Micro Cabling Systems

New Installation Methods for MCS-Drain, S.L.I.M.,
MCS-Liner and MCS-Road Optical Fiber Cables
MCS-LINER  18
For Drain and Pipeline Repair

MCS-Road  20
For Roads
Our cable concept for sewer systems comprises three products: MCS-Drain for installation in drain and sewer systems, S.L.I.M. for installation by robot, and MCS-Liner for drain system renewal and repair.

Our cable concept for the road: MCS-Road. Its fast, simple installation keeps roads obstacle-free and traffic flowing freely.
Installing optical fiber cables using conventional methods is a long, costly and nerve-wracking process. Now Corning has developed a revolutionary alternative for installation wherever extensive excavation would disrupt traffic, generate enormous costs and be time-consuming: Micro Cabling Systems (MCS®) and S.L.I.M.

This new optical fiber system enables installation to be completed rapidly and at reasonable costs. In sidewalks, roads or subterranean drain systems. Whether installing new local networks, the expansion of existing networks or campus cabling of industrial sites (such as backbone cabling) – we always have the ideal solution.

Our cabling concept for roads: MCS-Road. Where conventional methods require excavations of 60 – 80 cm depth, these special MCS optical fiber cables are laid in a shallow 8 – 10 cm groove in the street or sidewalk.

MCS-Drain is the answer when cabling needs to be installed directly in drain or sewer systems. Installation can be completed using standard equipment and machinery, eliminating all excavation costs. A further option for cable installation in drain and sewer systems is S.L.I.M., a robot-assisted cable installation method in which the robot positions the cable in the upper area of the drainage channel, bores attachment holes for special dowels and fixes the cable in position using elastomeric clips. Both these options drastically reduce the time and complexity of installation.

And we’ve simplified the new optical fiber system still further by designing both concepts - MCS Road and MCS-Drain – fully compatible with each other and with conventional optical fiber networks. Sounds simple? It is.
The Best Grounds

Cable Installation in Sewer Systems and Roads

A growing trend in cable installation is the utilization of sewer systems, making use of existing infrastructure and eliminating costly excavation work. The key to this new development lies in the new installation technologies of MCS-Drain and S.L.I.M.. When sewers are renewed or repaired, we recommend fitting our MCS-Liner during repair work. And the "last mile" to the user’s door is covered by MCS-Road, a simple process whereby the cable is installed directly in the road surface.

MCS-Drain
The Cable for Drain and Sewer Systems

In this special installation method, the compact cable is fixed only in the manholes and does not affect the functioning of the drain system. The cable is easy to install in all common sewers, whatever their material and diameter.

S.L.I.M.
The Cable for Robot-Assisted Installation

The S.L.I.M. method uses a special robot to install the cable in sewers. The cable is fixed in the upper area of the sewer pipe using special dowels. The robot positions the cable, bores the mounting holes and fixes the cable using special clips of non-ageing plastic.
In MCS-Liner technology, the optical fiber cable is installed during renewal and repair work to drains and sewers.

Installation of MCS-Road involves cutting a groove approx. 8 cm in depth into the road surface into which the ultra-slim cable is laid. A special filler is then used to secure and hold down the cable and the groove is finally sealed off with conventional watertight bitumen.
MCS-Drain is suitable for deployment in all existing drain channel systems, such as sewers, storm and mixed drainage systems. The MCS-Drain is pulled into place and then tensioned, so that on completion of the installation it is located in the upper curvature of the drain pipe.

The special feature of this installation method is that the compact cable is clamped solely in the manholes and does not affect the functioning of the drain system. The cable is easy to install in all common sewers, whatever their material and up to a diameter of 180 mm.

**Use**

The MCS-Drain cable has a diameter of just under 12 mm and was designed specifically for installation in drain channels. The cable is of proven high quality, contains up to 144 fibers and is of high tensile strength.

**Benefits**

- Simple, rapid installation (up to 0.5 km/day)
- No mechanical boring holes in drain pipes
- Low installation and fitting costs
- No special equipment needed
First, curved cable guides and attachments for the pulling eye are fitted in the manholes. A standard cleaning vehicle is used to clean the drain pipe and simultaneously pulls through the MCS-Drain cable. The tension helixes are attached to the cable and drawn through the pulling eye, and the cable is tensioned.
**FEATURES**

- No need to bore holes in drain pipes
- Significant reduction in costs over conventional installation methods
- Rapid installation: "2 weeks' work in a single day"
- Does not interfere with the required operation of the drainage system
- Excellent cable protection
- No excavation required
**MCS-Drain: Fittings**

**Use**

The DC-144 closure is suitable for use as an impermeable closure against pressurized water in branches and pipe junctions. The cables are led in and tensioned at the connection pipes. This sturdy, corrosion-resistant closure is impermeable to pressurized water and can be mounted in both manholes and road surfaces.

**Features**

- Installation of cut MCS-Drain cables (mid-span access)
- Short mounting times
- Replaceable adapters enable a variety of cable types to be used (Drain, Road, S.L.I.M., Standard)
- Reusable sealant enables closure to be re-opened and closed
- Splices are protected by Tekni-Tubes, enabling optical fiber length to be varied

**Make-up**

- Stainless steel armor, permanently elastic sealant
- Fibers grouped within a single tube
- 4 cable lead-ins
CABLE MAKE-UP

The MCS-Drain comprises a maxi-tube with water-tight filler. The tube has an approx. 6 mm external diameter, is longitudinally watertight and contains 12 to 144 fibers. The maxi-tube has steel wire armo-ring to absorb tensile forces and protect against rodents, and has an outer sheath of robust polyethylene. This compact cable has high tensile strength and is rodent-proof.

OPTICAL SPECIFICATIONS

The standard MCS-Drain Cable comprises single-mode fibers **) in compliance with ITU-T Rec.G.652; with the following optical values:

- Wavelength range approx. 1310 nm
  - Attenuation: 0.36 dB/km*)
  - Dispersion: 3.5 ps/(nm x km)*)
- Wavelength range 1550 nm
  - Attenuation: 0.25 dB/km*)
  - Dispersion: 18 ps/(nm x km)*)

*) Other values on request
**) Multimode and LEAF® fibers on request

MECHANICAL SPECIFICATIONS

- External diameter: approx. 11 mm
- Weight: approx. 225 kg/km

INSTALLATION AND OPERATION INFORMATION

- Minimum bending radius: 100 mm
- Max. permissible tensile force: 15 kN

TEMPERATURE RANGES

- Operation: −30° to +70°C
- Installation and fitting: −15° to +70°C
- Transport and storage: −35° to +80°C

CODING

Fibers are color-coded in groups of 12 with colored binders, enabling binders and optical fibers to be clearly identified.

ORDER INFORMATION FOR MCS-Drain

<table>
<thead>
<tr>
<th>Cable order code</th>
<th>Number of fibers</th>
<th>Drain pipe diameter</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-DAB 2Y 1x144</td>
<td>144</td>
<td>150 mm</td>
<td>V 46904-D144-U75</td>
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</tbody>
</table>
Underground Information – S.L.I.M. and Robot Installation

Use
- Mounted by robot in sewer systems
- Installation in man-sized drain systems
- For high mechanical stress levels
- For areas at high risk from rodents
- Direct underground installation
- Installation in concrete channels
- High number of fibers

Features
- Single-layer stranded make-up (up to 216 fibers)
- Corrugated steel sheath protects against rodents and mechanical strain
- Slim, sturdy cable

Benefits
- Designed for installation by robot anywhere within the drain pipe
- Compact make-up, high number of fibers
- Special dowels enable 2 parallel cables to be fixed in drain channel
Canister Closure

This flat closure can be fitted to the wall of a manhole. The stainless steel casing is impermeable to pressurized water, explosion-proof and ultra-rugged. Splices are in individual containers, enabling individual fibers to be handled without disruption to the overall service. Closure capacity can be expanded at any time by fitting a different cover model.
**Cable Make-up**

The S.L.I.M. cable contains up to 216 fibers, with 24 fibers per bunch core grouped around the central element.

**Temperature Range**

- Operation: –25° to +60°C
- Installation and Fitting: –5° to +50°C
- Transport and Storage: –25° to +70°C

**Test Procedures**

Subjected to tests in compliance with IEC 60793-1, 60794-2 and VDE 0888 Section 3

- Tensile strength
- Impact resistance
- Lateral crush resistance
- Bending
- Response to temperature
- Longitudinal watertightness

**Coding**

Bar and color coding are used for identification.

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**Order Information for S.L.I.M.**

<table>
<thead>
<tr>
<th>Cable order code</th>
<th>Number of fibers</th>
<th>Drain pipe diameter</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-D (SF) ZN B R 2Y 9x24</td>
<td>216</td>
<td>200 mm</td>
<td>C 1110190/824</td>
</tr>
</tbody>
</table>
NEW FROM TOP TO BOTTOM –
MCS-Liner in Renewal and Repair Work

**USE**

The optical fiber cable is installed during completion of renewal and repair in sewers.

**SYSTEM MAKE-UP**

MCS-Liner comprises a 2 mm PE-HD inner liner with plastic nubs as distance holders on the outer surface. The pencil-slim optical fiber cable is embedded in mortar between these nubs. Alternatively, empty pipes can be fitted for further optical fiber cable installation.

**TEMPERATURE RANGE**

<table>
<thead>
<tr>
<th>Operation</th>
<th>–25° to +60°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation and fitting</td>
<td>– 5° to +50°C</td>
</tr>
<tr>
<td>Transport and storage</td>
<td>–25° to +70°C</td>
</tr>
</tbody>
</table>

**BENEFITS**

- No extra outlay – cable installation is carried out during pipe maintenance work
- Our ultra-rugged cables present no problems in case later repair of drain channels subsequent to cable installation using MCS-Liner or another system becomes necessary
- Protection against mechanical damage, temperature change and stress – profile is retained
- Trouble-free maintenance of optical fiber cables after installation

**ORDER INFORMATION FOR MCS-Liner**

<table>
<thead>
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<th>Drain pipe diameter</th>
<th>Order number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-DC 2Y 1x144</td>
<td>144</td>
<td>250 mm</td>
<td>V 46904-D144-U19</td>
</tr>
</tbody>
</table>
Defective sewage pipes are repaired with MCS-Liner and the cables installed simultaneously. The pencil-slim cable is embedded in the annular gap between the two PE-HD sheath liners. The nubs on the liner determine the gap size. The cable and liner are drawn into the defective pipe together and the annular gap subsequently filled with special mortar giving a static load-bearing composite system with high resistance to extremes of temperature and to aggressive substances.
The design of MCS-Road is the culmination of our years of experience in the field of submarine cable technology. For MCS-Road, we used a crush-resistant copper sheath offering reliable protection even against extremes of mechanical stress.

In addition, MCS-Road cables are:
- watertight and gas-tight
- temperature-resistant
- easy to locate after installation
- also suitable for transmission equipment power supply

The cable has been deployed universally in projects to date for installation in roads, sidewalks, underground and in pipe systems, eliminating the need for transitions to special cables, and thus splicing.
The U-60 underground closure (for up to 60 optical fibers) can be used in MCS technology as a water-tight connecting closure for installation in roads and sidewalks. The MCS-Road cables attached are tensioned at the lead-in of the closure.

**Use**

The U-60 underground closure (for up to 60 optical fibers) can be used in MCS technology as a watertight connecting closure for installation in roads and sidewalks. The MCS-Road cables attached are tensioned at the lead-in of the closure.

**Make-up**

- Stainless steel casing with flat packing as sealant
- Integrated splice module for up to 60 splices (crimp splicing)
- Cable lead-ins
- Heavy-duty protective cover (complies with Euro standard EN124:D400)
- Splices and handling length of cable are removable
- Lead-ins which are not required are crimped with an extension pipe for subsequent cable connection or sealed with filler plugs

**Features**

- Reusable sealant enables closure to be reopened and closed without need for extra sealant material
- Short installation times
- Closure pack is supplied with all necessary components

The MCS-Road cable can be bent to very tight radii during installation without kinking or producing added attenuation. An advantage of this feature is the possibility of storing large amounts of cable slack in the road at regular intervals to maximize network flexibility. Branches, extensions and new connections can be supplied rapidly and without splicing, using the mid-span access technique.

The cable slack can be stored in one or more loops laid up in the oval described by the two core drilled holes.
Mid-Span Access Technique

Mid-span access technique enables optical fibers to be removed from the MCS-Road cable without cutting, using only a battery-operated access tool (shown right). The picture below right shows the MSC-Road cable looped longitudinally for access to the optical fibers. The diagrams below show the individual access process steps.

Access tool

Removing the PE sheath
Using the access tool

Access process

Uncut fibers
Cable access
Branch cable
U-144 or DC-144 closure

Leading the cable into the closure
**Cable Make-up**

The MCS-Road cable comprises a longitudinally watertight filled copper tube of around 5 mm external diameter, containing 12 – 144 optical fibers *). The copper tube is insulated with a polyethylene sheath. The overall cable has a maximum external diameter of 9.6 mm. The compact MCS-Road cable is crush-resistant and corrosion-resistant, rugged and easily bent without kinking.

*) Higher numbers of fibers on request

**Optical Data**

The MCS-Road Cable contains standard single-mode fibers **) complying with ITU-T Rec.G.652 and with the following optical specifications:

- Wavelength range 1310 nm
  - Attenuation: 0.36 dB/km*)
  - Dispersion: 3.5 ps/(nm x km)*)

- Wavelength range 1550 nm
  - Attenuation: 0.25 dB/km*)
  - Dispersion: 18 ps/(nm x km)*)

*) Other values on request
**) Multimode and LEAF® fibers on request

**Coding**

The optical fibers are individually color-coded. In cables with more than twelve optical fibers, fibers are bunched into groups of 12 with colored binders, so that individual fibers can be clearly identified.

**Mechanical Data**

- External diameter: approx. 9.6 mm
- Weight: approx. 154 kg/km

**Installation and Operation Information**

- Minimum bending radius: 70 mm
- Max. permissible tensile force: 1,000 N

**Temperature Range**

- Operation: –30° to +70°C
- Installation and Fitting: 5° to +70°C
- Transport and Storage: –35° to +80°C

**Order Information for MCS-Road**

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Convinced? Now you’ve had a chance to get to know Micro Cabling Systems and find out about their applications and their extensive range of features and benefits. You’ve compared our different cable models, and discovered what makes them special. Not enough? Need more? More features, more information, more details? Good - that’s just what we hoped to hear from you. We’ve put together a selection of our product catalogues, available free of charge upon request. Of course, you’re also welcome to get in touch with us directly, by calling our Customer Service staff on +44-1483-526697. We’ll be happy to answer all your questions, down to the last detail.

Our Training Center offers courses in all installation techniques, with successful participants being certified as qualified cable installation engineers.
Overview of Topics