M-Lok
New Generation Interlocking Suite
• MAcroLok®
• MicroLok®

Ansaldo STS  A Hitachi Group Company
M-Lok – Ansaldo STS New Generation Interlocking Suite

M-Lok is the 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.

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.

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

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)

Component | MTBF (Hours) | Architectural Features
---|---|---
Central Interlocking Unit | 2.793 x 10⁶ | 2 x 2oo2 Safety Kernel, 1oo2 for Communications
Object Controller | 2.255 x 10⁶ | 2oo2

- Availability: Meets 99.999%
- Environmental Compliance
  - Rugged to work in different environment conditions with no climate control in equipment room: ENS0125-3 class T1 (–25°C ± +70°C) and T2 (–40°C ± +65°C)
  - Compliant to ENS0121 for EMC
- Enhanced Maintainability.
  - Advanced diagnostic features
  - User friendly data tools are delivered to the user for system upgrades.

Example of MAcroLok® 200 Human-Machine Interface, as installed on Sharjah-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**

- **MicroLok® II**
  - Distributed Configuration
  - Based on Single Processor or 1+1 Hot Standby Architecture

- **MACroLok® 100**
  - Central Interlocking Unit for small- and medium-size Applications
  - Central or Distributed Configuration
  - Based on 2x302 Architecture

- **MACroLok® 200**
  - Central Interlocking Unit for large-size Applications
  - Centralised Configuration
  - Based on 2x202 Architecture

**Object Controllers**

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

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

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

**Distributed Configuration**

<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 Brownfield Lines</td>
</tr>
<tr>
<td>Solution 2</td>
<td>MACroLok® 100</td>
<td>OC 300 (MicroLok® II &amp; Gateway + OC 200)</td>
<td>For Greenfield Lines</td>
</tr>
</tbody>
</table>

**Centralized Configuration**

<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>MACroLok® 100</td>
<td>OC 300 (MicroLok® II &amp; Gateway + OC 200)</td>
<td>For lines with existing MicroLok® II or Mining Railways</td>
</tr>
<tr>
<td>Solution 2</td>
<td>MACroLok® 200</td>
<td>OC 300 (MicroLok® II &amp; Gateway + OC 200)</td>
<td>For Greenfield Lines</td>
</tr>
</tbody>
</table>

**Samples of hierarchical application:**

**Distributed Configuration Solution Example**

**Centralized Configuration Solution Example**

**M-Lok Interlocking Suite**

- Centralised or Distributed Configuration Example
- Centralised Configuration Example
- Centralised or Distributed Configuration 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.