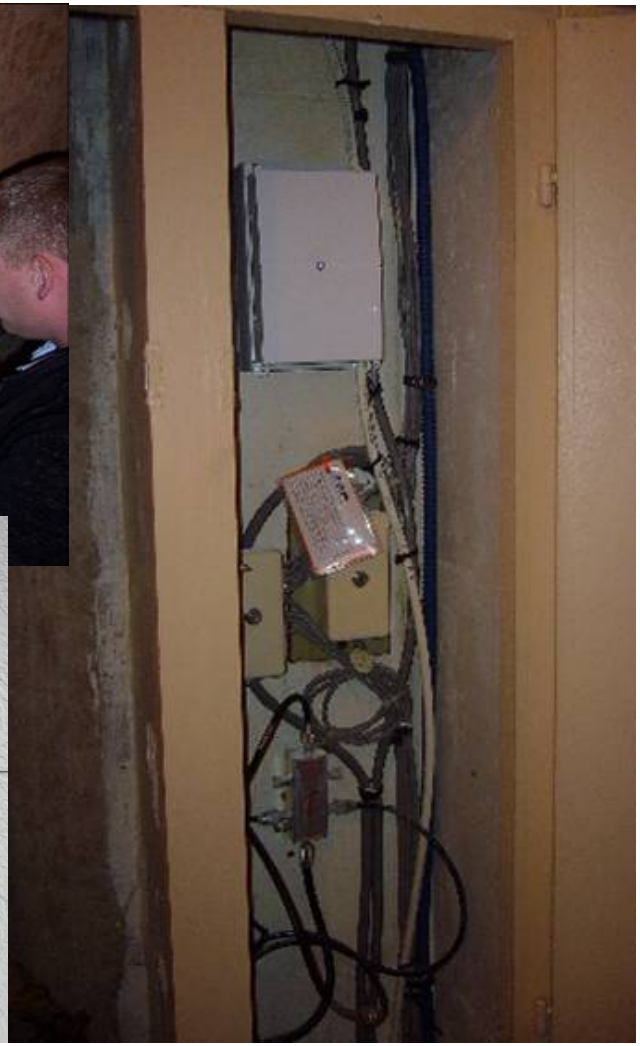
Before and after: conversion of existing network to FTTU network

Installation of pre-connectorized cabling

FTTH inside MDU's: some examples

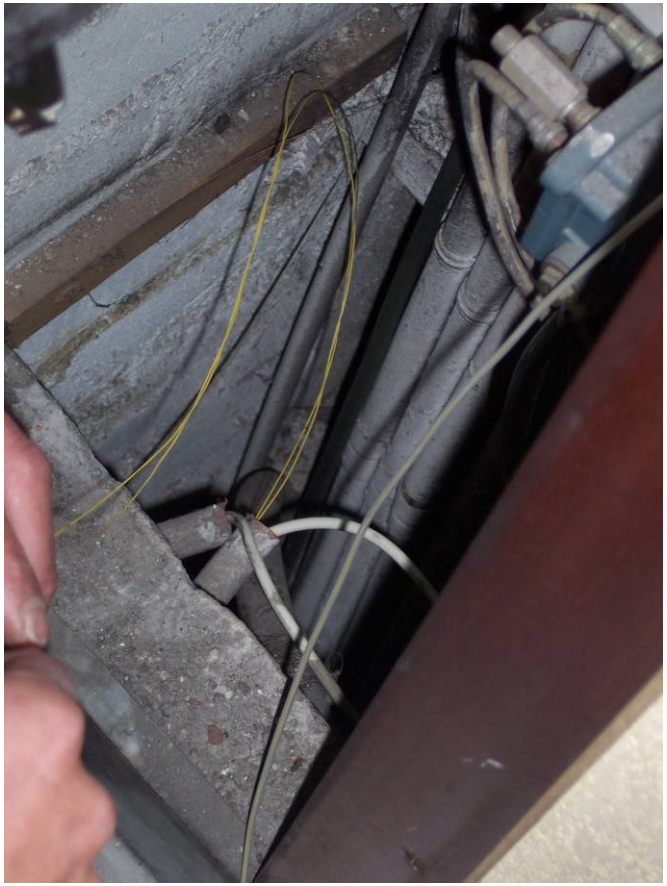






FTTH inside MDU's: some examples

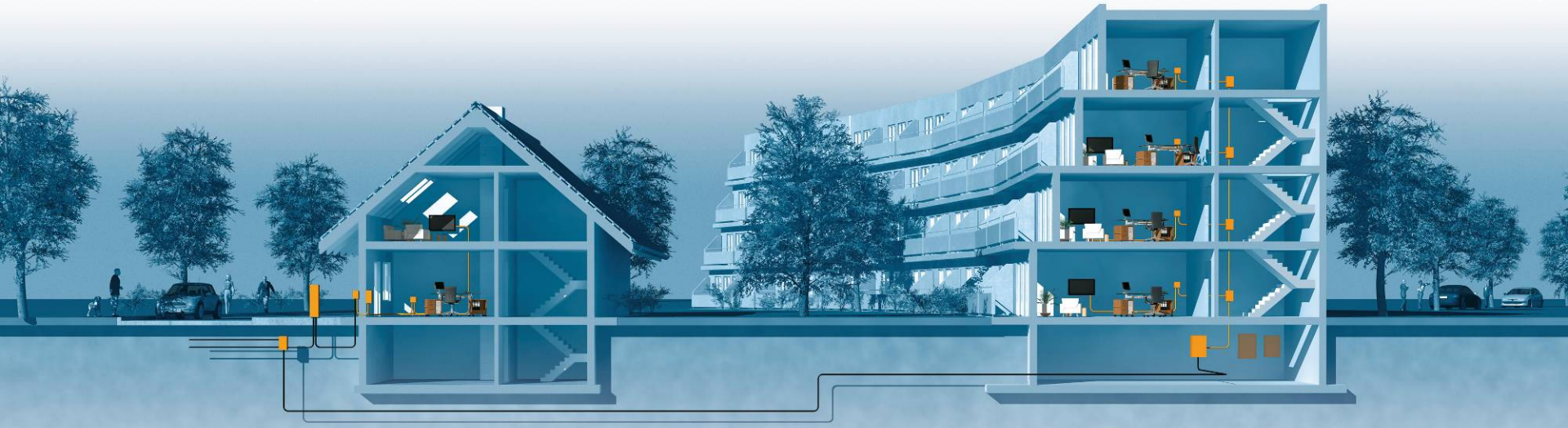
FTTH inside MDU's: some examples




127a Stiege 6
EG

Premises connectivity

MDU system solution

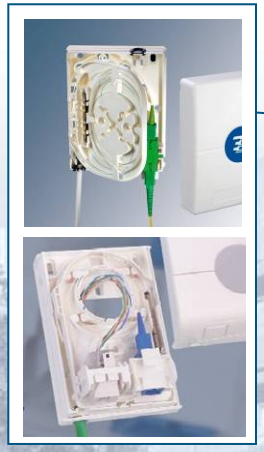


home - **EnLighten**

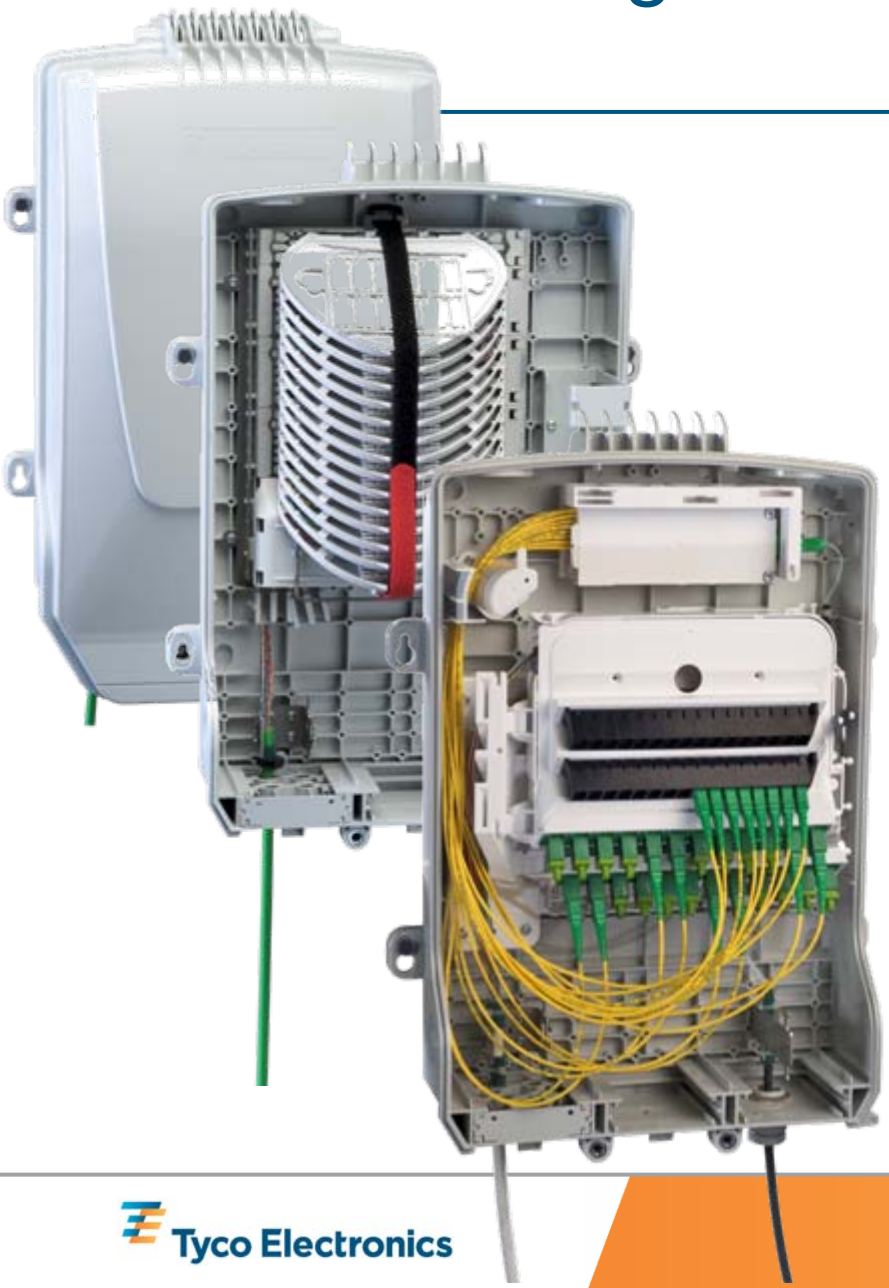
FTTH Solutions

home - EnLighten

FTTH Solutions

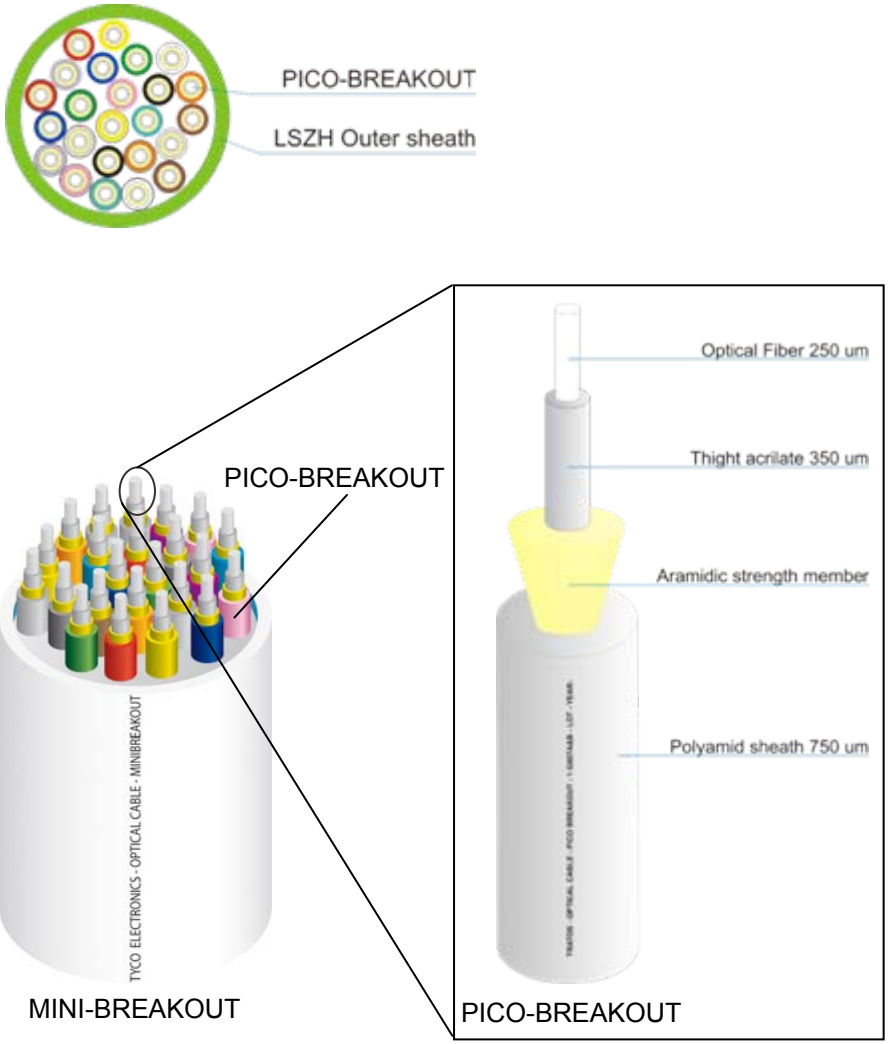


BUDI: Building Distribution Boxes



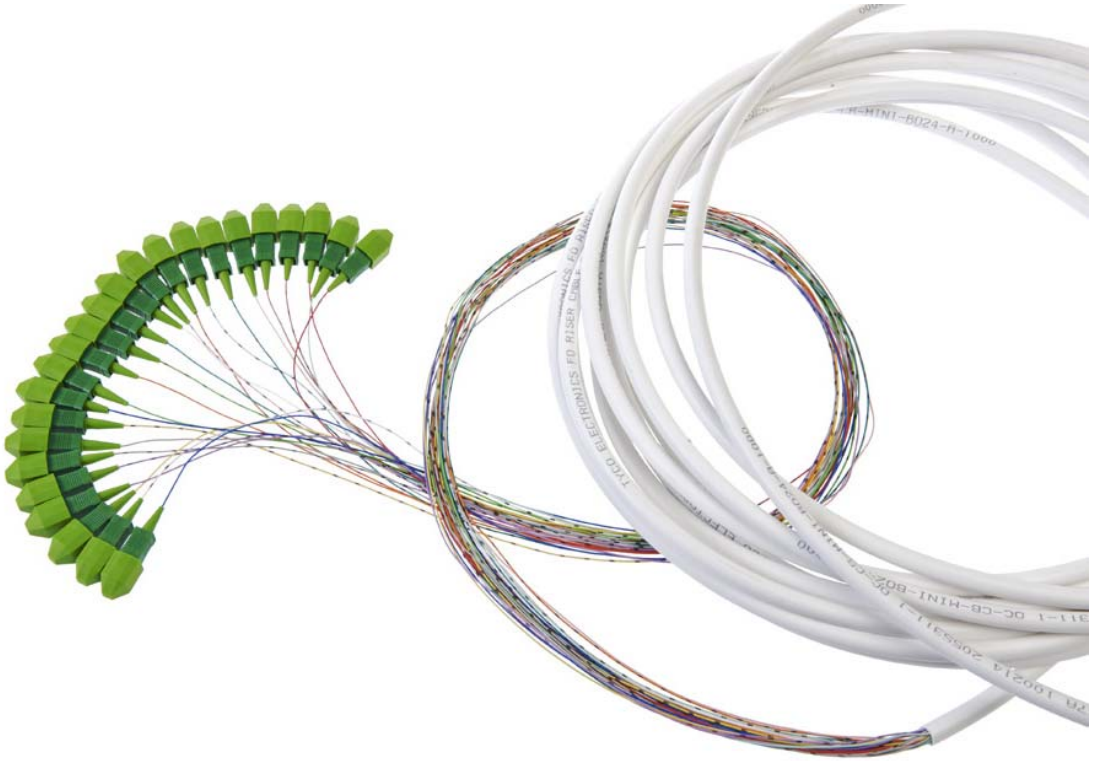
- Multiple Connectivity solutions possible
  - Connectors with splice to cable
  - Pre-connectorized cables
  - Fusion and Mechanical splicing
- Multiple sizes with capacities from 8 to 96 connectors and 196 splices
- Modular design with organizer building blocks that allow customization (regional requirements)
- Configurations for PON and Point-to-Point network architectures
- Reduced skill levels for plug and play/connectorized solutions with demarcation between patch panel and fiber management

Riser Cable: MINI-BREAKOUT CABLE



- Riser Cable is a mini-breakout cable containing individually reinforced fibers called pico-breakouts (780 micron diameter)
- Pico breakouts can be pulled through a tube/pipe as these elements are reinforced (Kevlar) without requiring overtubing
- Pull strength of pico-breakouts: 300N
- 12, 24 Fiber cable available
- G657A1 fiber standard

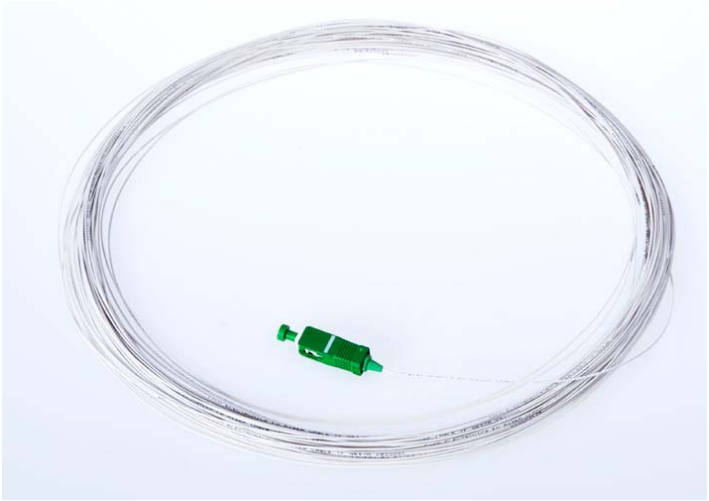
Riser Cable



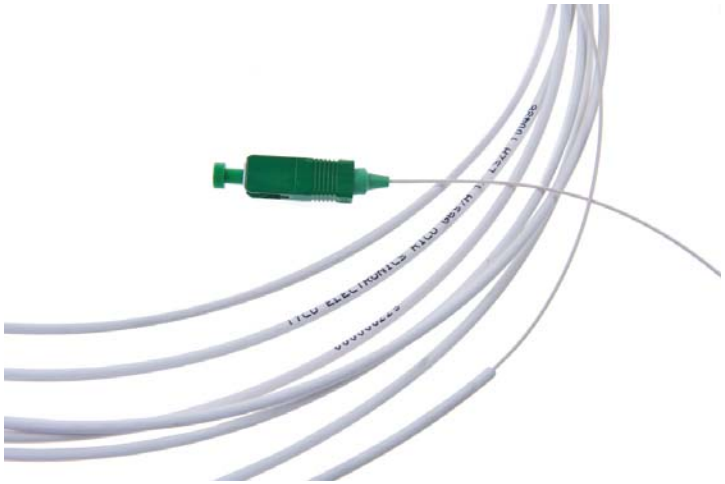
- As cable is very compact in size and very flexible the cable can be pulled through almost all ducts such that the requirement of site surveys can be reduced
- Can be pre-connectorized in a robust way (basement side)

Horizontal Cabling

- Pico-Breakout based solution
  - Pico-Breakout pre-connectorized pigtails
    - SC and LC connectors
    - Lengths: 10, 20, 30, 40 and 50m
    - Very small diameter (Ø780µm)
    - G657A1 fiber

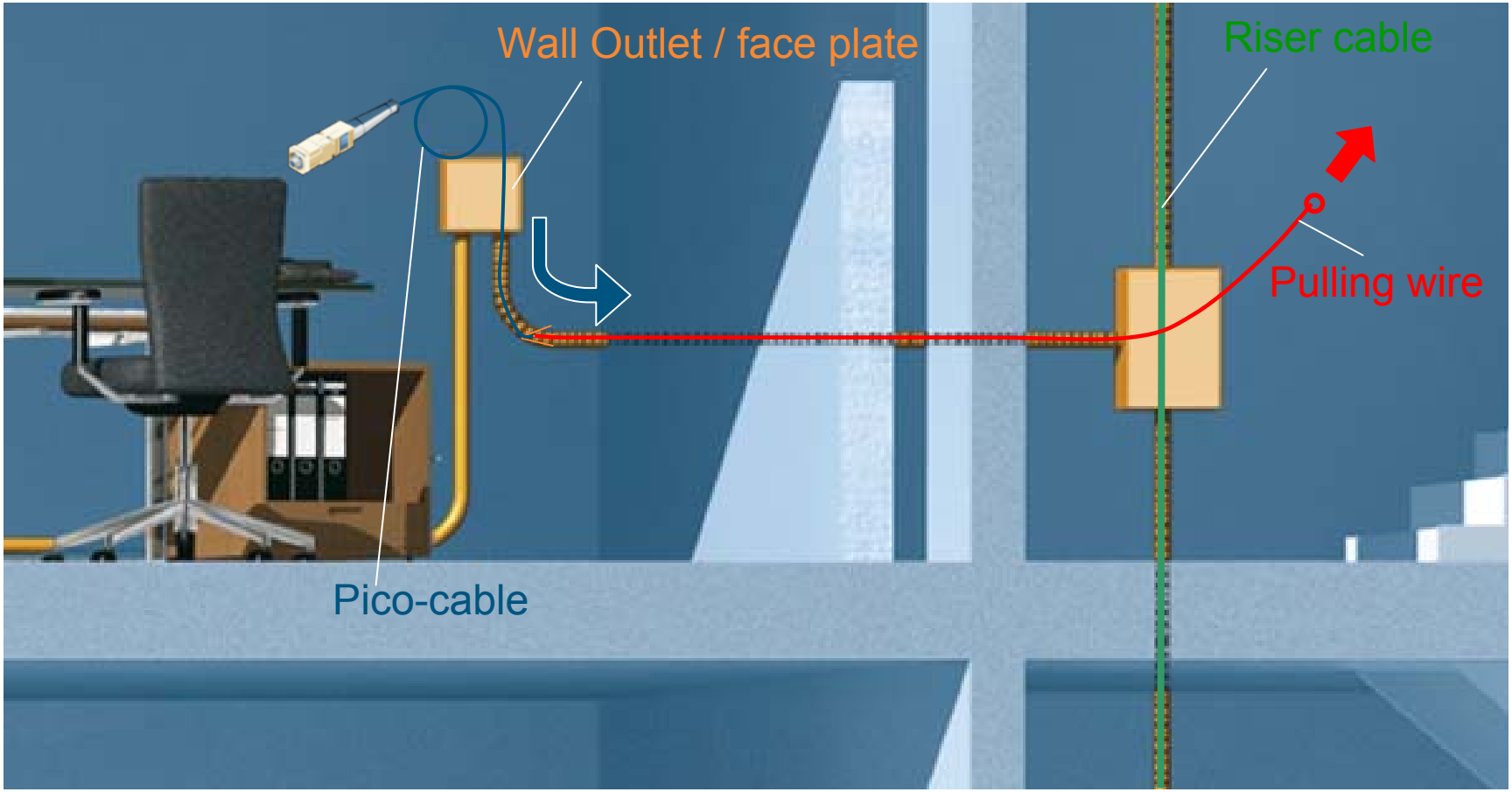


  - Rico-Breakout pre-connectorized pigtails
    - Overtubed (Ø2,6mm) Pico-Breakout
    - SC and LC connectors
    - Lengths: 10, 20, 30, 40 and 50m
    - Kink insensitive
    - G657A1 fiber



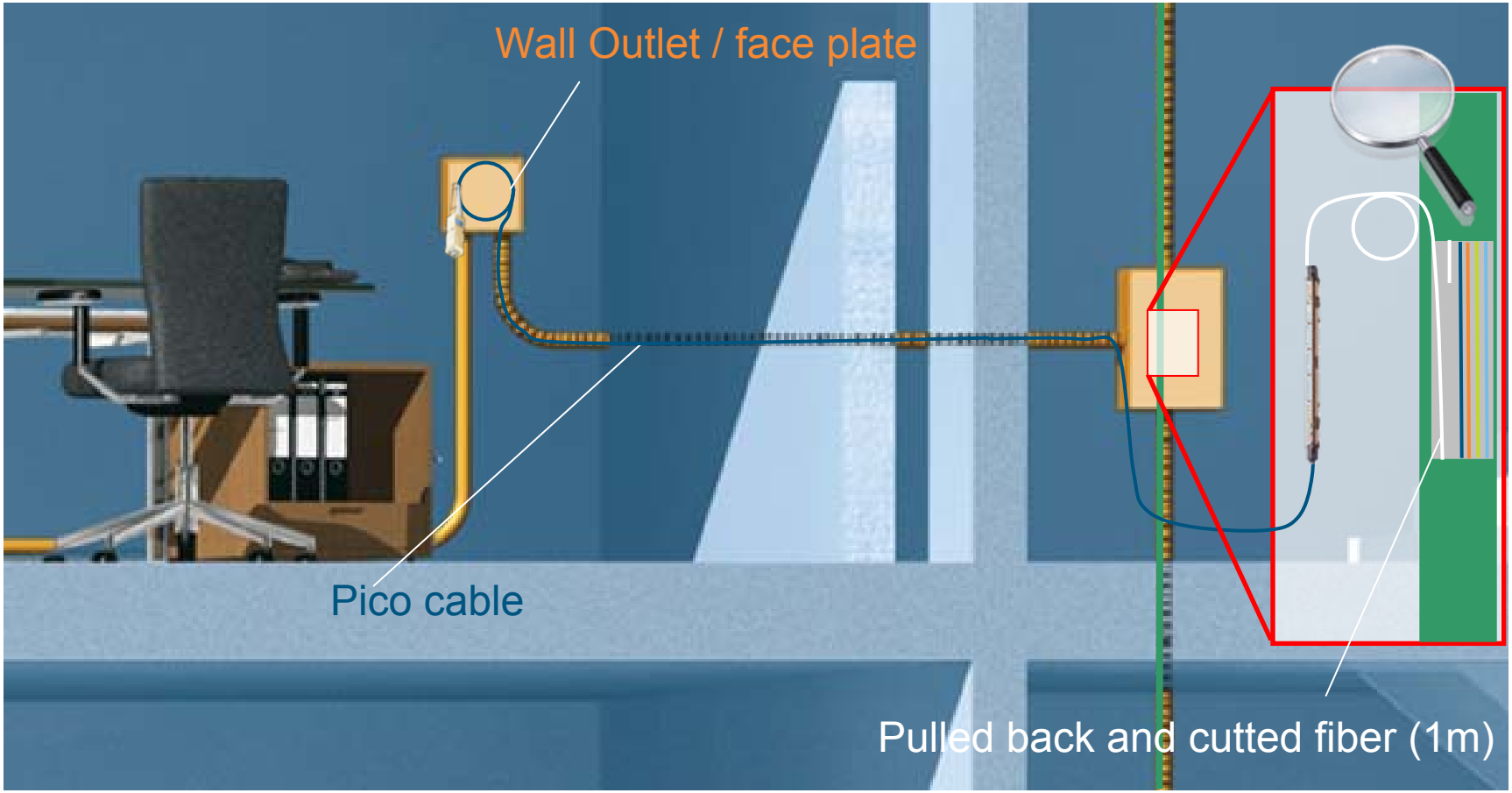
Premises to Floor

•Pulling wire to pull factory terminated Pico-cable pigtail from customer premises to Floor box.



Premises to Floor

- In the floor box, the Pico-Breakout is spliced to riser fiber (Pico-Breakout)



Floor and Wall outlet connectivity

- As wall-outlets contain a connector termination as a necessity to connect to the ONT.
- In between this outlet and the building distributor box; typically a splice is used as no flexibility is required in the connection between the riser fibers and horizontal fibers
  - Fusion typically used if the horizontal network is installed in the Homes-Passed (HP) scenario
  - Mechanical splicing is typically used if only the riser network is installed in a HP scenario

Building Distribution Point connectivity

- In most indoor residential networks, this point contains connectors for multiple reasons:
  - Fast and easy customer connecting
  - Fast and easy splitter additions on increased take rate
  - Network measurement point
  - Typical trouble shooting start point to locate issue in operator vs. building network
  - Demarcation point

Benefits of home - EnLighten FTTH Solutions

- **Brownfield Optimized**
  - Small diameter of the cable for easy installation in risers/ducts
  - Very compact cable accessories (IFDB-S; IPSO; SPLX) and for this reason ideal for Brownfield applications
  - The smallest drop cable (Pico-Breakout) on the market as horizontal drop wire for pulling into existing tubes/ducts which might even be occupied by COAX or UTP cables
- **Less Connectivity Points**
- **Less Material and Reduced Installation Time**
- **Flexible Building Distribution Points for all network architectures and connectivity choices**

BUDI PRODUCT LINE

BUDI-M, BUDI-S and BUDI-2S

BUDI product line

- BUilding DIstribution boxes are developed for FTTH deployments as a central distribution point for indoor/outdoor-above-ground applications.
- The box is designed around a hingable patch panel for connectorized solutions and the FIST organizer system for spliced solutions.
- This box can contain multiple pre-connectorized PON splitters

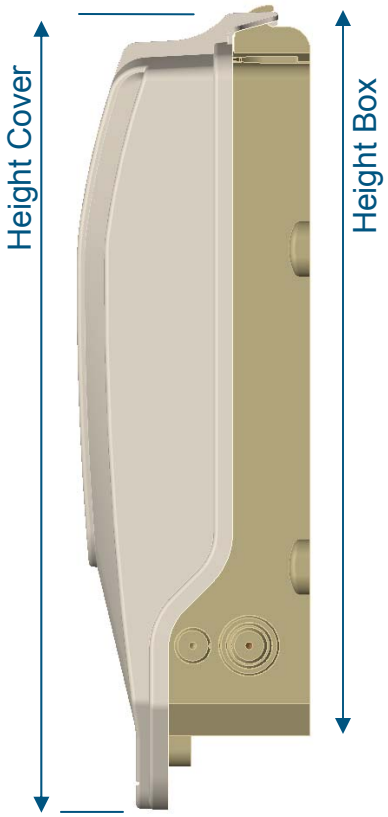
BUDI product line

- Designed to operate in category C (controlled); category G (outdoor ground level) and category A (Aerial) as characterized by IEC61753-1
- UV stable and flame retardant materials and UL listed
- Impact resistant (IK08)
- Wrap around cable ports (loop and drop cable)

- 3 Sizes will be available
  - BUDI-S (available)
  - BUDI-M (introduction ongoing)
  - BUDI-2S (introduction planned in November 2010)

BUDI Connectorized

Size	BUDI-M	BUDI-S
Height box (mm)	480	425
Height cover (mm)	550	500
Width (mm)	360	295
Depth (mm)	175	145
SC ports w–w/o ptp tray	48 - 60	24 - 36
LC ports w–w/o ptp tray	96 – 120	48 – 72
Ptp tray cable termination	8F	8F
Number of splitter modules (OCM6)	6	4



BUDI Connectorized Main Features

- Riser fibers are spliced on a tray that hold the connectors or store fiber overlength of factory terminated raiser cable
- Multiple trays are stacked and hingable
- Once installed, trays do not need to be hinged to access the connectors
- Top tray-cover holds unused splitter ports (connector parking)
- Input fibers/connectors are spliced to splitters in the base tray
- PtP customers are directly spliced from the main cable to drop cables

BUDI Connectorized Main Features

- The BUDI-M can have cable loop storage of LT's; the BUDI-S does not have this space
- Accommodate up to 4 (S) or 6 (M) OCM6 splitter modules
- In line cable installation possible (bottom/top)

BUDI- Connectorized

Capacity:

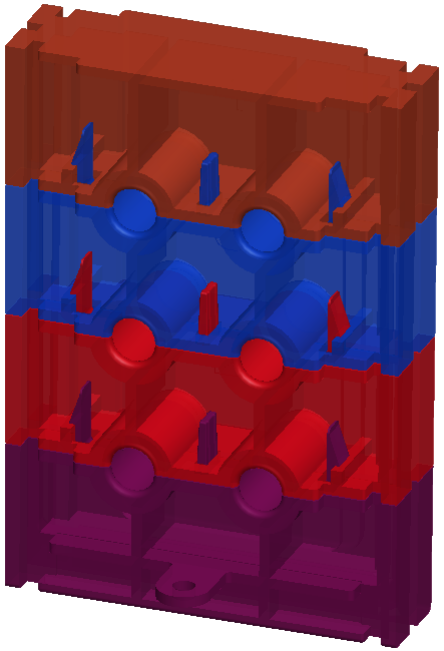
- Base tray:
  - → 8 splices (PtP direct connections)
  - → storage shaved tube fiber
  - → 6 splices (feeder with splitter)
- Patch Panel Tray
  - →trays for 12SC or 24LC
  - → parking lot 2x16 SC or LC
- Splitter tower
- Storage zone feeder cable (M only)

BUDI Seal block design

-All cable ports are wrap around and very simple to install
- No blind plugs required
- Stackable design

-Top port wrap around for indoor applications

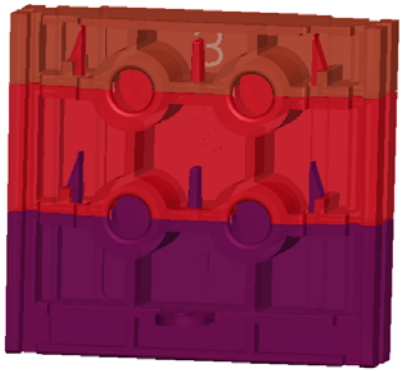
BuDi-M drop

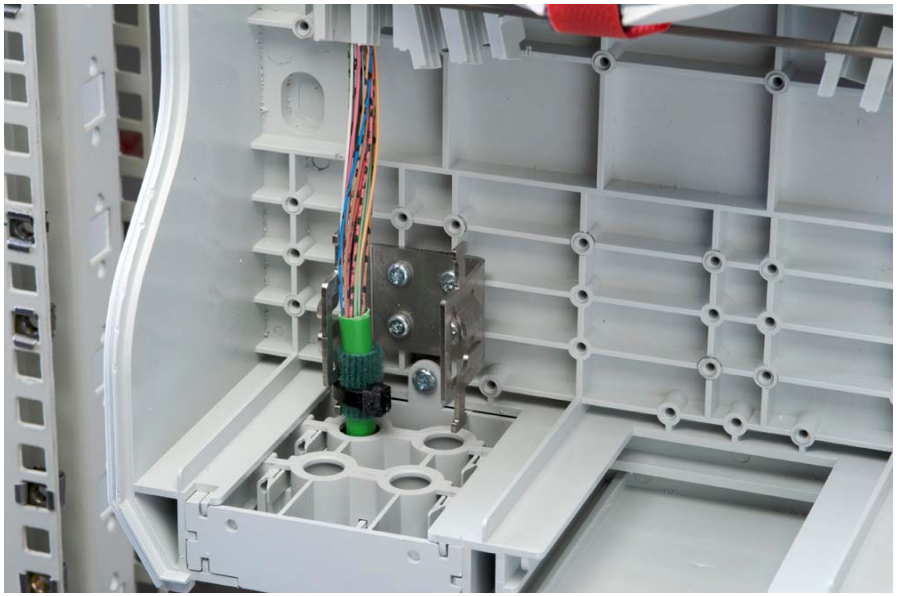


=

=

BuDi-S





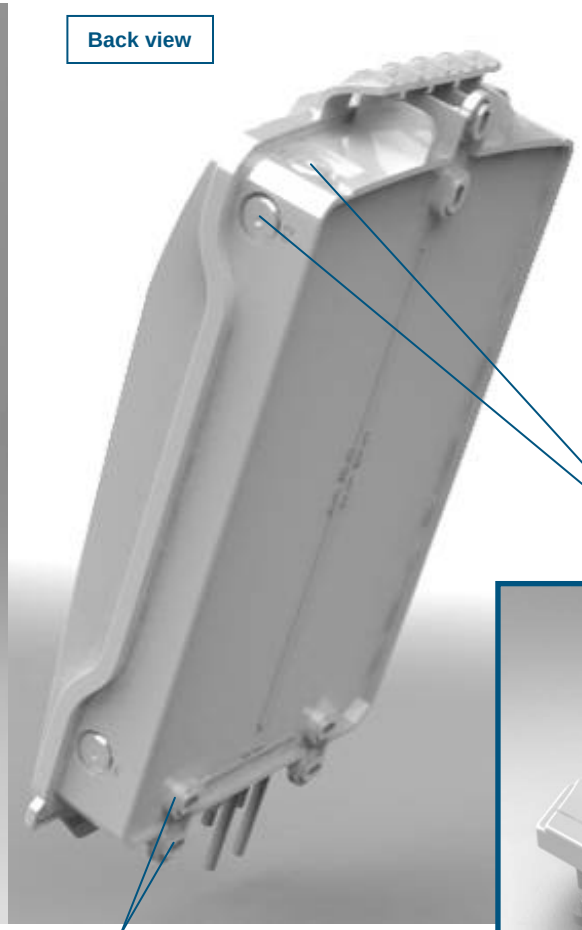
BUDI cable ports with glands

- Each of the sizes has multiple cable knock-out ports on bottom, left and right side and top

BUDI-M and S: Spliced version

- Uses FIST as splice organizer system
- Capacity for SOSA's:
  - BUDI-M: 36 UMS units
  - BUDI-S: 28 UMS units
- Loop storage at right side
- Wrap around cable ports available

BuDi-2S: outside

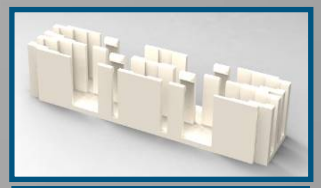


Main Features

- IP55 enclosure (when using bottom ports); UV stable and UL listed housing
- Splice capacity up to 12 splices (universal splice holder) in base tray
- Hingable tray for unused fiber storage
- 2 splitters with pre-connectorized outputs can be integrated (reducing splice capacity to 6 spliced)
- Patch panel for 4 or 6 SC OR 8 or 12 LC connectors
- Input cables can be blown fiber duct including gas block or conventional cable
- Wrap around cable ports in bottom
- Dimensions (HxWxD in mm): 260x155x60

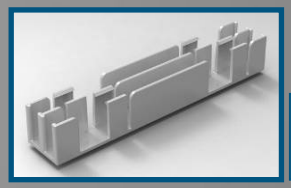
BUDI-2S: inside

Unused/Dark Fiber storage tray



universal spliece holder

4 splices

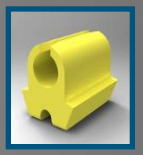


Splitter holder

2 splitters

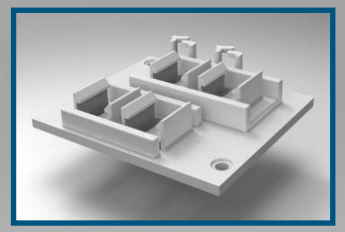
Gabocom fixation plate

2 pieces



KTU:

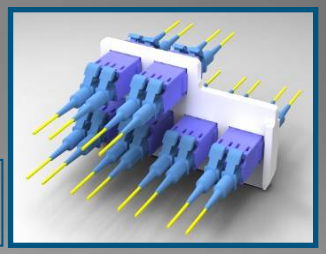
Capacity 2x6



Axial pull fixation plate:

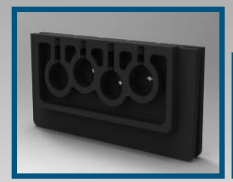
4 KTU's

6x ANT splice holder



Patchpannel:

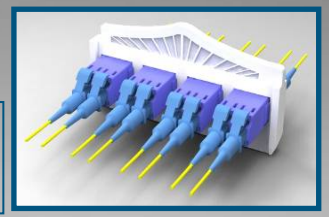
6 duplex LC adaptors



Sealblock:

Wrap around

4 Cables of diameter: 4.5 mm



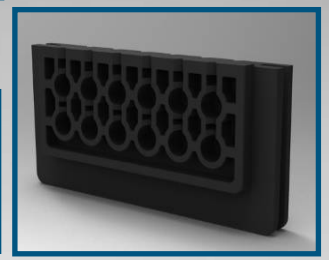
Patchpannel:

4 duplex LC adaptors

Sealblock:

Wrap around

Cable diameter: 4.5 mm-7 mm-10 mm



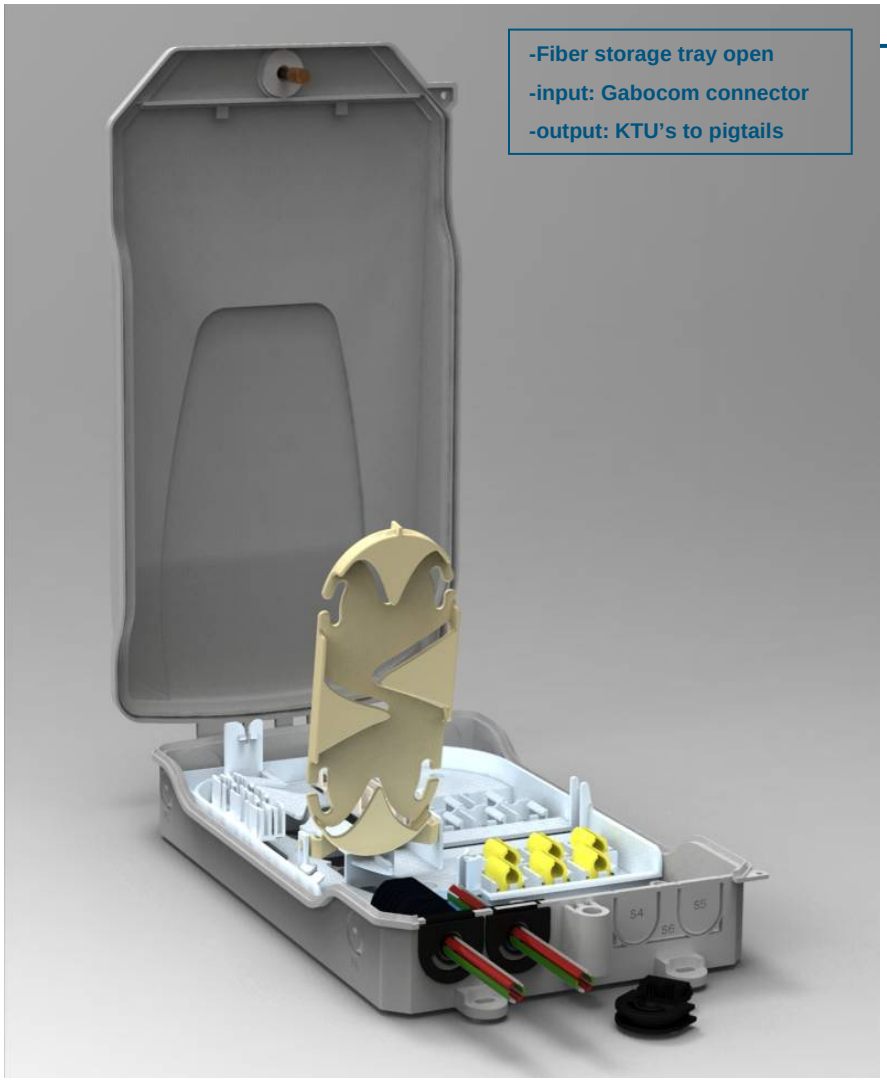
Sealblock:

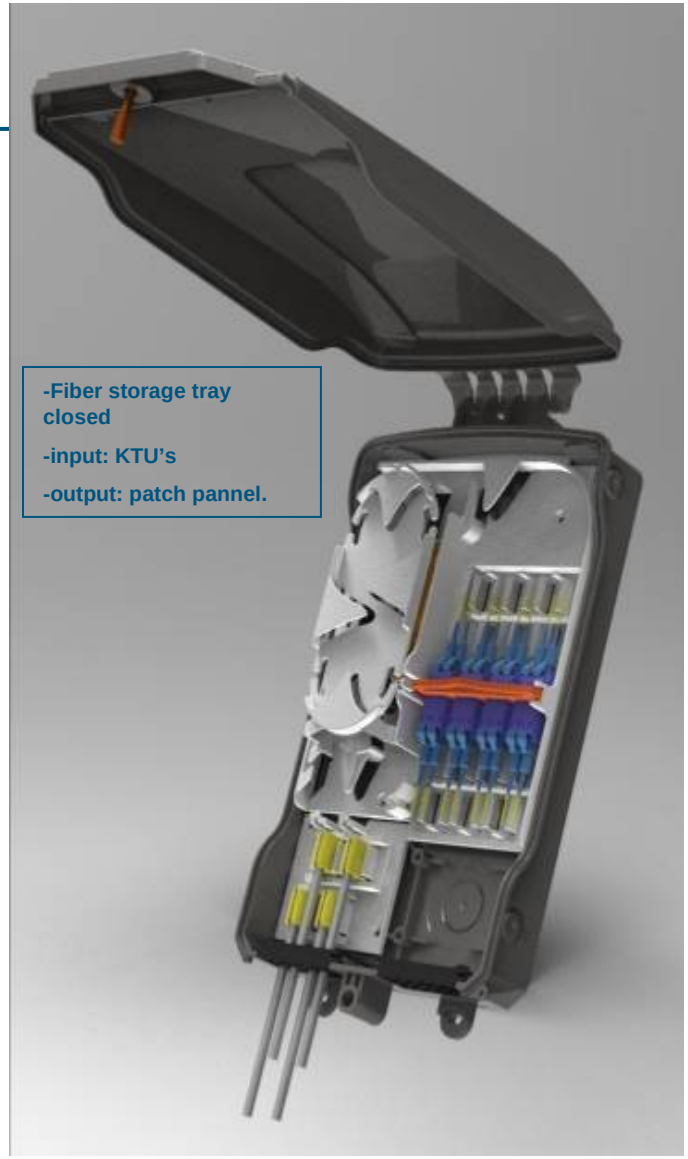
Wrap around

12 pigtails of diameter:

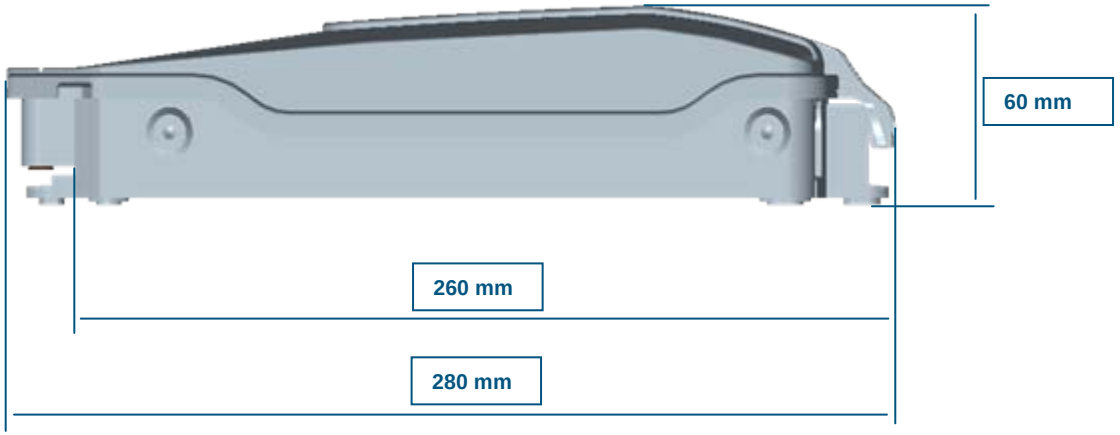
3 mm

BUDI-2S: config. examples





BUDI-2S: Dimensions



Ordering Information

- Strategy
  - For key customers: customize kits to their needs and requirements
  - Others: ordering guide by ordering box and application kit separate

  - See Ordering Guide Draft BUDI-S -