M-Lok New Generation Interlocking Suite
• MAcroLok® • MicroLok®
M-Lok – Hitachi Rail STS New Generation Interlocking Suite

M-Lok is a new flexible suite of Interlocking for Railway and Metro systems, implemented with programmed logic technology. According to the chosen configuration, M-Lok is able to control either very large station layouts or complete railway lines, exploiting the desired architecture (centralized or distributed).

M-Lok also performs automatic diagnostics, operator assistance and data logging functions to improve the efficiency of both signalling operators and maintenance engineers; the availability of M-Lok automatic tools for design, testing, verification and validation, troubleshooting and maintenance contributes to reducing system implementation times and overall plant costs, both in terms of CapEx and OpEx.

Main characteristics
(Central Interlocking Unit and Field Units Controllers):

- Modular, scalable solution offering high availability and reliability (double 2oo2 platform for MAcroLok® 100, 200)
- Core logic easily adaptable to several Signalling Rules
- Flexible Interfaces to Traffic Management, ERTMS L1/L2/L3, Zone Controller, other Interlockings (peer-to-peer, Master/Slave, Subset-098, relays, etc.)
- CENELEC certified SIL4 Products (EN50126, EN50128, EN50129)
- Data Preparation & Validation process and tools are SIL4 certified by different ISA (e.g. TÜV, Italcertifer, Bureau Veritas)
- Enhanced Reliability, Availability, Maintainability with Diagnostic
- Already proven and in-service technology
- Object Controllers driving any type of field device: Switch Machines, LED Signals, Balises, Axle Counters, Track Circuits, Level Crossings, other I/O's (Vital and Non-Vital)
- Enhanced Reliability
  - High MTBF of proposed products:
  - Availability: Meets 99.999%
  - Environmental Compliance
    - Rugged to work in different environment conditions with no climate control in equipment room: EN50125-3 class T1 (–25°C ÷ +70°C) and T2 (–40°C ÷ +65°C)
    - Compliant to EN50121 for EMC
  - Enhanced Maintainability.
    - Advanced diagnostic features
    - User friendly data tools are delivered to the user for system upgrades.

<table>
<thead>
<tr>
<th>Component</th>
<th>MTBF (Hours)</th>
<th>Architectural Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central Interlocking Unit</td>
<td>2.793 x 10⁶</td>
<td>2 x 2oo2 Safety Kernel , 1oo2 for Communications</td>
</tr>
<tr>
<td>Object Controller</td>
<td>2.255 x 10⁶</td>
<td>2oo2</td>
</tr>
</tbody>
</table>

MACroLok® 100, 200 Interlocking Key Features

MACroLok® kernel is a Safety Core based on a double “2-out-of-2” redundant architecture, which hosts the main safe software in terms of generic Interlocking functionalities (signalling rules), specific line characteristics (project configuration) and communication stacks.

MACroLok® object controlling capability can stretch from some dozens of field elements (typically for small lines) up to several thousands of field elements (typically in long lines and/or complex stations), managed from the same Central Interlocking Unit. Thanks to its application flexibility, M-Lok Interlocking can be indifferently adapted to be applied in the frame of Mainlines, Freight Lines, High Speed Lines, Metro Lines, Suburban Lines, and Light Rail Lines.

- Eight multi-drop redundant RS-485 serial bus pairs working at 10 Mbps
- Two bus pairs can be converted in fibre optic to link remote object controllers (up to 50 km)
- Communication towards peers (interlockings) or higher hierarchical elements (ERTMS, Traffic Management, Zone Controller) using redundant Ethernet
- Main Cabinet can integrate up to six Object Controller modules to manage local station devices; other Object Controllers may be distributed along the line
- Different sizes of Main Cabinet available
- Adaptable to 24 VDC, 48 VDC and 220 VAC power supply.

MACroLok® 200 Safety Core, as applied on Railway Lines (for instance, the Shar-Habshan-Ruwais Line in Abu Dhabi, and the Turin-Padua Line in Italy) and on Metro Lines (for instance, the Red Line in Stockholm).

M-Lok – M-Lok Suite comes with a complete set of user-friendly tools for System Diagnostic and Upgrades.

Example of MAcroLok® 200 Human-Machine Interface, as installed on Shan-Habshan-Ruwais Line in Abu Dhabi (integrated with ERTMS and Traffic Management)
# M-Lok Interlocking Suite

A flexible and scalable solution:

## M-Lok Interlocking Suite

### Interlocking Unit

<table>
<thead>
<tr>
<th>Architecture</th>
<th>Interlocking Unit</th>
<th>Peripheral Unit</th>
<th>Typical Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution 1</td>
<td>MicroLok® II</td>
<td>OC 100 and/or MicroLok® II</td>
<td>For Greenfield Lines</td>
</tr>
<tr>
<td>Solution 2</td>
<td>MACroLok® 100</td>
<td>OC 200</td>
<td>For Brownfield Lines</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OC 300 (MicroLok® II &amp; Gateway + OC 200)</td>
<td>For lines with existing MicroLok® II</td>
</tr>
</tbody>
</table>

## Centralized Configuration

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<th>Interlocking Unit</th>
<th>Peripheral Unit</th>
<th>Typical Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution 1</td>
<td>MACroLok® 100</td>
<td>OC 200</td>
<td>For Greenfield Lines</td>
</tr>
<tr>
<td>Solution 2</td>
<td>MACroLok® 200</td>
<td>OC 200</td>
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<td></td>
<td>OC 300 (MicroLok® II &amp; Gateway + OC 200)</td>
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## Object Controllers

Using a combination of Peripheral Units

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<tr>
<th>OC 100</th>
<th>OC 200</th>
<th>OC 300</th>
</tr>
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<tbody>
<tr>
<td>Based on MicroLok® Delay Controller</td>
<td>Based on New Generation Field Device Units</td>
<td>Gateway between Central Post and OC 100/OC 300</td>
</tr>
</tbody>
</table>

## M-Lok Interlocking Suite

Samples of hierarchical application:

### Distributed Configuration Solution Example

- Central Interlocking Unit for large-scale Applications
- Based on 2x2002 Architecture

### Centralized Configuration Solution Example

- Central Interlocking Unit for small- and medium-size Applications
- Based on 2x2002 Architecture

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**M-Lok Interlocking Suite**

**M-Lok Interlocking Suite**
Hitachi Rail STS
M-Lok – on the footsteps of the Worldwide bestselling Interlockings

Hitachi Rail STS M-Lok Interlocking suite represents the natural evolution of the thousands of Hitachi Rail STS Interlockings currently in service all around the world. The experience gained with the successful MicroLok, SEI/PAING and ACC/ACC-M Products has been transferred by Hitachi Rail STS into the next generation of Computer Based Interlocking: the M-Lok suite, which is adaptable to any kind of Railway and Mass Transit lines and delivers to Customers state-of-the-art performances, in terms of capacity, reliability, flexibility and efficiency.