M-Lok
New Generation Interlocking Suite
- MAcroLok®
- MicroLok®
M-Lok – Ansaldo 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 signaling 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.

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 Vdc power supply.

Component | MTBF (Hours) | Architectural Features
--- | --- | ---
Central Interlocking Unit | $2.793 \times 10^6$ | 2 x 2oo2 Safety Kernel, 1oo2 for Communications
Object Controller | $2.255 \times 10^6$ | 2oo2

- 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.

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:
M-Lok Interlocking Suite

A flexible and scalable solution:

**M-Lok Interlocking Suite**

**Interlocking Unit**

- **MicroLok II**
  - Based on Single Processor or “1+1” Architecture
  - Distributed Configuration

- **MacroLok® 100**
  - Central Interlocking Unit for small and medium-size applications
  - Centralized or Distributed Configuration

- **MacroLok® 200**
  - Central Interlocking Unit for large-size applications
  - Centralized Configuration

**Object Controllers**

- **OC 100**
  - Based on MicroLok Object Controller

- **OC 200**
  - Based on New Generation Field Device Units

- **OC 300**
  - Gateway between Central Post and OC 100/OC 200

**Architecture**

<table>
<thead>
<tr>
<th>Solution</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>Brownfield Lines</td>
</tr>
<tr>
<td>Solution 2</td>
<td>MacroLok® 100</td>
<td>OC 200</td>
<td>Greenfield Lines</td>
</tr>
</tbody>
</table>

**Centralized Configuration**

<table>
<thead>
<tr>
<th>Solution 1</th>
<th>Interlocking Unit</th>
<th>Peripheral Unit</th>
<th>Typical Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solution 2</td>
<td>MacroLok® 200</td>
<td>OC 300 (MacroLok II &amp; Gateway + OC 200)</td>
<td>Greenfield Lines</td>
</tr>
</tbody>
</table>

**Centralized Configuration Solution Example**

**Distributed Configuration Solution Example**
Ansaldo STS
M-Lok – on the footsteps of the Worldwide bestselling Interlockings

Ansaldo STS M-Lok Interlocking suite represents the natural evolution of the thousands of Ansaldo STS Interlockings currently in service all around the world. The experience gained with the successful MicroLok, SEI/PAI-NG and ACC/ACC-M Products has been transferred by Ansaldo 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.