MNS *i*S Motor Control Center
System Setup and Operation Quick Guide
System Release V5.4/0

Power and productivity
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Technical descriptions relate to System Release 5.4/0.

MNS *i*S

System Setup and Operation

Quick Guide

System Release 5.4/0

Content

1 MNS *i*S Design & Components

1.1 Switchboard Construction

MNS *i*S as part of the ABB Low Voltage Switchgear solution uses the well proven ABB MNS standard design aspects. MNS aspects described in this section are fully applicable to MNS *i*S.

MNS system is a verified design in accordance with IEC61439-1/-2.

The consistent application of the modular principle both in electrical and mechanical design as well as the use of standardized components allows its flexible and compact design.

Depending on operating and environmental conditions different design levels are offered.

Notable system advantages with regard to design aspects:

- Compact, space-saving design
- Easy project and detail engineering through standardised components
- Verified design acc. IEC 61439-1/-2
- Earthquake-, vibration- and shock-proof designs are available
- Easy retrofitting without the need for switchgear de-energizing
- Maintenance-free busbar construction
- High operational reliability and availability
- Optimum personal protection

1.1.1 Functional separation

The switchboard is divided into vertical and horizontal compartments thus separating different functional areas.

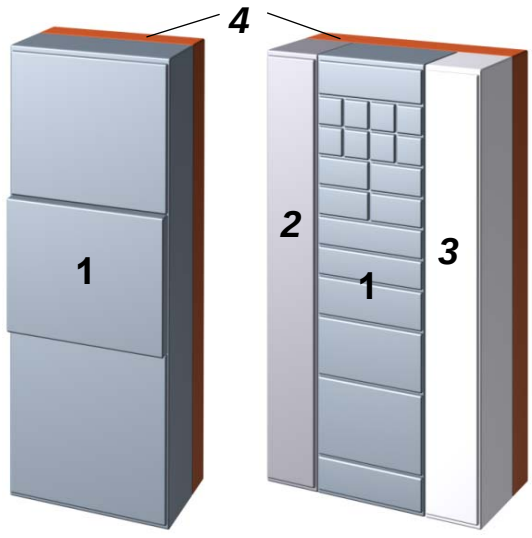


Figure 1 Functional areas: Incomer and MCC

As even power cabling and control wiring are strictly separated within MNS *iS*, the switchboard is structured as follows:

1. Equipment compartment
All equipment, including the standard motor starter modules M*Start* or feeder modules M*Feed* in withdrawable design, is situated therein. The compartment can be divided in horizontal and vertical sub compartments.

2. Control cable compartment
Contains the integrated control devices M*Control*, control cables and terminals.

3. Power cable compartment
Contains power cables and connection units.

4. Busbar compartment
Contains the MNS main busbar system and distribution bars. The distribution bars are embedded in the Multifunction Separation Wall (MFW) which is located between the Equipment compartment and the Busbar compartment

1.1.2 Cable Compartments

Access to integrated components such as electronic protection relays on standard switchgear is usually not possible if the module is energized.

As an outstanding attribute MNS *i*S switchgear provides separate compartments, one for power cables on the right hand and another for control cables on the left hand. The two cable compartments can be provided with different key locks in order to assure specific access rights.

MNS *iS* motor/feeder cables are housed in their own power cable compartment completely isolated from any control equipment or wiring. The cubicle arrangements are configured suitable for front cable access.

The power cable compartment can be provided with cable entry from the top or bottom of the cubicle.

The control cables have their own control cable compartment completely segregated from the power compartments.

This control compartment also houses the integrated motor control units M*Control* and other associated control equipment.

The control wiring can enter from the top or bottom as required for the project. External signals (such as pushbuttons, indicators etc.) connect directly to the M*Control* main board.

Figure 2 MNS *i*S switchboard with control cable compartment (left side) and power cable compartment (right side)

1.2 Withdrawable Module Design

M*Start* and M*Feed* modules of withdrawable design provide a maximum of plant and operator safety.

As per definition in IEC 61439-1/-2 withdrawable modules can be electrically disconnected (“withdrawn”) without the help of a specific tool with respect to the main incoming circuit, the main outgoing circuit as well as the auxiliary circuits.

M*Start* and M*Feed* are standardized components, ready-to-use and offered for a wide application range leading to maximum flexibility.

The high device packing density allows a comparatively low footprint of the MCC.

Figure 3 M*Start* modules in MNS *i*S switchboard

1.2.1 Main Characteristics

- Multi-functional operating handle connecting to module interlocking mechanism (see page 44)
- Ergonomic module handle to withdraw the module
- Status display (4 LED) integrated in module front
- Module rear wall with integrated contact system and sensors
- Control terminal block

M*Start* and M*Feed* comprise the power circuit and measurement functionality, thus they are decoupled from integrated control.

Integrated control and protection functionality is performed by the allocated M*Control* located in the control cable compartment.

Utilisation of conventional feeder modules for energy distribution is possible for conventional control instead of M*Control* functionality.

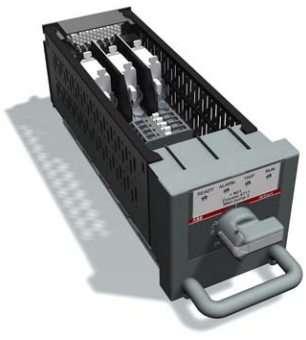


Figure 4 M*Start* size 6E/4

Figure 5 M*Start* size 6E/2

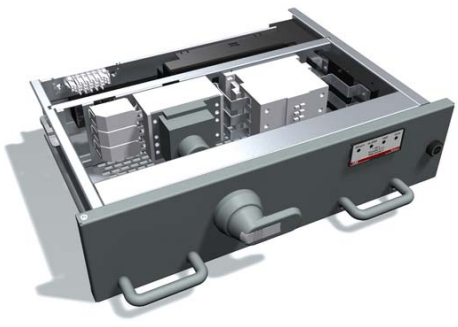
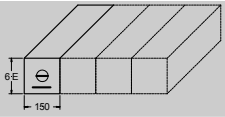
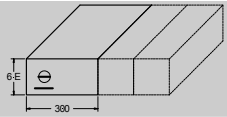
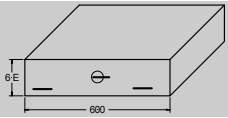
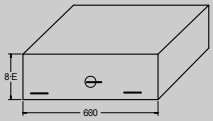
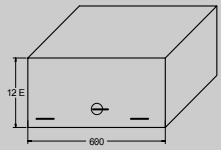
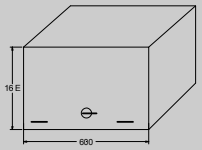
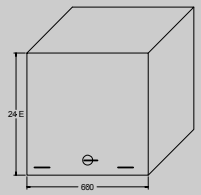


Figure 6 M*Start* size 6E

1.2.2 Dimensions

6E/4 height 150mm; width 150mm	**6E/2** height 150mm; width 300mm	**6E** height 150mm; width 600mm	
			
8E height 200mm; width 600mm	**12E** height 300mm; width 600mm	**16E** height 400mm; width 600mm	**24E** height 600mm; width 600mm
			

1.3 Fixed Module Design

For specific applications M*Start* is offered in fixed design. The module size is 85E (full height of the switchboard).

Fixed modules are utilised for motor starting solutions where a rating in excess of 250kW is required for DOL starting and 160kW for Star Delta.

The motor starter components such as the switching device, contactor and shunt modules are mounted in the main compartment.

The M*Control* and field I/O connections are located either in the upper compartment or lower compartment, dependant upon the cable entry requirements. For example, when cable entry is from below the M*Control* is located in the upper compartment and vice versa.

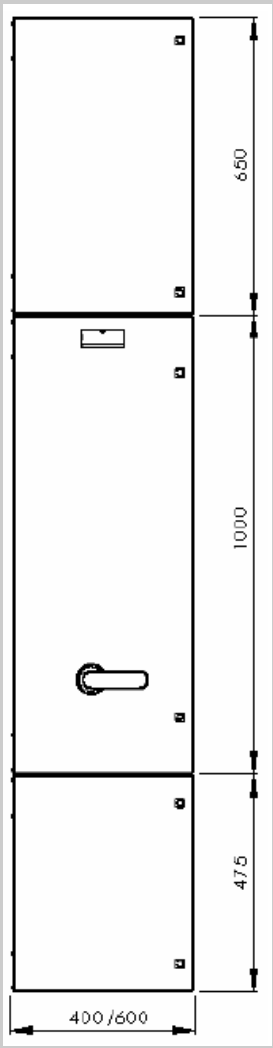
Figure 7 M*Start* modules in MNS *i*S switchboard

1.3.1 Main Characteristics

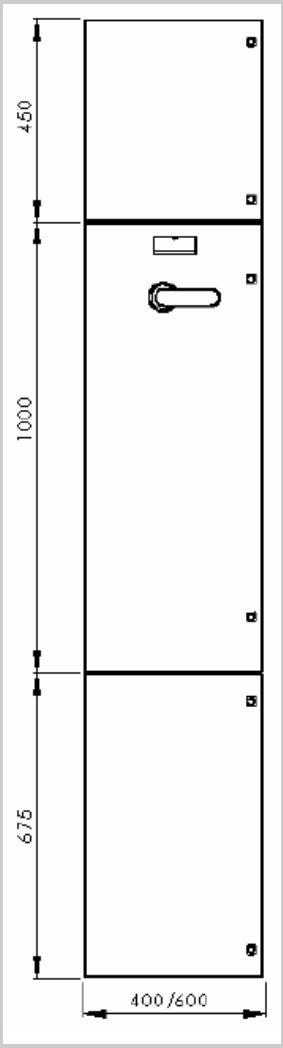
- Multi-functional operating handle connecting to module interlocking mechanism with 3 module positions (ON, OFF, Test), see page 45.
- Status display (4 LED) integrated in front door
- Cable mounting supports for top or bottom entry.
- Direct connection to main busbar

1.3.2 Dimensions

85E – Cable entry from top
Height 2125mm
Width 400/600mm
Depth 600/800/1000mm



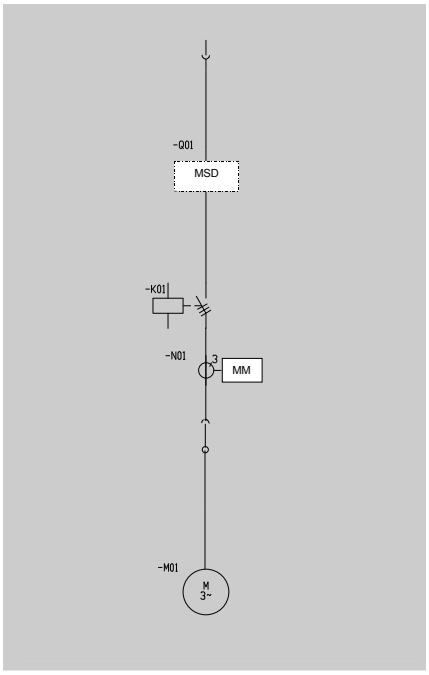
85E – Cable entry from bottom
Height 2125mm
Width 400/600mm
Depth 600/800/1000mm



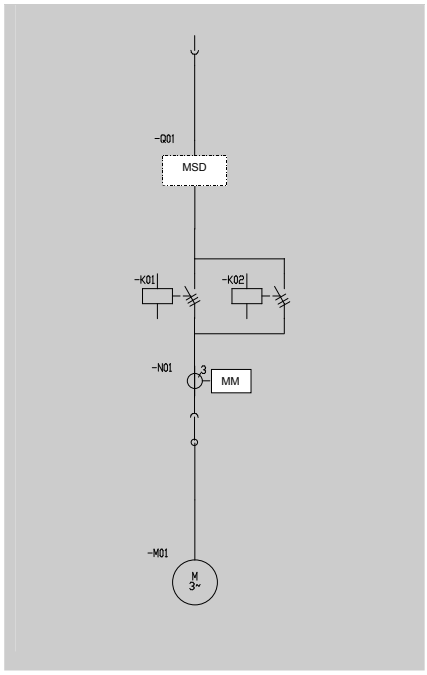
1.4 Module Type Samples M*Start*/ M*Feed*

Motor Starters M*Start*

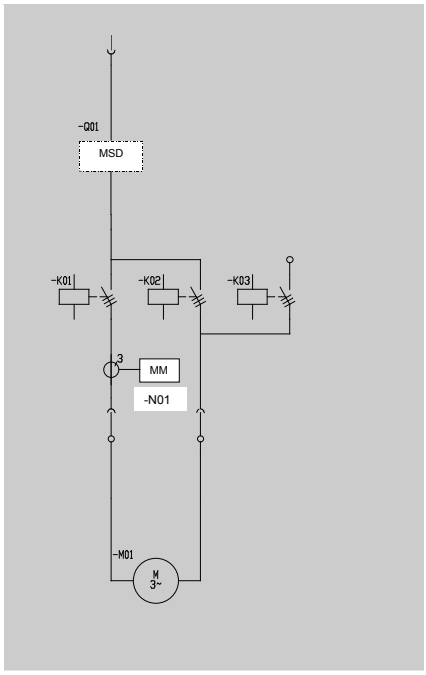
NR-DOL, HD
Direct Online starters,
Heavy-duty starters



REV-DOL
Reversing starters
(not available in Fixed Design)

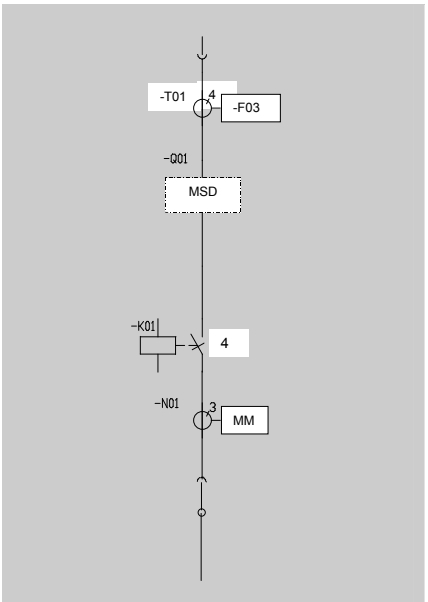


NR-SD
Star/Delta starters

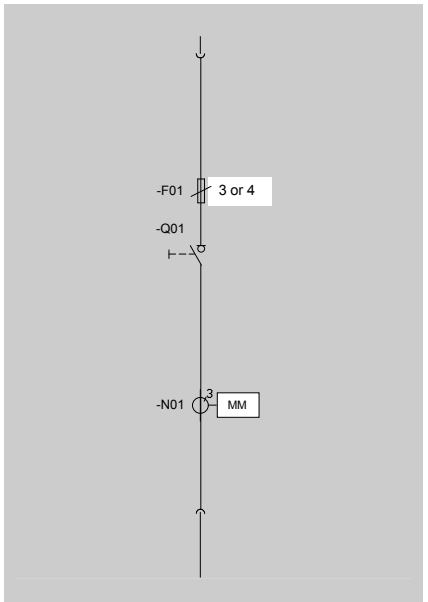


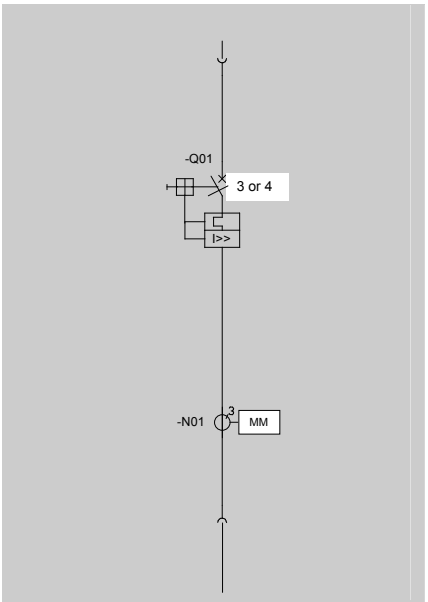
Contactor Feeders and Energy Distribution Modules M*Feed* (not available in Fixed design)

Contactor Feeder



Energy Distribution





Abbreviations:
MM = Measuring module (option for Energy Distribution)
MSD = Main switching device (Fused or Fuseless)

1.5 Power Contact

The precision engineered power contact type 101 is characterized by a turn-able bearing, thus uncoupling cable and contact. Consequently any occurring bending forces can-not affect the stability of the contact.

The mechanical stabilisation is taken over by the supporting plate whereas the contact fingers ensure positive electrical contact. Contact fingers are silver plated.

The contact design has been verified and exceeds the requirements of IEC 61439-1/-2.

Tests:

- Design verified acc. IEC 61439-1/-2
- Corrosion test acc. DIN 50017 and IEC 60068-2-60
- Crimping quality check acc. IEC 61238-1
- Vibration and shock test acc. IEC 60068-2-6 and IEC 60068-2-27

Further on during manufacturing each single contact is subject to a particular routine test screening its function and contact force.

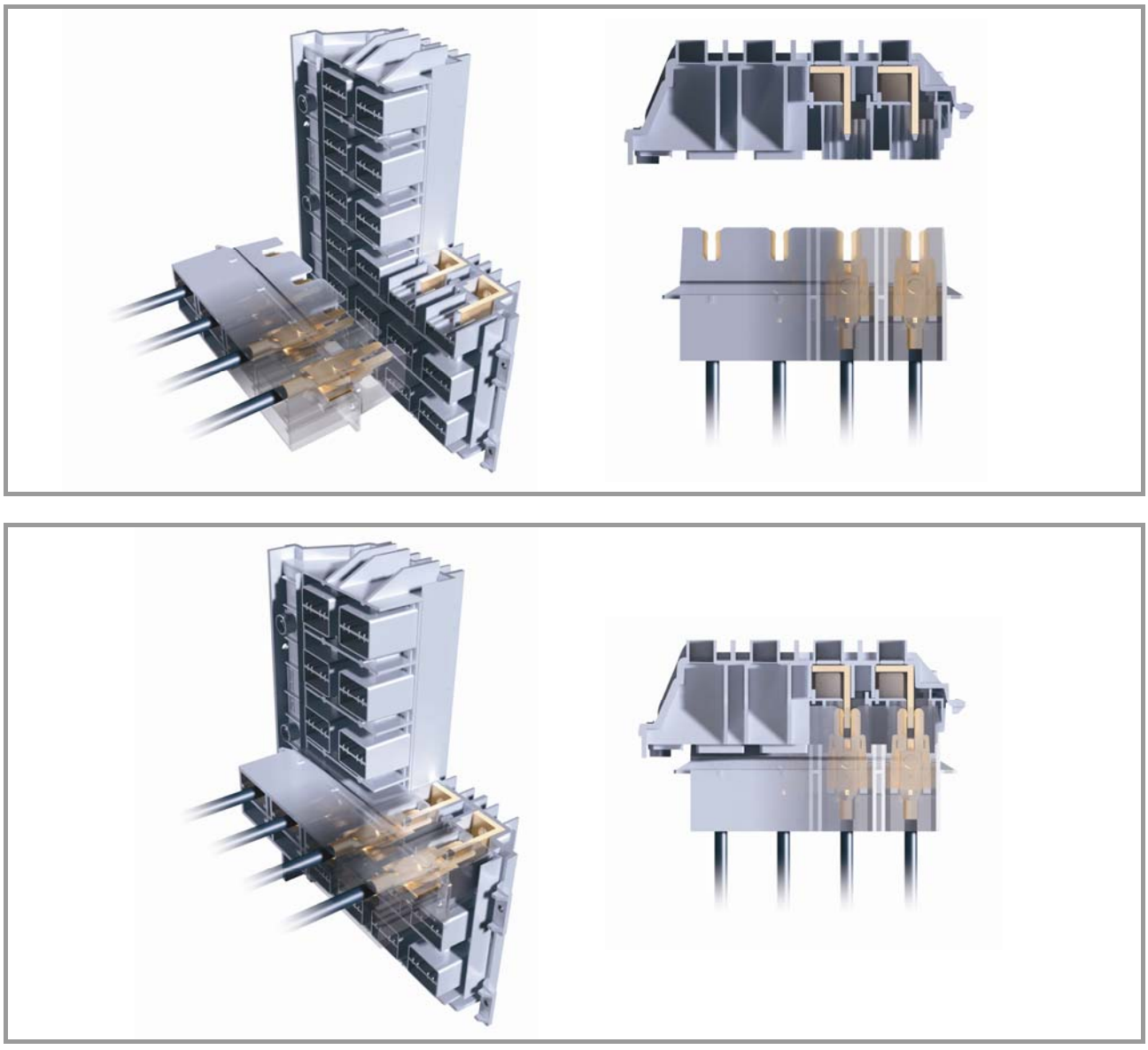


Figure 8 Withdrawable module contacts

1.6 Components overview

1.6.1 MNS *i*S components

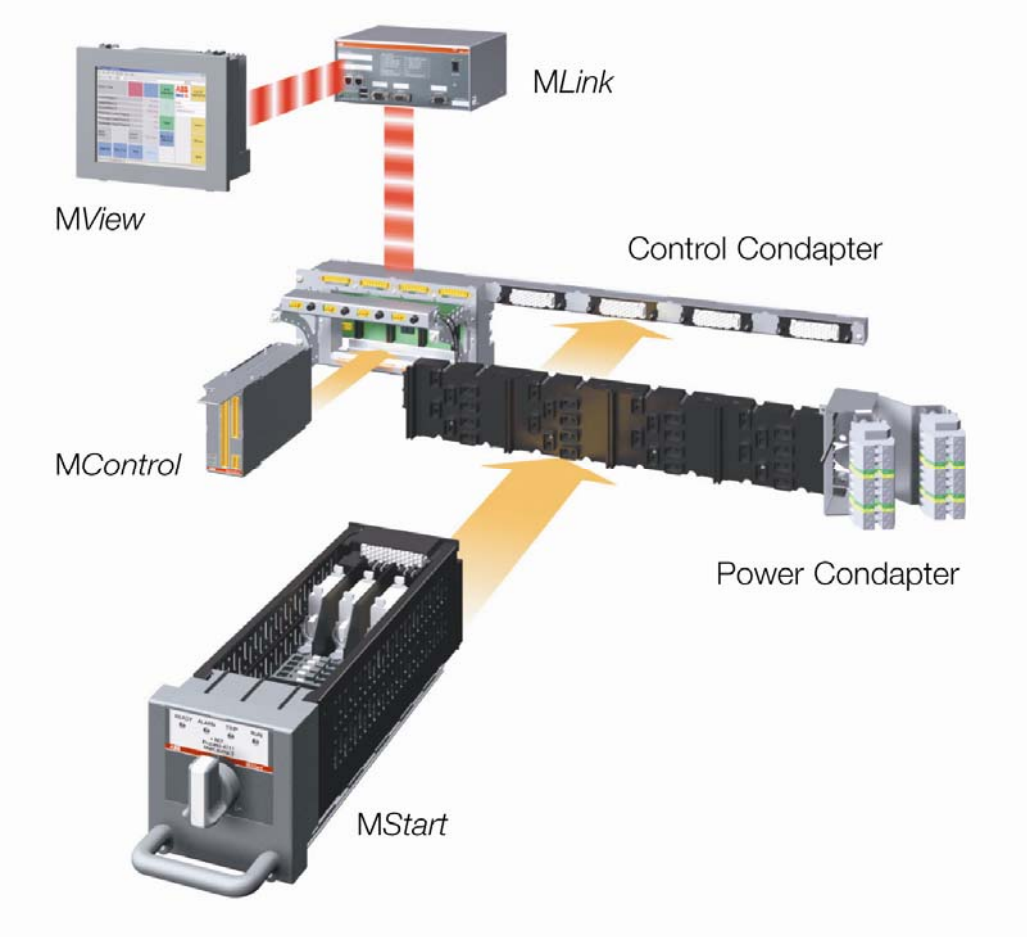


Figure 9 MNS *i*S components

The power module **M*Start* / M*Feed**** comprises:

- the electrical isolator
- the short circuit protection (fuses or circuit breaker)
- contactor and any electrical control equipment and status indication.
- the sensor module (measuring the electrical values, which are made available to the process via the M*Control* processor module.

The integrated motor controller module **M*Control*** (located in the control compartment) comprises:

- the processor performing all the protection, control functions and monitoring functions. It sends and receives information to and from the M*Start* / M*Feed* via an internal bus.
- I/O interface modules providing an interface to external components for both control and indication.

The interface module **M*Link*** serves for the serial gateway interface to higher level systems which communicate through the internal bus to all M*Control* modules.

A local Human System Interface **M*View*** is available to monitor the MNS *i*S status and display information for each connected motor / feeder.

1.6.2 Power Modules M*Start* / M*Feed*

*Specific characteristics of Fixed M*Start* modules see page 10

The withdrawable M*Start* / M*Feed* modules are available in the sizes from 6E/4 to 24E depending on the kW rating of the connected motor / load. For module dimensions and selection tables, please see page 9.

A combination of high precision shunt and micro-processor forms a complete measuring system, which does not only measure current very precisely, but at the same time measures the voltage and contact temperature.

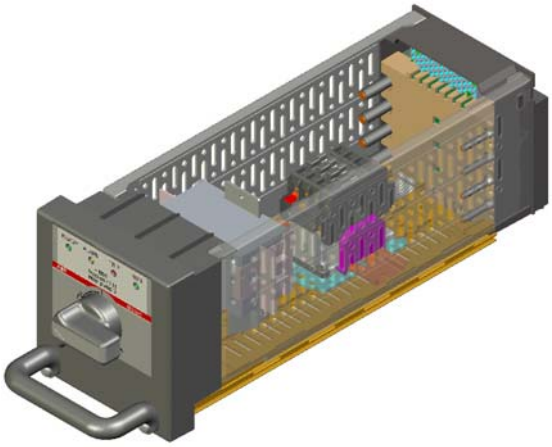


Figure 10 M*Start* module size 6E/4

1.6.3 Conventional Feeder Modules

Feeder modules with module sizes described on page 9, are also available for conventional solutions, ready to be integrated into MNS *i*S switchgear.

Utilisation of this option enables more cost effective solutions for energy distribution applications, where integrated solutions are not required.

Connection details see section

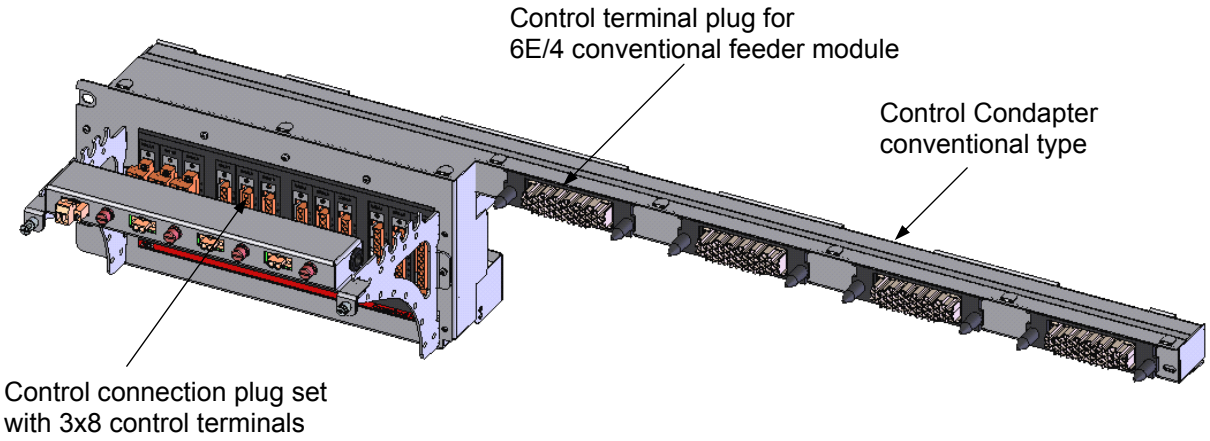


Figure 11 Control Condapter for conventional feeders

1.6.4 Integrated Controller Module M*Control*

The M*Control* is a powerful and modular platform for communication, control, data processing and protection functions. The main control board is based on a microprocessor platform and includes memory for application and process data and a fast communication interface to M*Link* as well as an interface to the M*Start* / M*Feed*.
The module is fully scalable and offers multiple solutions for digital and analogue I/O together with addition relay, measurement and communication cards for specific applications

For description of available interfaces/ connectors, please see section 2.3.

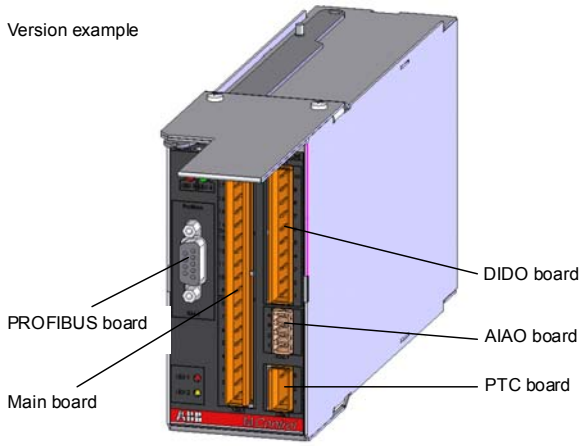


Figure 12 M*Control* module

The M*Control* modules are plugged into separate slots in the control cable compartment. Each slot belongs to a dedicated power module.

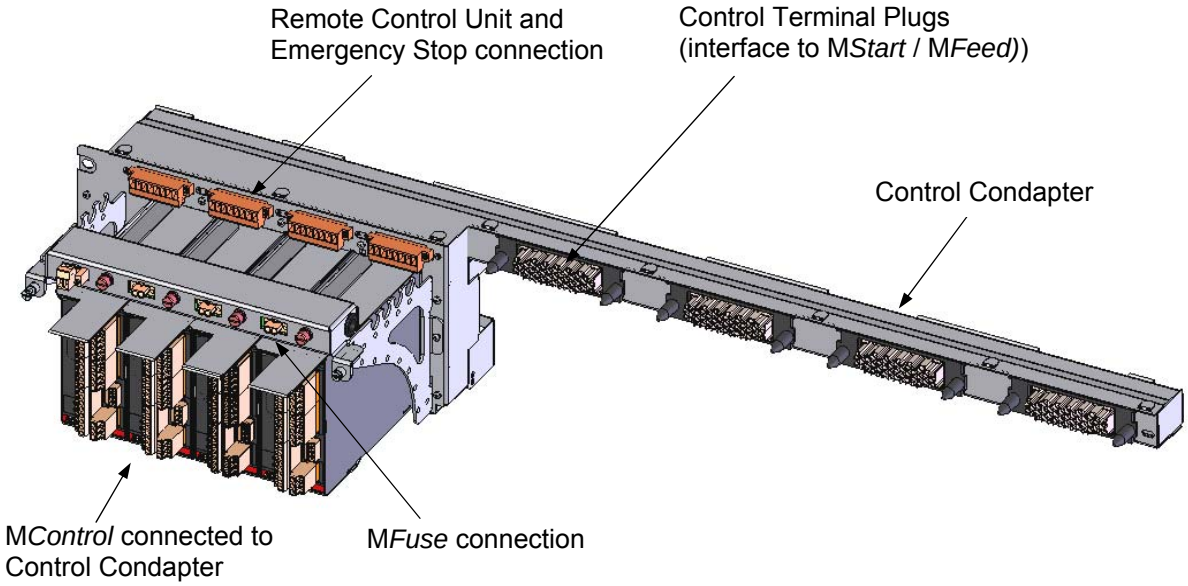


Figure 13 M*Control* connected to Control Condapter

1.6.5 Information Exchange via M*Link*

Information collected through M*Control* is sent to a communication interface module M*Link* in MNS *i*S.

M*Link* is the communication centre internally to a maximum of 60 M*Control* modules and externally between MNS *i*S and the higher level PLC or Process Control System. The main tasks are gateway functionality and information provider.

As an option, through an Ethernet interface on M*Link*, access to information from and controlling of each M*Control* is available via a web server.

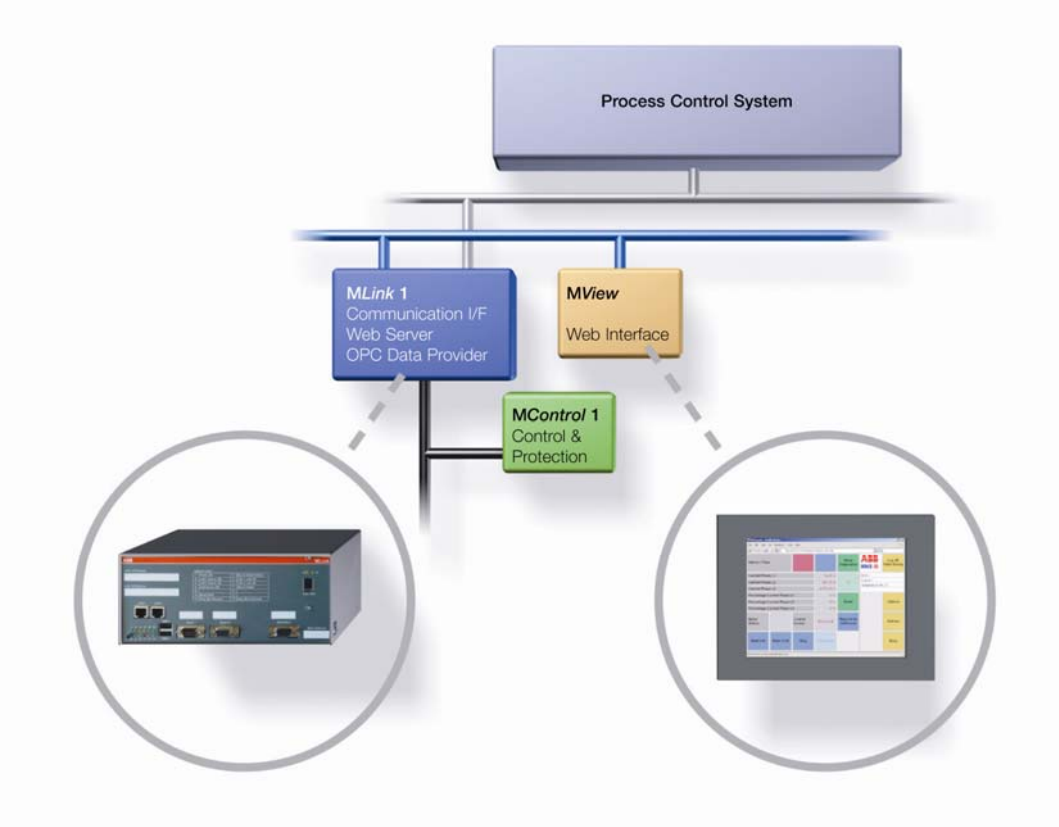


Figure 14 Information exchange via M*Link*

1.6.6 User Interface M*View*

The local Human Machine Interface M*View* can be installed in the switchgear and connected to M*Link* to monitor and operate the system depending on the access rights.

The M*View* is a standard Industrial Panel. Touch screen functionality allows easy operation and navigation through windows. The connection to MNS *i*S is configuration free, all information displayed is received directly from a web server integrated in the M*Link*.

In addition a standard PC, running Web browser software, can be connected directly or through a standard Ethernet network to access the web server in M*Link*.

Figure 15 M*View* in MNS *i*S Switchboard

1.6.7 Parameterization SW Tool M*Navigate*

The Microsoft Windows XP based software application M*Navigate* can be used to parameterize MNS *i*S from a convenient location outside the switch room environment. The PC is connected via Ethernet network topology to the M*Link* devices in this network.

Capabilities:

- User settings/ Access control
- Parameterization, Configuration and Download
- Diagnostic function
- Archive/ Restoration/ Reports of project data
- Switchgear Arrangement overview
- Guidance by Online help

For details see section 2.8 Project specific parameterization via MNavigate

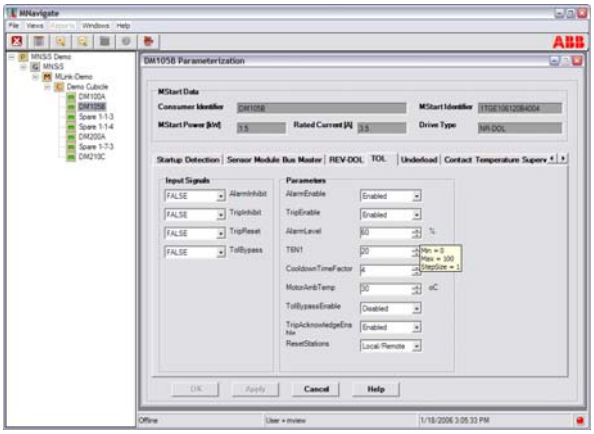


Figure 16 M*Navigate* motor starter parameter screen

1.6.8 Communication Details

The communication between M*Link* and the M*Control* devices internally is a RS485 peer-to-peer communication (max 10MBps) with a deterministic Master-Slave protocol.

Up to 60 M*Control* devices can be connected to one M*Link*. The wiring between all M*Control* and M*Link* Motor Operation via Human Machine Interface (Web Interface) is built-in inside the switchboard, no additional wiring is required. Multiple M*Link* can communicate via fieldbus (Profibus or MODBUS) to the control systems. The M*Link* acts as a standard fieldbus slave device in Master-Slave communication protocols.

As an option, redundancy in communication systems and fieldbus technology allows data communication between a PLC or PCS master to slave devices on two independent communication links. This may be utilized if a higher availability of the communication link is required.

The M*Link* contains time server / client functionality as an option to provide accurate time signal to all M*Control*. The time stamp of alarm and events from M*Control* is distributed to a higher level Process Control System via the Ethernet network.

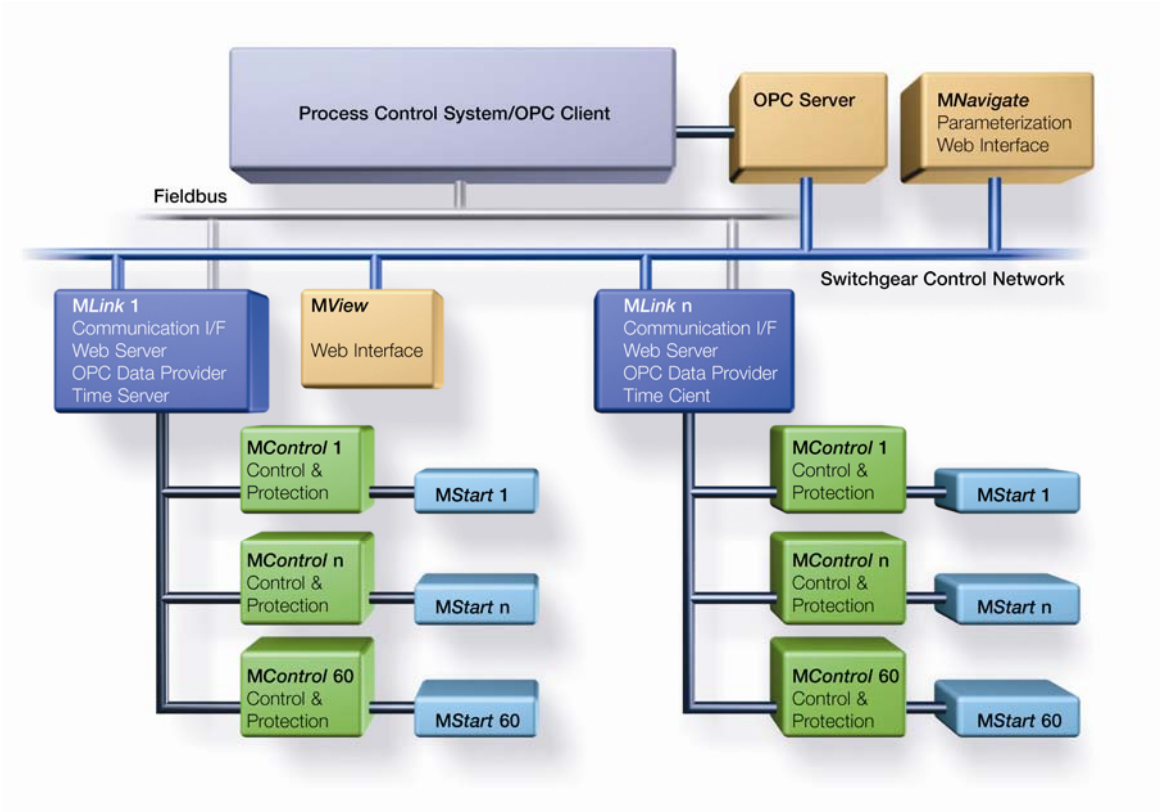


Figure 17 Typical Communications Overview

2 MNS *i*S System Setup

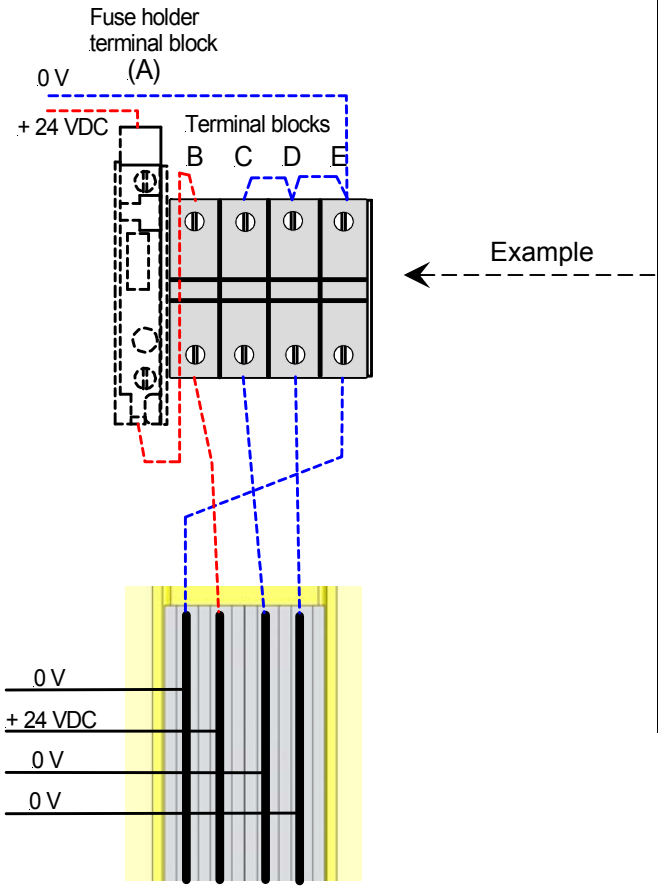
2.1 Cubicle identification

For the MNS *i*S System to operate correctly each cubicle requires an identification number. One M*Link* communicate to a maximum of 7 cubicles. This numbering is defined at the project engineering stage.

Cubicle numbers are accordingly set by defined connections of the terminal blocks to the fuse holder on the top of the 24 V DC Control voltage supply bar.

M*Link* identifies the cubicle based on the live supply bars.

Figure 18 shows exemplarily the coding of cubicle number 1.



Example

Cubicle number	Connection of the terminal blocks		
	B	**C**	**D**
	(Binary code 2^0)	(Binary code 2^1)	(Binary code 2^2)
1	→ **A**	→ **E**	→ **E**
2	→ **E**	→ **A**	→ **E**
3	→ **A**	→ **A**	→ **E**
4	→ **E**	→ **E**	→ **A**
5	→ **A**	→ **E**	→ **A**
6	→ **E**	→ **A**	→ **A**
7	→ **A**	→ **A**	→ **A**

Figure 18 Switchboard identification (example)

2.2 Module location setting

Each single M*Control* as well as M*Start* / M*Feed* module position is defined in the MNS *i*S project configuration data.

As a precondition for the allocation between particular M*Control* and M*Start* / M*Feed* devices the vertical position of the M*Control* in the switchboard has to be set.
The BCD rotary switches used for this setting are located on the backplane of the control condapter, see Figure 19. Both switches indicate the horizontal position of the module top edge as decimal code.

The horizontal positions 1 through 4 on each level are registered automatically with the insertion of the particular M*Control*.

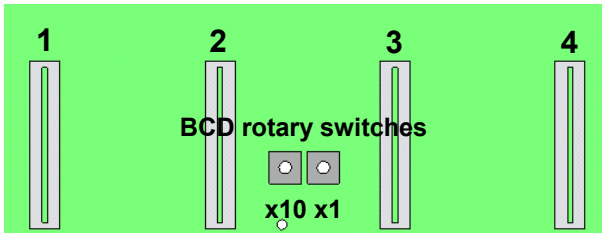


Figure 19 BCD rotary switches on control condapter

BCD rotary switch x 10 Position	BCD rotary switch x 1 Position	Module location (2E steps)
0	1…9	01…09
1	0…9	10…19
2	0…9	20…29
3	0…6	30…36

Sample configuration

BCD rotary switch position x 10	BCD rotary switch position x 1	Horizontal level of module in switchboard (upper edge)	Module height (Sample configuration)	Vertical position of module in compartment (No. of M*Control* main board)
0	1	**1**	4 x 6E/4	1 / **1** | 1 / **2** | 1 / **3** | 1 / **4**
		2		
		3		
0	4	**4**	2 x 6E/2	4 / **1** | 4 / **3**
		5		
		6		
0	7	**7**	6E	7 / **1**
		8		
		9		
1	0	**10**	12E	10 / **1**
		11		
		12		
		13		
		14		
		15		
1	6	**16**	16E	16 / **1**
		17		
		18		
		19		
		20		
		21		
		22		
		23		
		24		
2	5	**25**	24E	25 / **1**
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		27		
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		35		
		36		

2.3 M*Control* Overview

For an introduction to M*Control* functionality see section MNS *i*S Design and Components, page 15.

2.3.1 Mainboard and Extension cards

The basic component of the M*Control* unit is the main board. It is contained in a metal housing.

The main board is the main processing unit providing

- basic digital I/Os
- switchgear bus interface
- serial connection to M*Start* / M*Feed*
- power supply

If specified, extension cards providing optional functionality are added to the main board:

- Extended Digital I/O
- Extended Analog I/O
- Profibus Direct Interface
- PTC I/O
- Relay cards
- 3-channel PT 100

Extension cards can be used if they are selected with the project specific configuration within the ABB Engineering tool.

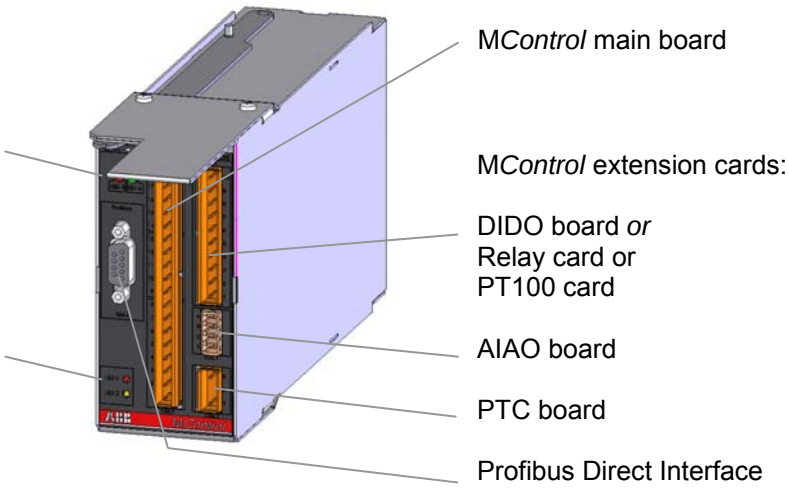


Figure 20 M*Control* components

2.3.2 Location

Each M*Control* is plugged into a slot of the control condapter located in the control compartment of the MNS *i*S cubicle (see Figure 21).
The horizontal and vertical position of this slot corresponds with the dedicated power module (M*Start* / M*Feed*) location. After insertion, the M*Control* unit is internally connected (hardwired) to this M*Start* / M*Feed* module.

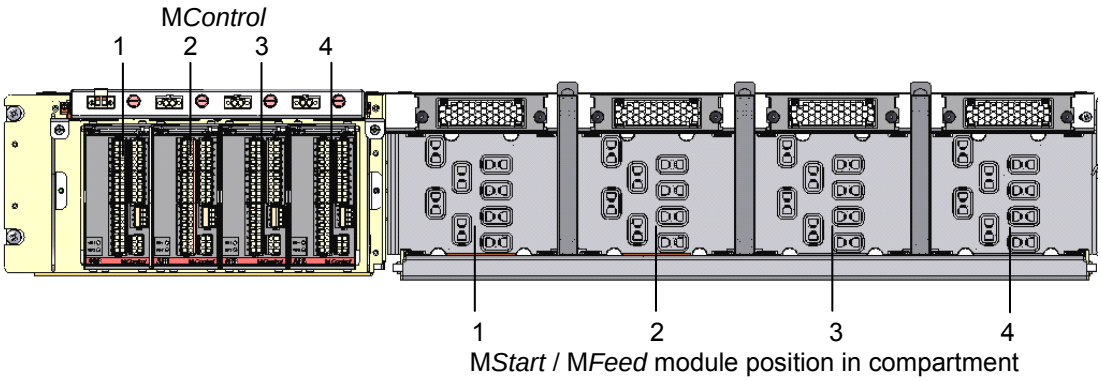


Figure 21 M*Control* location

2.4 Connection Details

2.4.1 M*Control* connection

After insertion, the M*Control* is mechanically locked by pivoting the locking lever on the top of the unit.

The connection of M*Control* with the M*Start/* M*Feed* module works as the plug and produce method via the rear connector of the M*Control* unit. The M*Control* front connectors are wired according the project specific pin allocation of I/Os, bus interfaces etc.

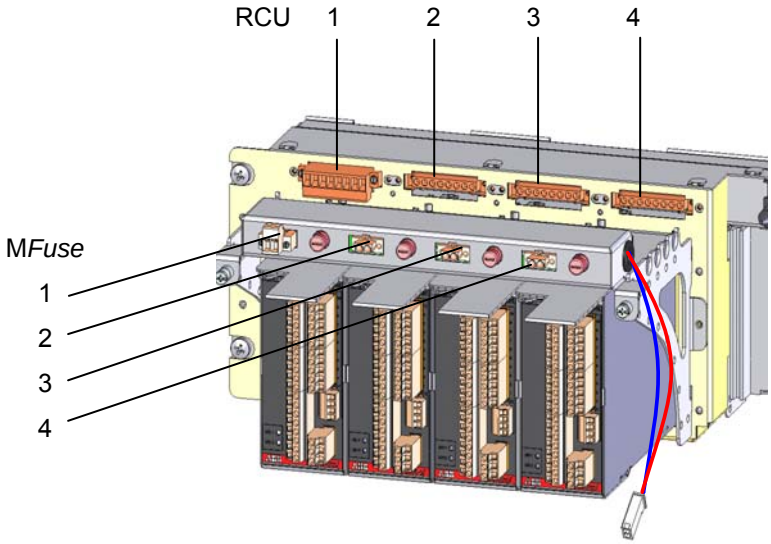


Figure 22 M*Control* connection

Important:
The contactor control circuit for each starter can be opened for the optional use of a Remote Control Unit (RCU) or Emergency Stop at connector X35 (above M*Control*). Connectors X35.1 and X35.4 are to be bridged in case none of these options is used. See connection diagram on page 25.

M*Control* Connection Diagrams

Overview of connectors on the control condapter backplane and the M*Control* unit:

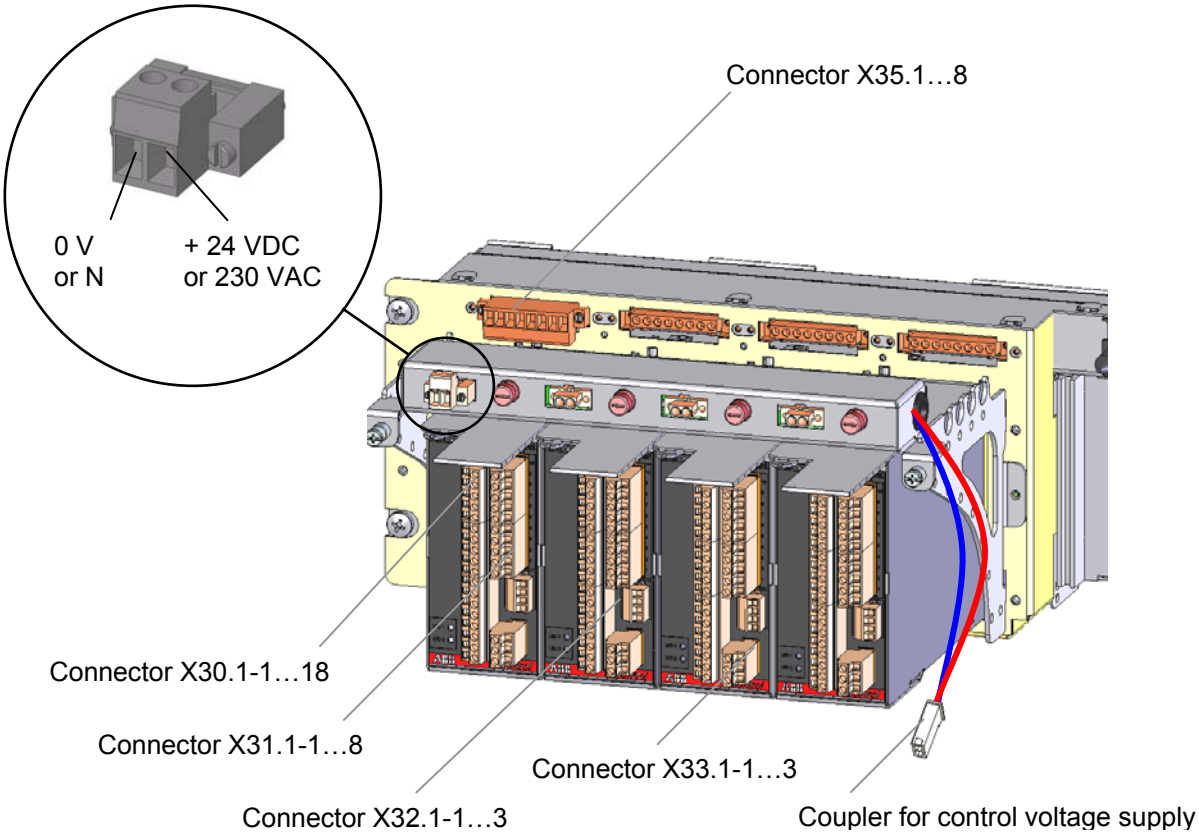


Figure 23 M*Control* connectors overview

For detailed connection diagrams see the following figures. They show the options available for the control and auxiliary circuits. Please refer to the project specific documentation for a more detailed overview.

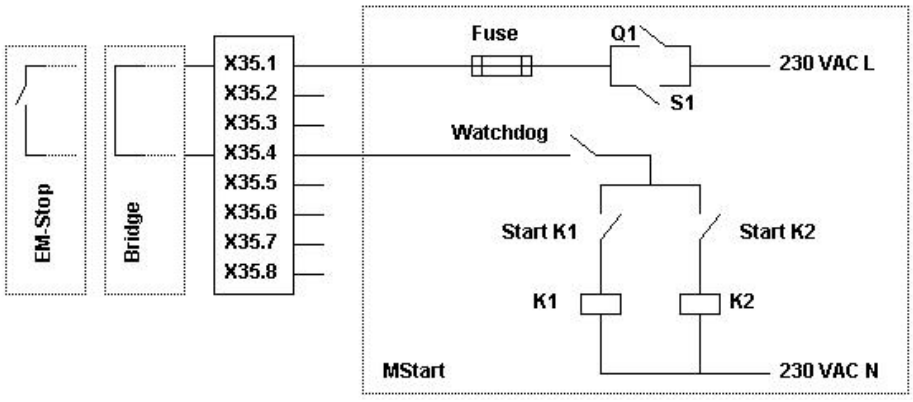


Figure 24 Connection diagram X35

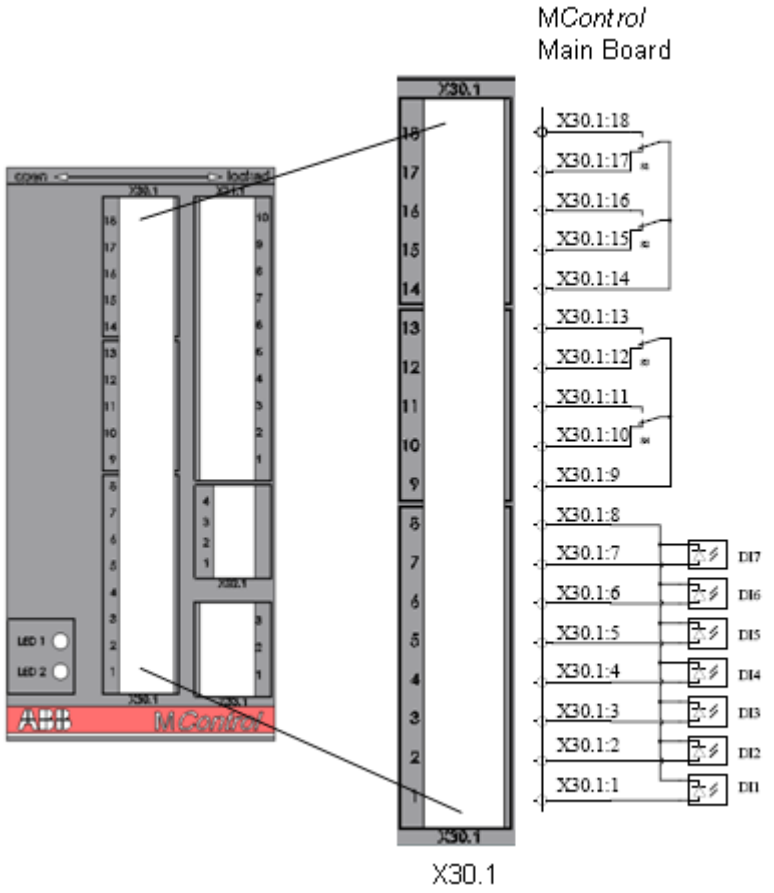


Figure 25 Connection diagram X30 – Main Board

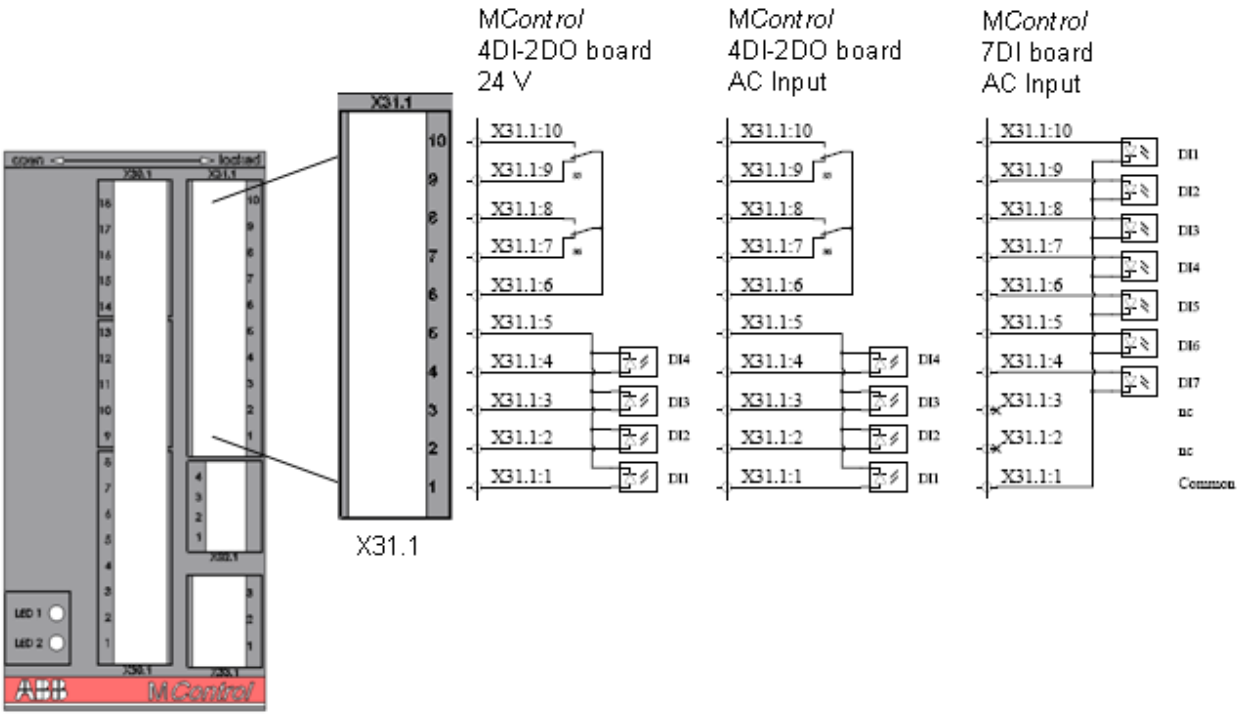


Figure 26 Connection diagram X31 – DI/DO

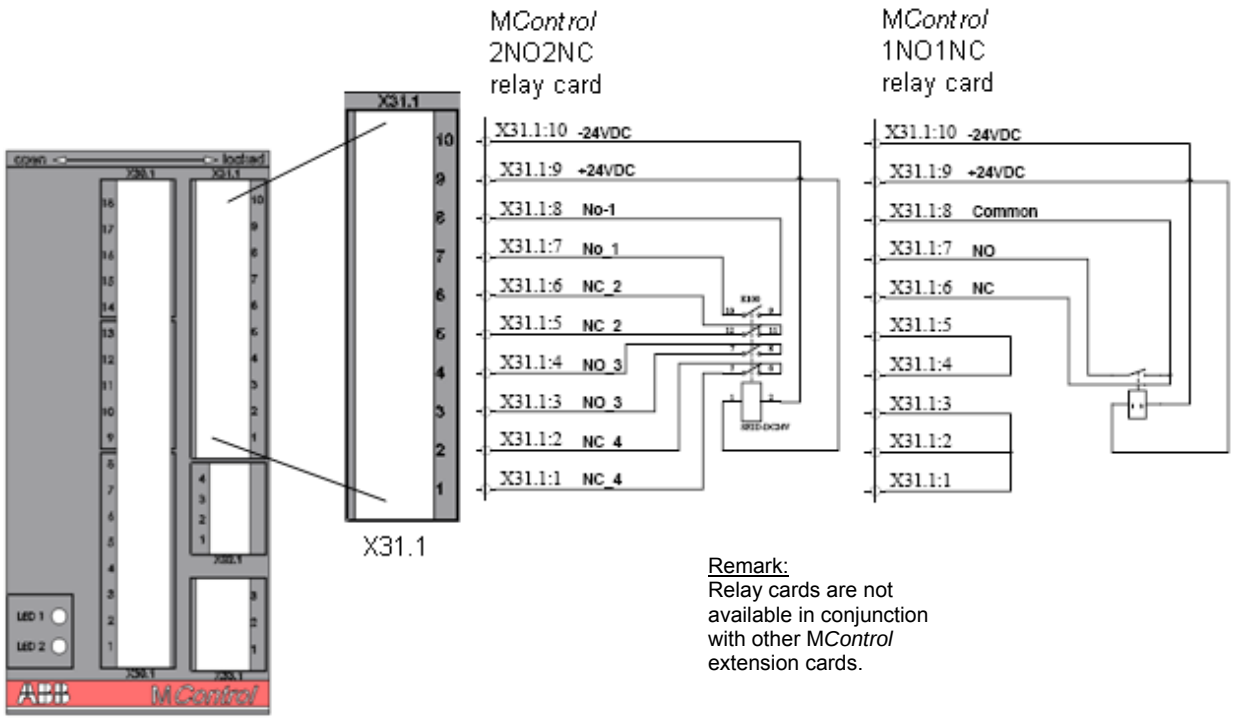


Figure 27 Connection diagram X31 – Relay card

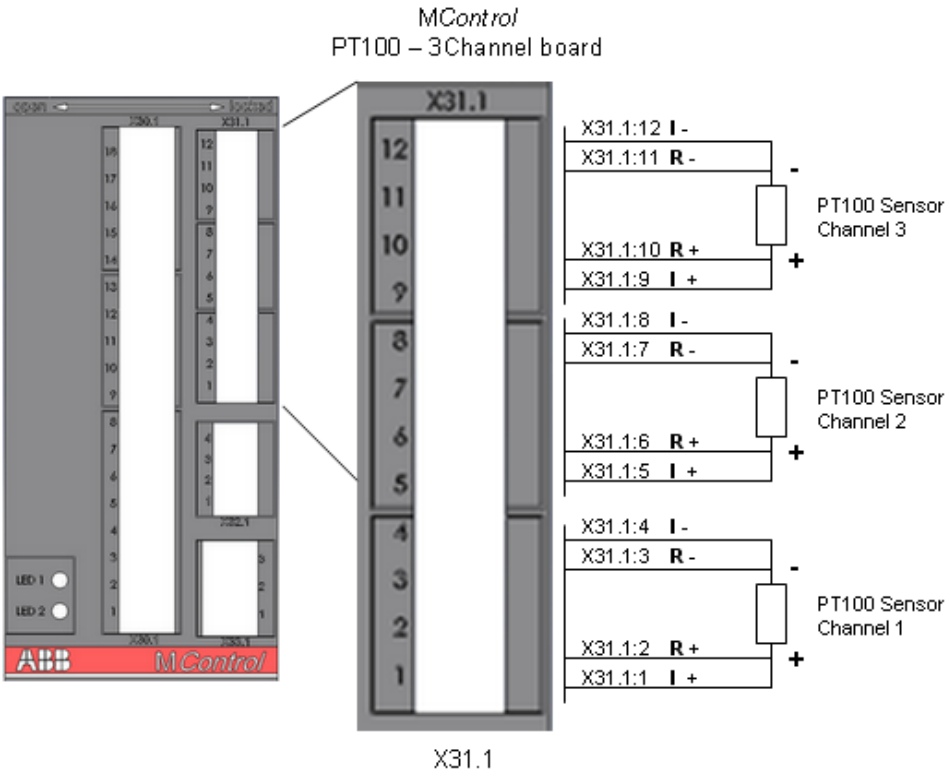


Figure 28 Connection diagram X31 – 3 channel PT100

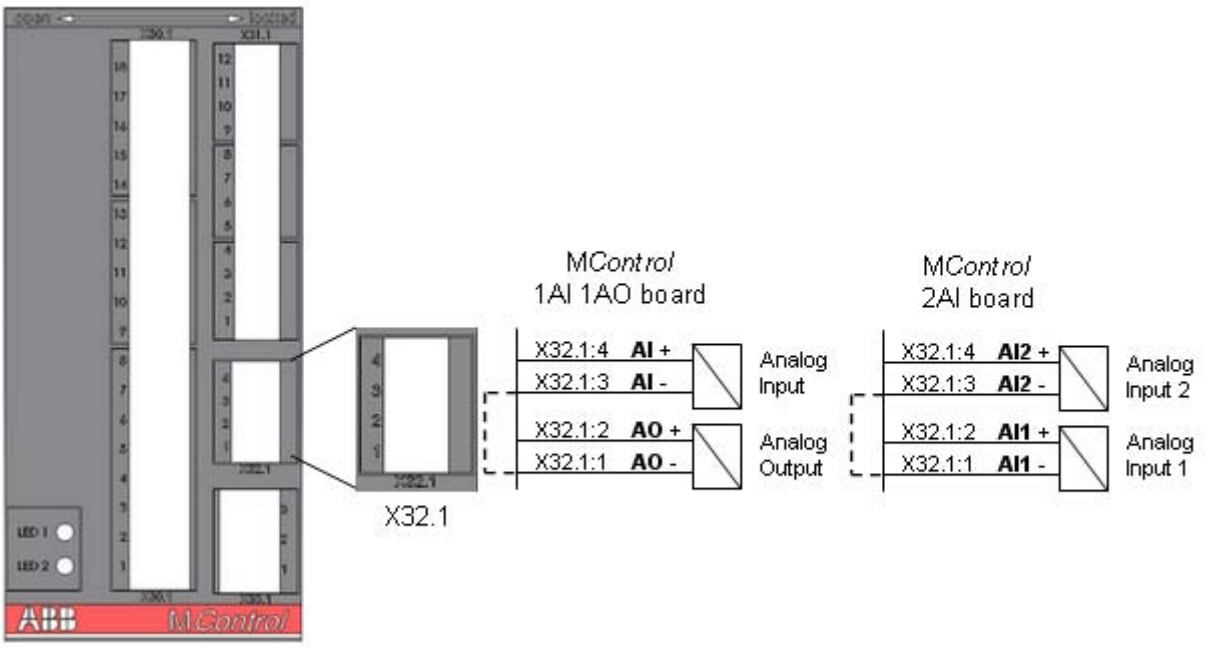


Figure 29 Connection diagram X32 – Analog In-/Outputs

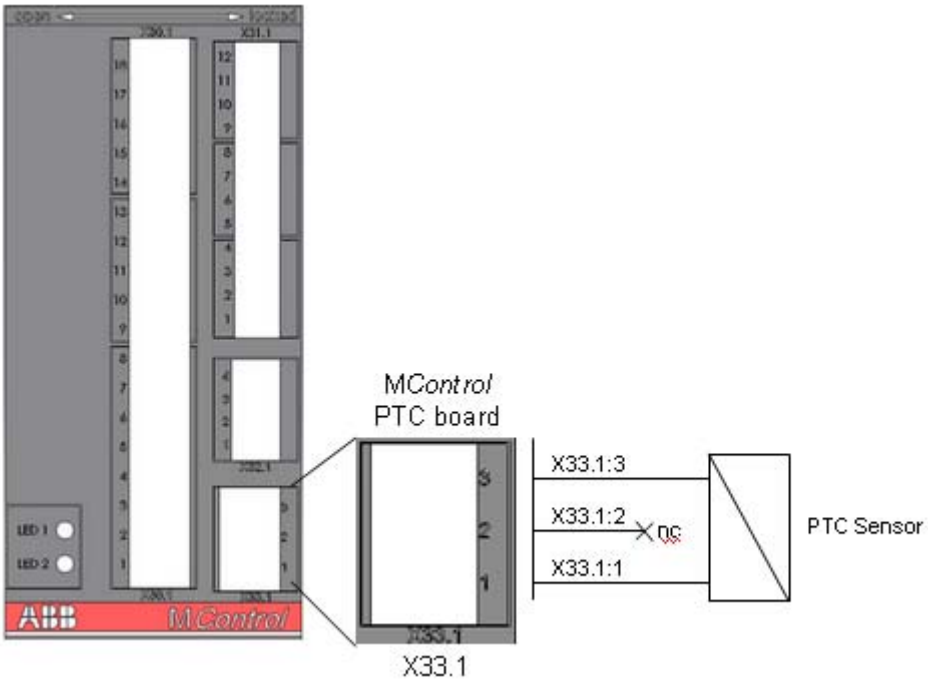


Figure 30 Connection diagram X33 – PTC

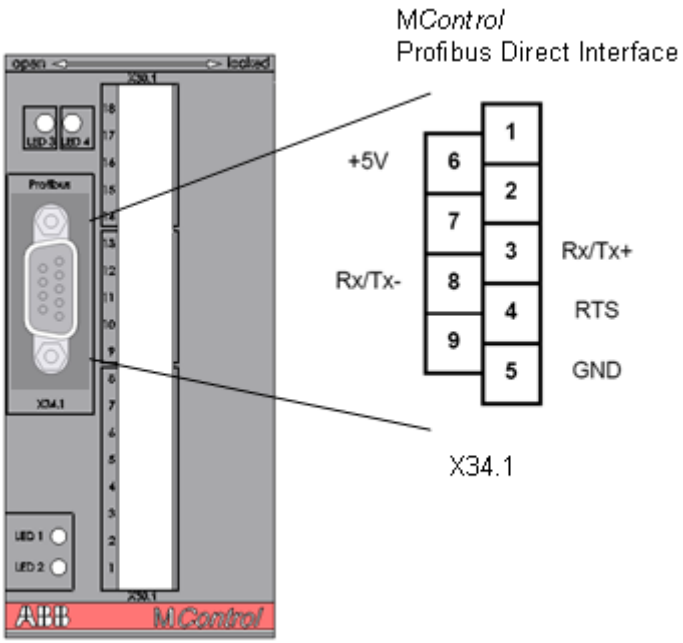


Figure 31 Connection diagram X34 – Profibus Direct Interface

2.4.2 Connection of Conventional feeders

Pin assignments on the control condapter connectors for conventional feeder modules, valid for module sizes 6E/4, 6E/2 and ≥ 6E:

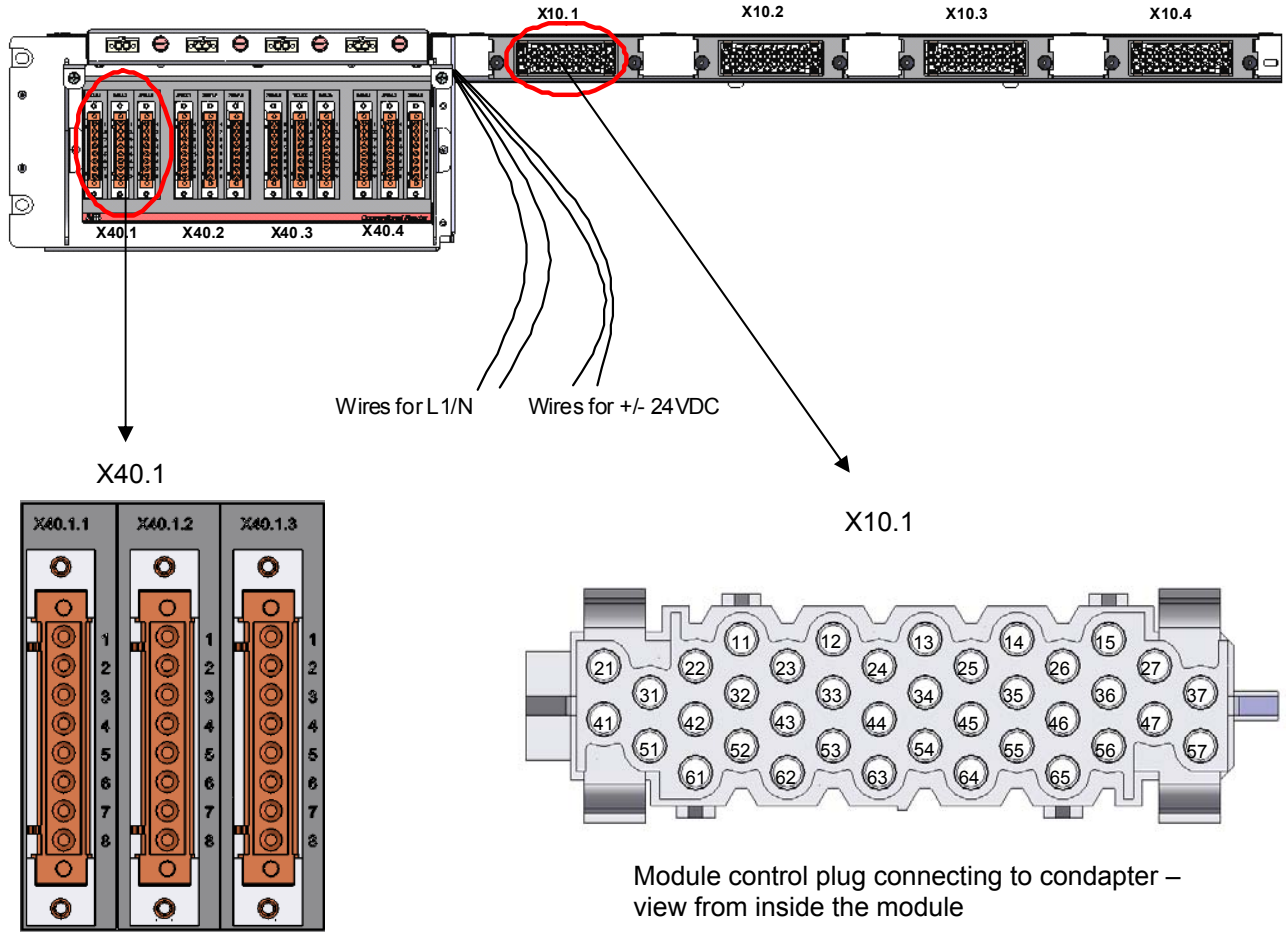


Figure 32 Connection of conventional feeders – pin assignment X40 – X10

Example: Terminal pin assignment for X40.1 to X10.1:

3x8 pole control plug at control condapter			38 pole control plug at withdrawable module		
X40.1.1.	1		X10.1.	12	The terminal pin assignments of X40.2 – X10.2 X40.3 – X10.3 X40.4 – X10.4 are according to this example.
	2			-	
	3			-	
	4			13	
	5			22	
	6			23	
	7			24	
	8			25	
X40.1.2.	1		X10.1.	21	
	2			31	
	3			32	
	4			33	
	5			34	
	6			35	
	7			36	
	8			37	
X40.1.3.	1		X10.1.	11	
	2			41	
	3			51	
	4			46	
	5			27	
	6			47	
	7			57	
	8			-	
External wires					
L1			X10.1.	14	
N				15	
+ 24V			X10.1.	44	
- 24V				45	

2.5 M*Link* Overview

2.5.1 General

The communication interface module M*Link* collects information from the connected M*Control* units.

Maximum units per M*Link*:
- 7 cubicles or
- 60 modules

In case more cubicles/ modules are required, several M*Link* units are linked via a Network Switch.

2.5.2 Interfaces and Annunciation

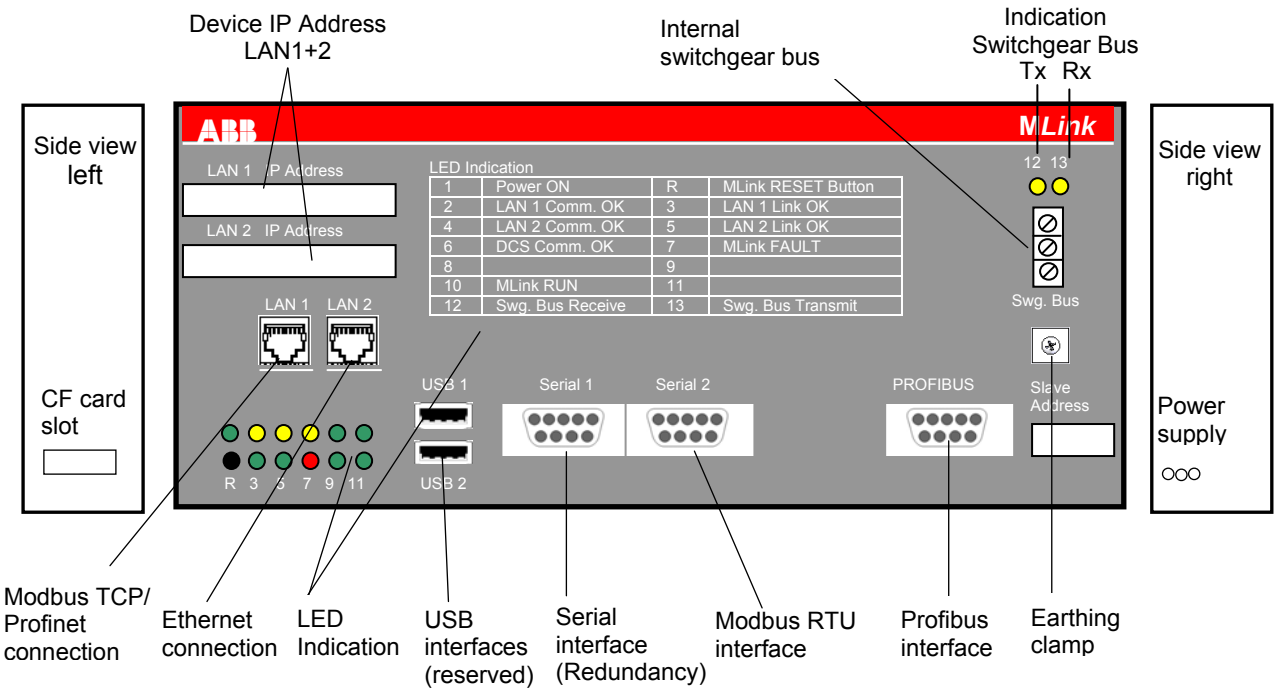


Figure 33 M*Link* interfaces and annunciation

2.5.3 Compact Flash (CF) Card

The compact flash card contains:
- Operating System
- IP address
- M*Link* parameters
- Fieldbus parameters

The card is inserted to the slot at the left side of the M*Link* unit. As soon as the flash card is inserted and M*Link* is connected to the voltage supply, M*Link* starts polling the M*Control* units connected to the switchgear network.

2.5.4 Installation and Connection

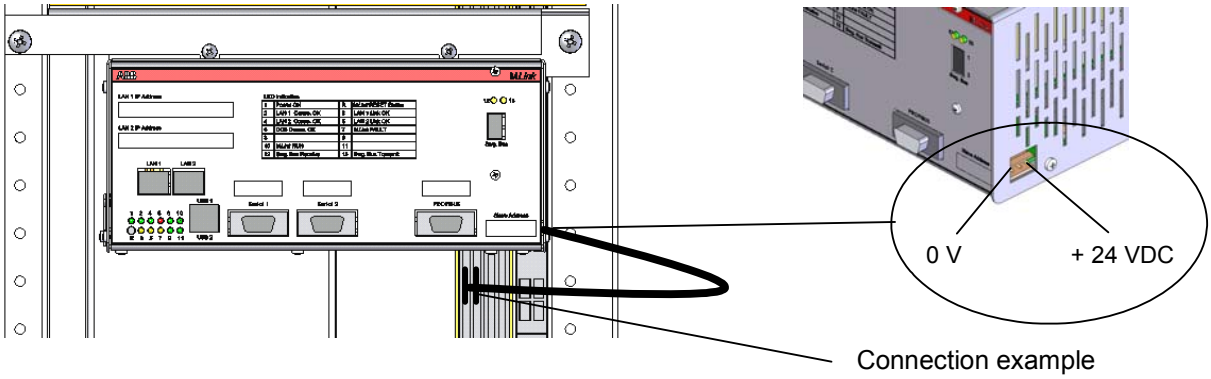


Figure 34 M*Link* installation

2.5.5 Bus wiring in multiple cubicles

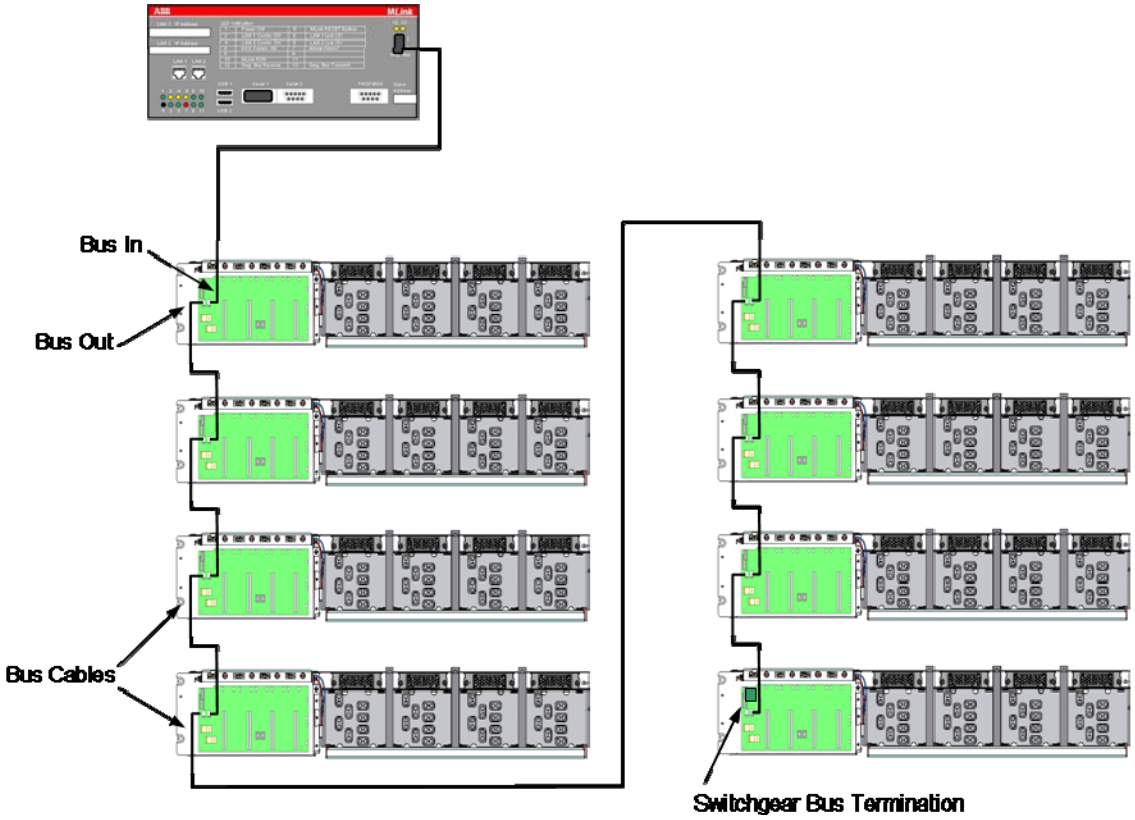


Figure 35 Bus wiring in multiple cubicles

2.5.6 Bus wiring in multiple cubicles, dual redundant configuration

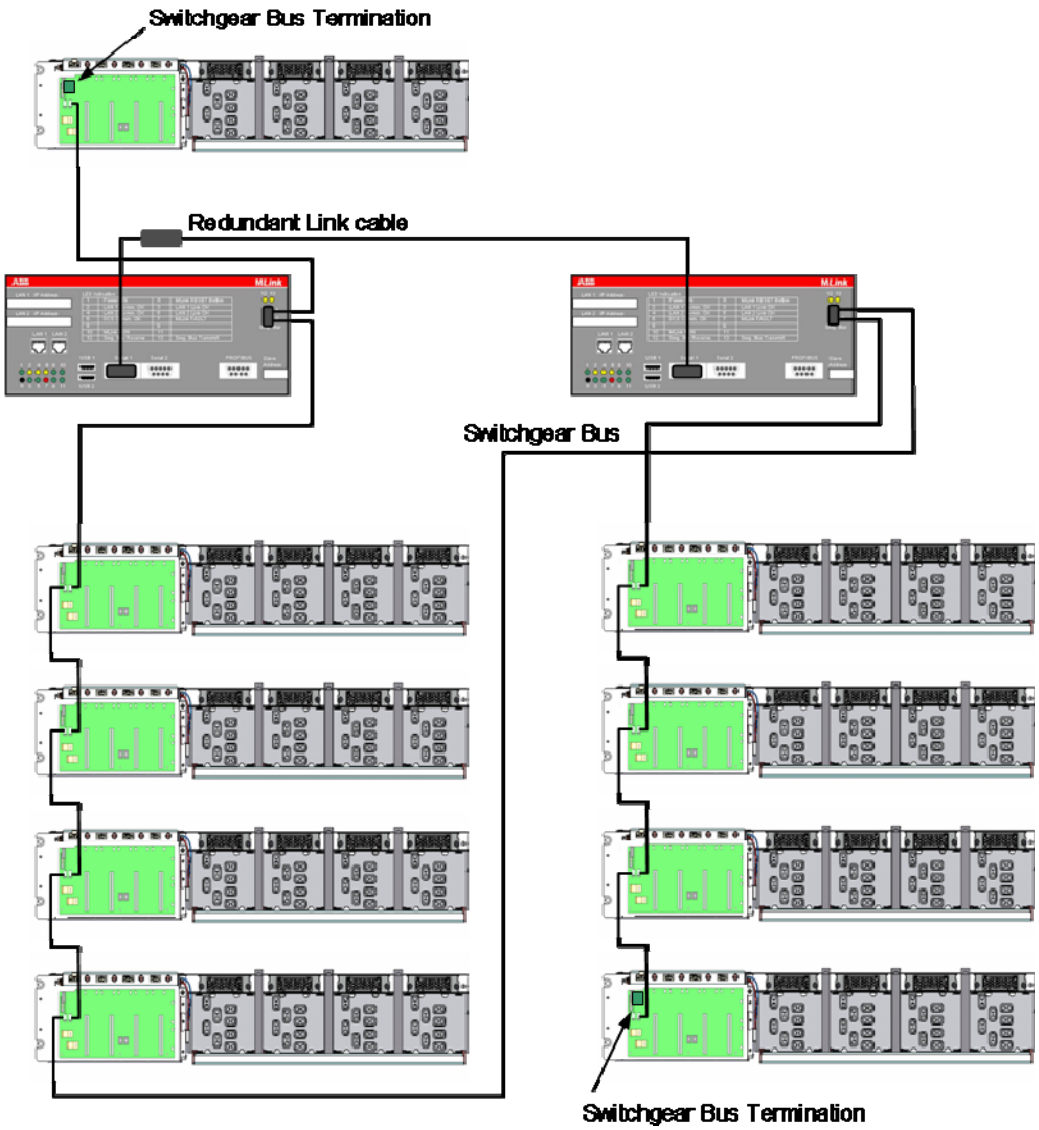


Figure 36 Bus wiring in multiple cubicles – Redundant M*Links* approved topology example 1

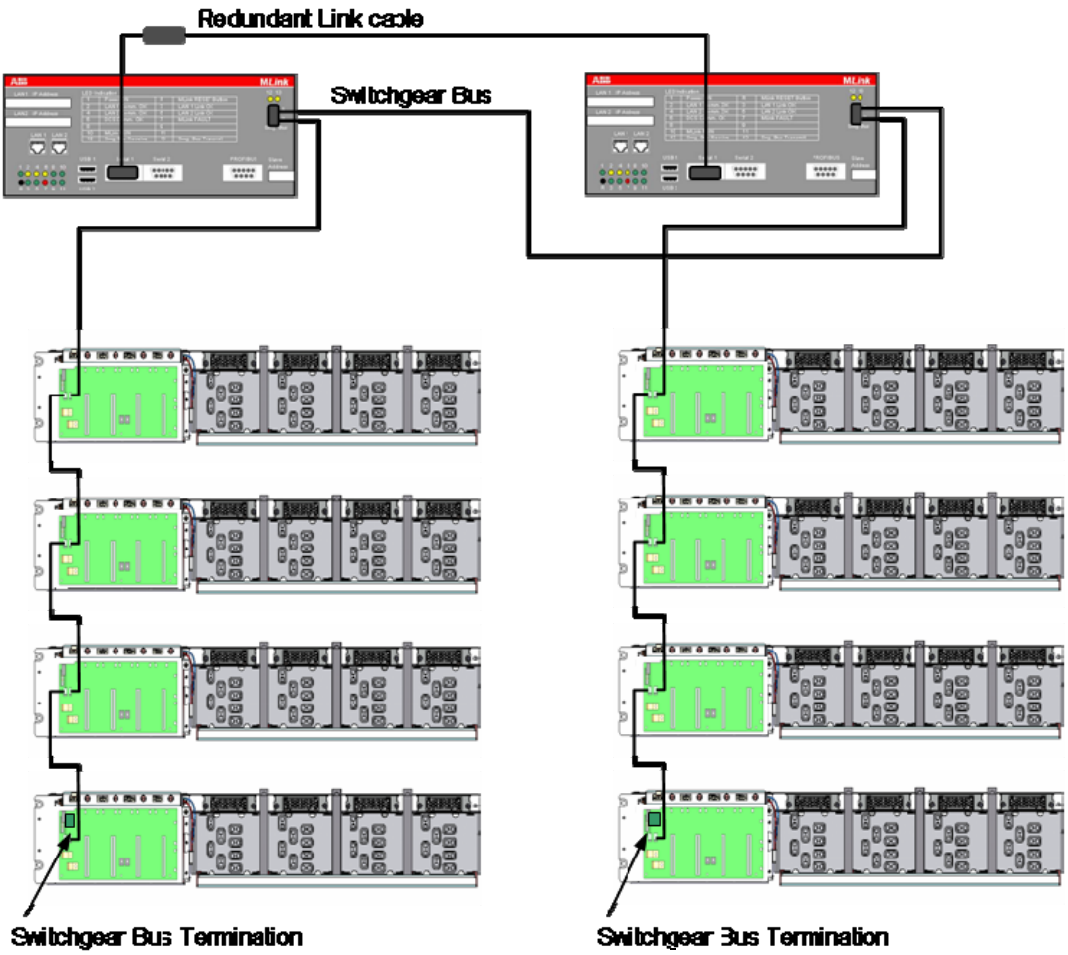


Figure 37 Bus wiring in multiple cubicles – Redundant M*Links* approved topology example 2

2.6 M*View* Overview

A standard touchscreen running web browser software is used as M*View* mounted at a central place in the switchboard.
General information on M*View* functionality is given in section MNS *i*S Design & Components, page 18.

The touchscreen is installed in the control cable room door and connected to M*Link* as shown in Figure 38 hereunder.
Note: Figure 38 refers to the ABB's standard device, however also other industrial touch-screens can be used.

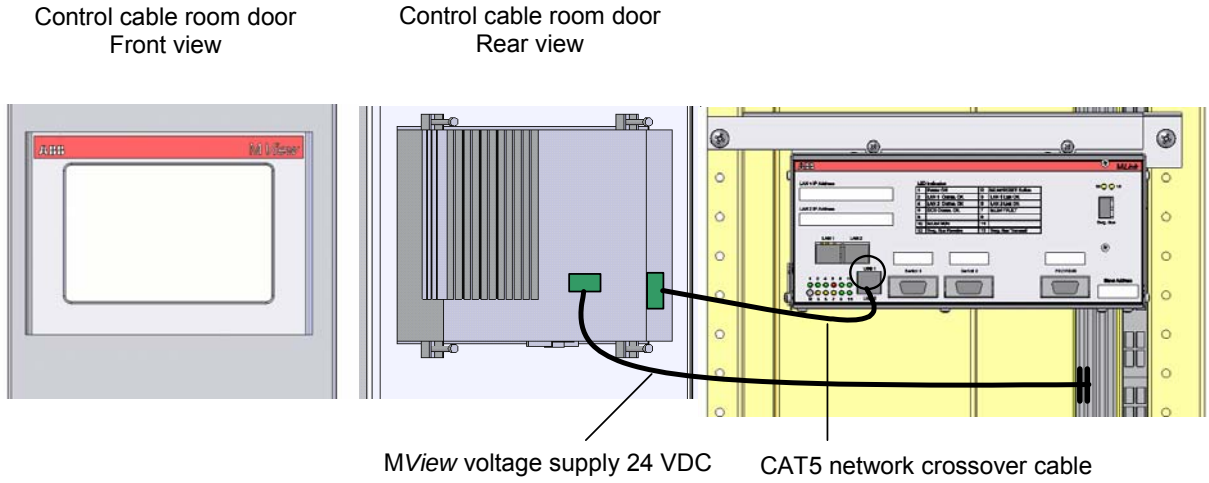


Figure 38 M*View* installation and connection

2.7 M*Start* / M*Feed* installation

M*Start* / M*Feed* modules installation depends upon the type and function of that particular application defined within the ABB Engineering software. The M*Control* associated with the power module confirms that the correct power module is utilised, if there is a conflict a 'location supervision' alarm is activated. Therefore any mismatch of applications or power ratings is prevented.

For more information on module operation, please see section MNS *i*S Operation, page 44.

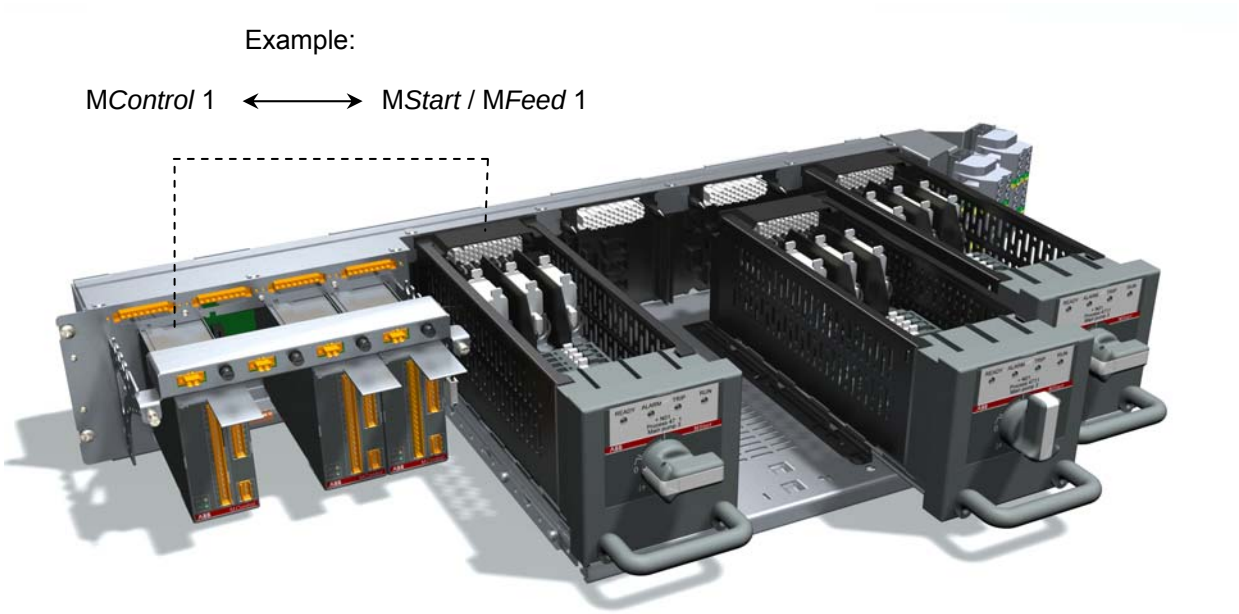


Figure 39 M*Control* and M*Start* / M*Feed* connected to control and power condapters

2.8 Project specific parameterization via M*Navigate*

The parameterization tool M*Navigate* is used for setting/ editing project specific parameters.

Note:
Precondition for the use of M*Navigate* for above actions is the availability of an MNS *i*S **project application** imported from the ABB Engineering tool.
This application contains all plant specific fixed information for example

- the device list (M*Start*, M*Feed*, M*Control*, M*Link*)
- device locations
- used hardware options (e.g. M*Control* extension cards).

Hence parameterization with M*Navigate* only refers to the alterable attributes like

- **parameters**
  (motor characteristics, protection settings)
- **configuration parameters**
  (M*Control* I/O settings)

Help files for M*Navigate* users are available via

- the M*Navigate* entry in the Windows Start menu or
- the “Help” button in the upper M*Navigate* navigation bar
- as a separate chm file

These files contain information on

- M*Navigate* Software itself
- Starter, Control, Protection and Maintenance Functions

View options for the content are

- order by fixed content sections
- order by index words (incl. details like single parameters)
- search function

For more information on M*Navigate*, please refer to

- the M*Navigate* online help, see section hereunder
- the M*Navigate* help file as separate chm file.

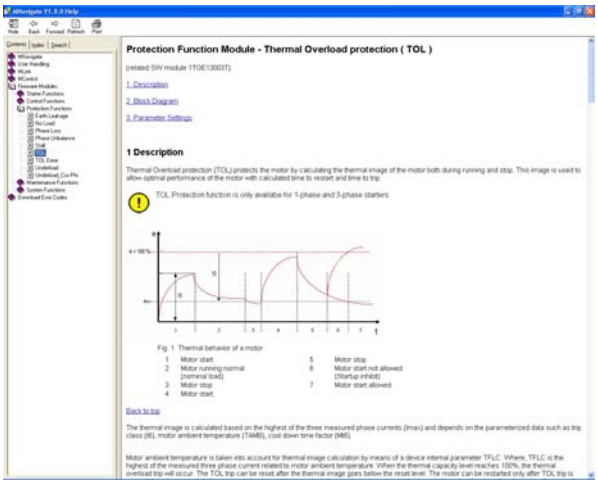


Figure 40 Help function

Parameterization steps:

(1) After program startup and project data import the **start page** is shown.

Figure 41 M*Navigate* Start View

Use the following buttons for further actions:


Change Switchgear Tree View to Network Tree View (alternating button)


Change Network Tree View to Switchgear Tree View


Collapse Tree


Expand Tree


Close Tree View (alternating button)


Open Tree View


Help


Show Event Log (Download History)


Hide Event Log


Close current project and open startup window to select another project

(2) Views and device selection


selects the **Switchgear tree view** in the left navigation showing all MNS *i*S components belonging to the particular project.


is used for changeover to **Network tree view** showing M*Link* allocation.

Symbols mean the following:


Project name


Switchgear name


Cubicle name

M*Link* name


M*Control* (motor starter)

M*Control* (feeder)


is used for changeover to **Bitmap view** which delivers a switchgear front view in the main window. Selection of M*Control* units for further actions can also be done from here.

Figure 42
Switchgear tree view

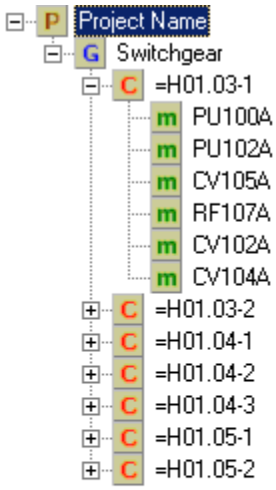
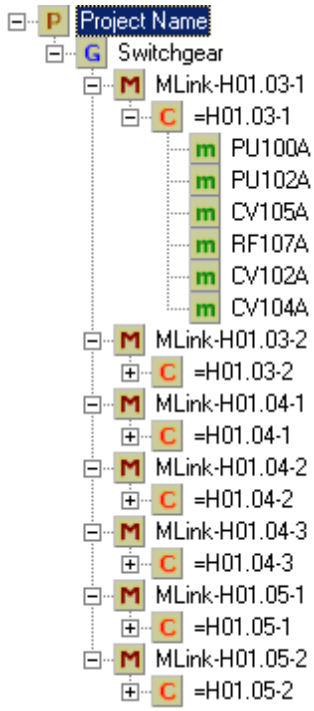


Figure 43
Network tree view



To select an **M*Control*** from the Tree view, simply right click with the mouse, this will, in one action select the required M*Control* and show the functions that are possible for that particular module.

Alternatively the M*Control* can be selected from the **Bitmap view** (Switchgear front view)

For each M*Control* you have the options to:

- Parameterize
- Download
- Assign to M*Control*s

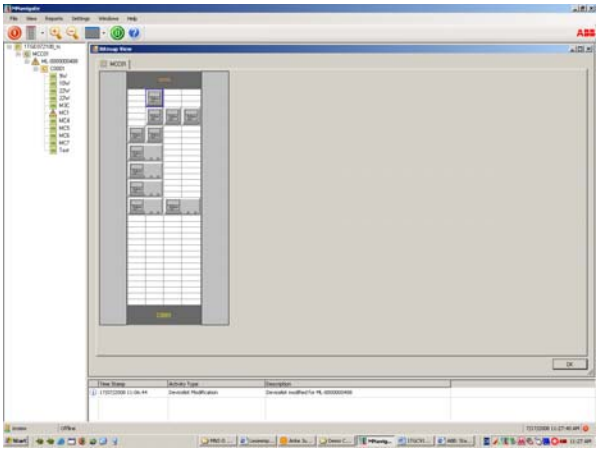


Figure 44 Bitmap view (switchgear front view)

(3) Parameterization

The **M*Control* Parameterization screen** is open in the window area once the Parameterize option has been selected for the particular module.

Note:
The parameters shown here are those held within the M*Link* (CF Card). The parameters are not changed in the M*Control* until they have been downloaded.

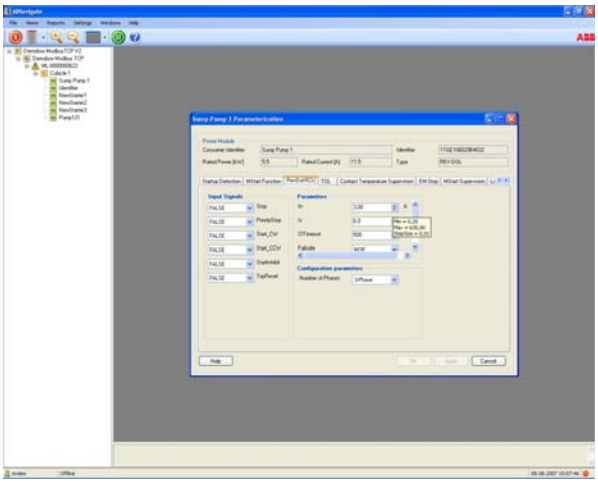


Figure 45 M*Control* parameterization screen

A parameterization window has different areas.

In the top area the M*Start* data is shown (Consumer Id, M*Start* Id, Power and Current Rating and Starter type). This data is not editable, and is imported from the ABB Engineering tool.

The area below is used for the firmware module and its settings. Each firmware module has its own window. Only those applications are presented, which are available for the selected M*Control*/M*Start*. Depending on the firmware function the module has

- motor related parameters and
- configuration parameters

The change of configuration parameters alters the functions of the M*Control* I/Os.

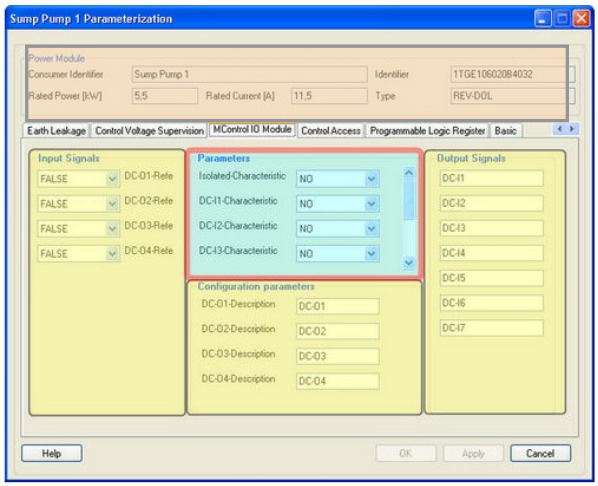


Figure 46 Parameterization window sections

Within the parameterization window it is possible to toggle forwards and backwards with the arrow keys on the right hand side of the window. This will then display the list of parameters available for the selected module. It is also possible to select the required protection function by the name tab.

To edit / enable / disable functions is simply a matter of editing the values available in the fields, moving the cursor over the field shows the available values for that particular field.

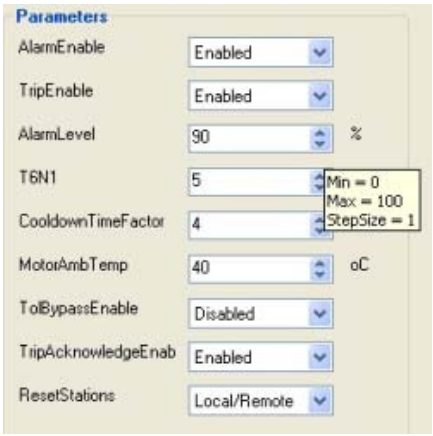


Figure 47 Parameter list (example)

Once a field is edited and **Apply** is selected, the information is saved within the M*Navigate* package. The icon for the particular M*Control* in the Tree View changes from the normal m M*Control* icon to the ⚠ warning icon.
Now the parameters in the M*Navigate* differ from those in the actual M*Control*.

User can now proceed to edit more parameters. Each time a field is edited and shall be saved, select 'Apply'.

'Cancel' discards the data input.
'OK' closes the parameterization window returning to the start page.

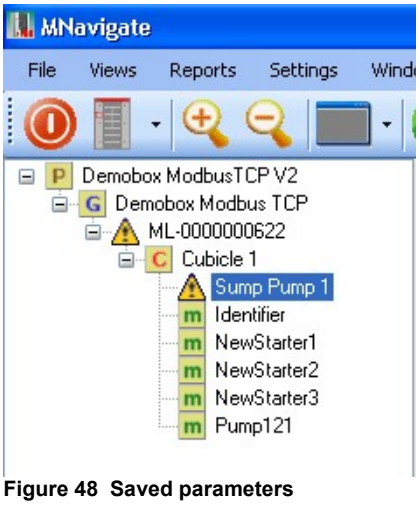


Figure 48 Saved parameters

(4) Parameter download

To **download the edited parameters** to the M*Control*, select 'Download', then 'Parameters' from the options given from 'right clicking' on the required M*Control*.

For information on the status of the parameter download select the  event log icon from the toolbar, this opens an additional pane at the bottom of the screen.

As long as the download is in process the indicator in the bottom left hand corner of the screen flashes Green, in addition the status is given in the event log window. Once the download has been completed the indicator the bottom left hand corner returns to the steady state Red condition, conformation is also given in the event log window, and the M*Control* icon returns to the  state.

Figure 49 Download of parameters

(5) The option **Assign to M*Control*** allows the user to copy the settings of one M*Control* to other M*Control*s.

Select one M*Contro*l to be the data source.

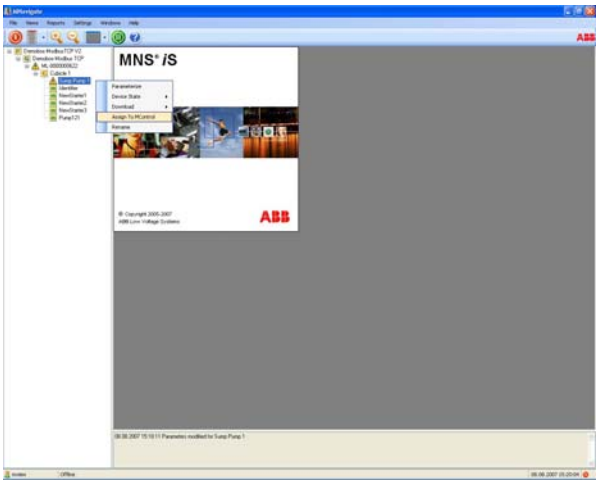


Figure 50 Assign parameters

Within the **Copy configuration** window, all target M*Controls* are selected from the left list to the right list. Re-moving them to the left discards the assignment.

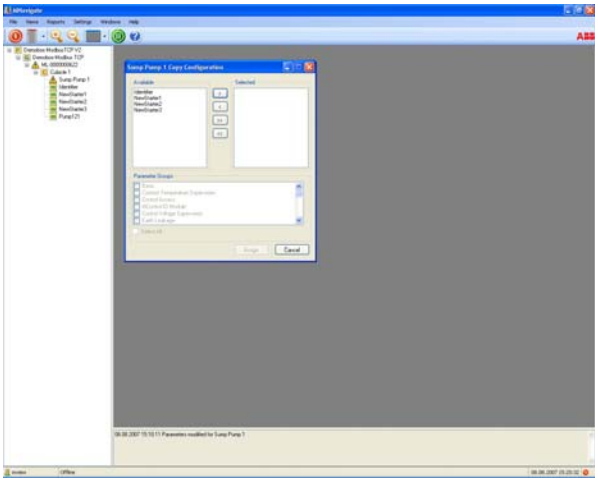


Figure 51 Copy parameters

Afterwards all parameter groups to be copied are selected in the respective window.

After selection, user must click on 'Assign' to copy the data to all selected M*Controls*.

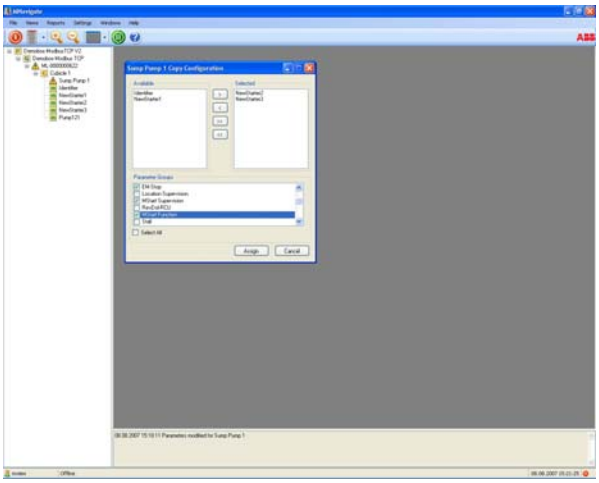


Figure 52 Choose parameter groups to be copied

3 MNS *i*S Operation

3.1 Withdrawable module operation and interlocking

MNS *i*S withdrawable power modules are operated with the module operating handle. This handle also activates the electrical and mechanical interlocking of the module.

Handle positions are shown in Figure 55.

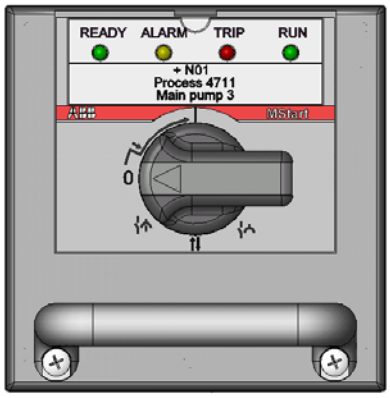


Figure 53 Power module front view

Status information such as ON, OFF, READY, ALARM, TRIP can be indicated with the 4 LED's above the module operating handle.

The allocation of status information to these LEDs is defined with the project configuration data and can be modified with M*Navigate*. The label attached to the module indicates the motor/starter identification as well as the LED function, see Figure 54.

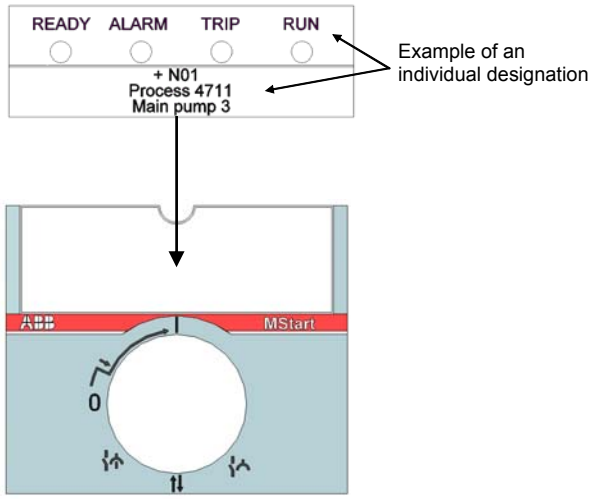


Figure 54 LED designation example

Withdrawable modules operation/interlocking modes

Position			Mechanical status		Electrical status		
6E/4, 6E/2	6E…24E	Designation	Module interlocked	Padlock possible	Withdrawable contacts	Main switch	Control circuit
		ON position (I)	✓	---			
		OFF position (O)	✓	✓			
		Test position	✓	✓			
		Disconnected position (Isolated position)	✓ 30 mm withdrawn	✓			
		Moving Position (Withdrawn position)	--- removal possible	---	 or		

Figure 55 Operating handle positions

3.2 Fixed module operation and interlocking

Status information LEDs (incl. label) are installed in the front door of the central compartment of fixed M*Start* modules.

Characteristics are the same as for withdrawable M*Start* modules, see page 44.

Fixed modules operation/interlocking modes

Position		Mechanical status		Electrical status		
85E 6E…24E	Designation	Module interlocked	Padlock possible	Withdrawable contacts	Main switch	Control circuit
	ON position (I)	✓	✓ (optional)			
	OFF position (O)	✓	✓			
	Test position	✓	✓			

3.3 Motor operation

3.3.1 Operation modes

Location	Operation via	Operation mode	See section
Motor	Pushbutton at local control panel	Local	3.3.3
Switchgear room	M*View*	Bus-Local	3.3.5
DCS	DCS Command	Remote	3.3.4

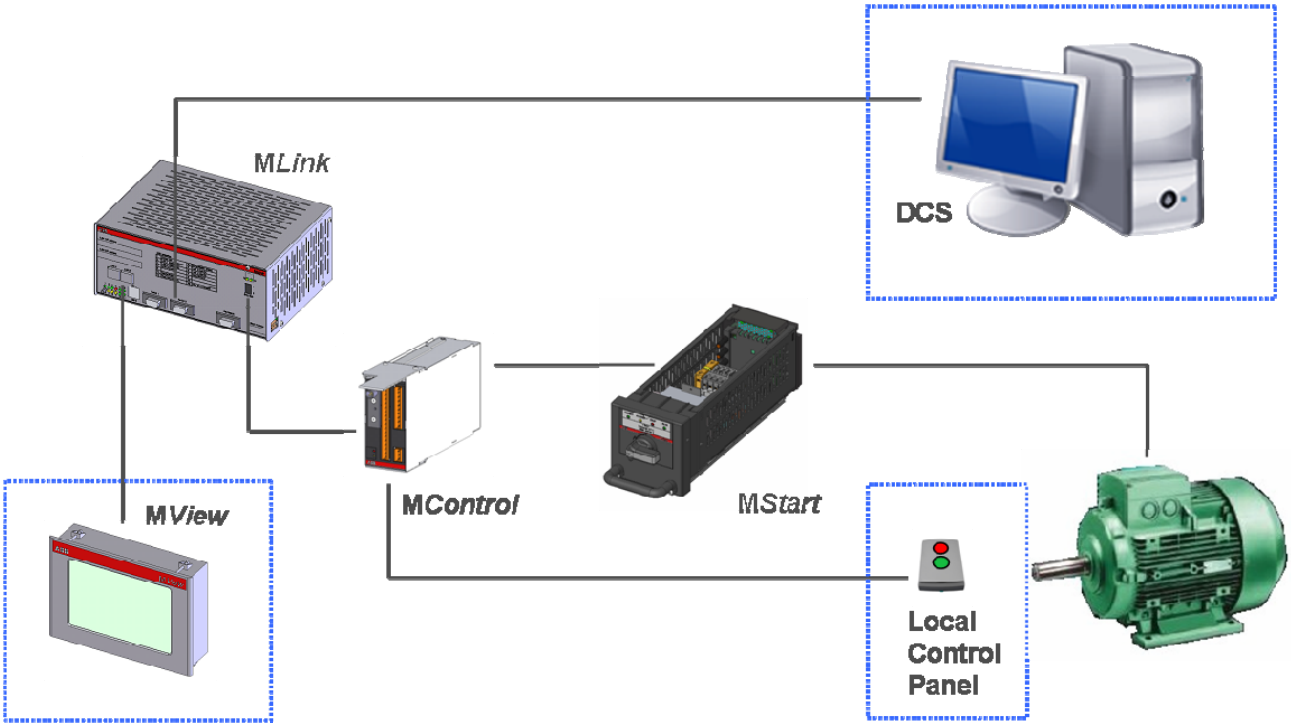


Figure 56 Operation modes

3.3.2 Control Access

Before operators at any location are able to send a command, a control access request must be sent to the M*Control*.

3.3.3 Local motor operation

Motors can be operated from a local control panel which is connected to M*Control* digital inputs (DI).

There are 2 alternatives to enable local operation:

Hardware-Local:
Selector switch (local/remote) at the local control panel hard-wired to M*Control* digital inputs (DI)

Software-Local:
DCS command sent to M*Link,* enabling local control panel to operate the motor

3.3.4 Remote motor operation via DCS

Details of communication with DCS using Profibus or MODBUS can be obtained from the respective MNS *i*S Interface Manuals (see page 58).

3.3.5 Motor Operation via Human Machine Interface (Web Interface)

Motors are operated via the MNS *i*S Web Interface by connecting

- an M*View* unit or
- a standard PC

to one M*Link* in the switchgear.
These devices run a standard web browser enabling them to communicate with the M*Link*.

1) The first step is to enter the **IP address** (e.g. http://192.168.200.100) of any M*Link* in the network into the browser address bar.

A list of all connected M*Links* shows up. Select one M*Link* by touching the related button, e.g. Pump Station 1.

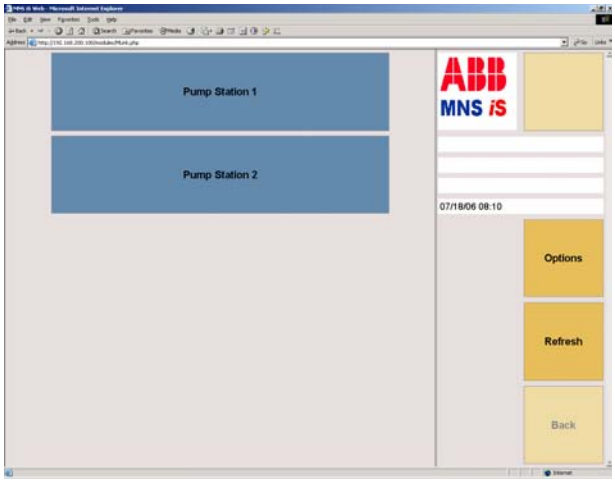


Figure 57 Addressing

2) A **logon screen** appears after choosing one M*Link.*

User and password is entered via the virtual keyboard in the M*View* window (or optionally by a real keyboard if existing). After pressing the Logon button the entered data is checked (according to the user definition).

Note:
Default user: mview

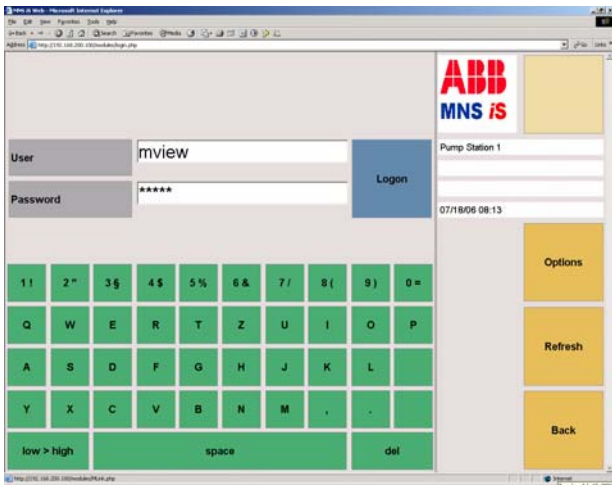


Figure 58 Logon

3) If the password is correct the user is logged in and the user name appears in the yellow field besides the ABB sign. Clicking on “Log off” will cancel this step and user gets back to the logon screen (see step 2).
The **switchgear view** appearing after logon shows a list of all cubicles (max. 7) containing configured M*Control* devices.

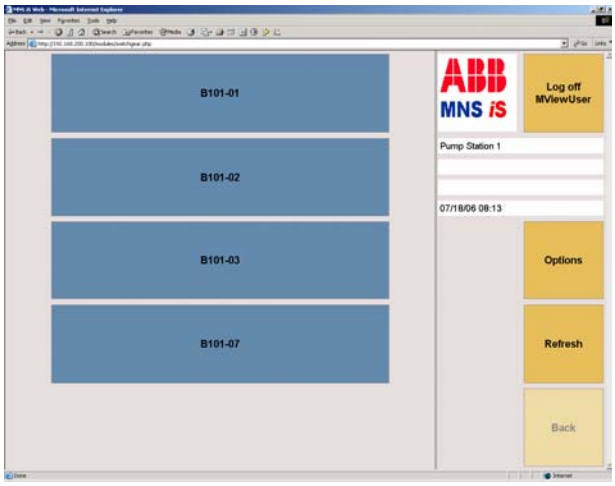


Figure 59 Switchgear view

4) After choosing e.g. B101-01, the **cubicle view** of B101-01 appears, showing the position of the devices in the cubicle.
The green navigation buttons are used to navigate between the single modules. Blue buttons are used to select the operate or setup view for this particular starter module.

Use the yellow “Options” button to change between indication of different M*Link* and M*Control* (motor) identifiers.

Figure 60 Specific cubicle view

M*Control* colors indicate the current status of the particular device.

The operate view can be called for all M*Control* devices that are indicated online.

	Configured but currently absent
	In place but offline
	Online and switched on
	Online and switched off
	Online and tripped
*	Online, switched on and alarm
*	Online, switched off and alarm
*	Online, tripped and alarm
X	Configured according to device list but application file missing (M*Control* application download required) and device currently absent
X	Online, application file missing (M*Control* application download required)

5) The **operate view** is the main view for monitoring and operating a starter module via its M*Control.*
Use the green button “Show diagnostics” to change between

- measurement values
- diagnostics (service information)
- device status

Motors are started/ stopped using the blue buttons at the bottom.

Press the button twice for

1. **Selection** (button changes colour from light to dark blue, indicating “ready for activation”)
2. **Activation** (activates the required function)

Appearing alarms/trips are shown with red and blue indicators next to the Alarms/trips window. Pushing the red or blue button opens the alarm/trip view.

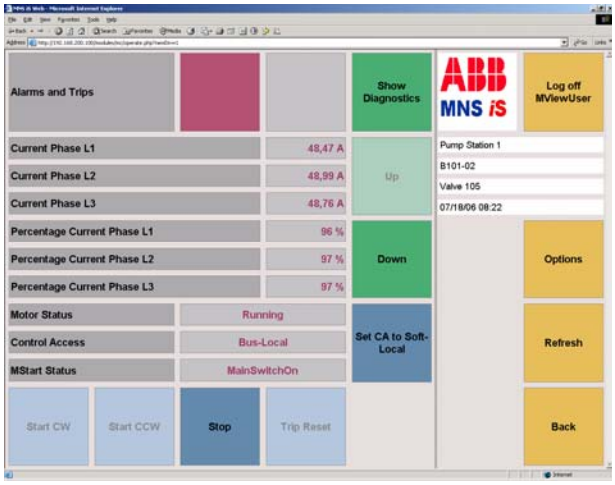


Figure 61 Operate view

6) A detailed **alarm/trip view** appears after pressing the blue or red indicators in the Operate view (see step 5). Time stamp relates to the last change of M*Control* alarm/event information.

If the list extends the screen size, use “Up” and “Down” buttons to scroll.

Use the yellow “Options” button to change between indication of either

- the complete alarms/events list (with active alarms marked) or
- only active alarms/events

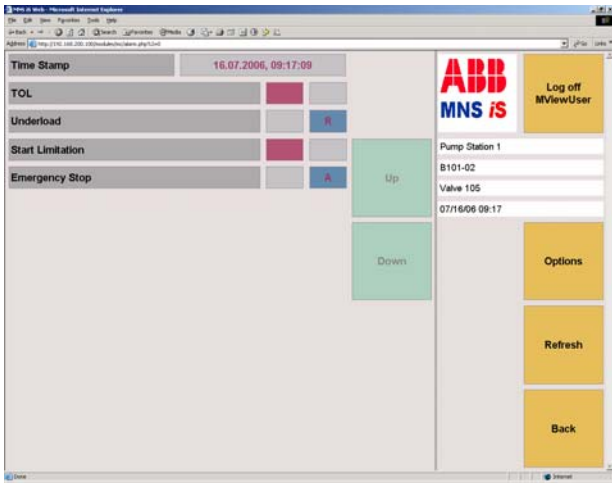


Figure 62 Alarm/Trip View

Different alarm/trip and reset situations are distinguished with a variety of indicators.

The system acts in accordance with the selected **reset parameters** for each drive and each single protection function.

No alarm no trip

Trip

Alarm

Alarm and Trip

Trip resettable (trip situation removed)

Trip acknowledged (trip will be reset as soon as trip situation is removed)

7) Via the **Device Setup menu** downloads of configuration data, parameters and new firmware are initiated.

Precondition:
Prior to the download any necessary modification of configuration data or parameters has to be executed via M*Navigate* and made available in M*Link*.

Depending on the user's profile some of the options may not be available (light blue buttons). After execution of selected operations, result messages come up in the 2nd column (grey fields).

Note:
For configuration data download the corresponding M*Control* unit has to be set offline.

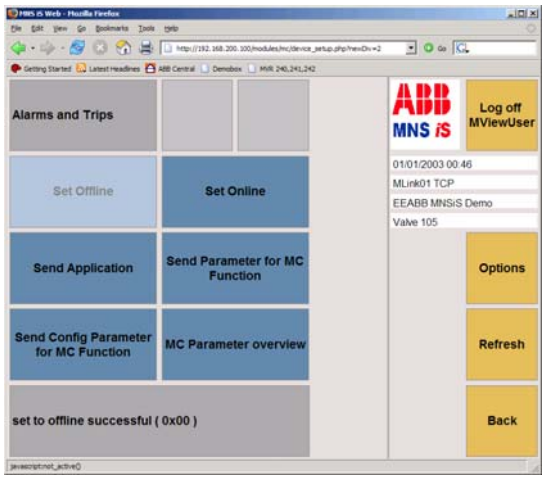


Figure 63 Device setup menu

8) By selecting the option 'MC Parameter overview' it is possible to view the protection functions (applications) that have been selected for that particular module.

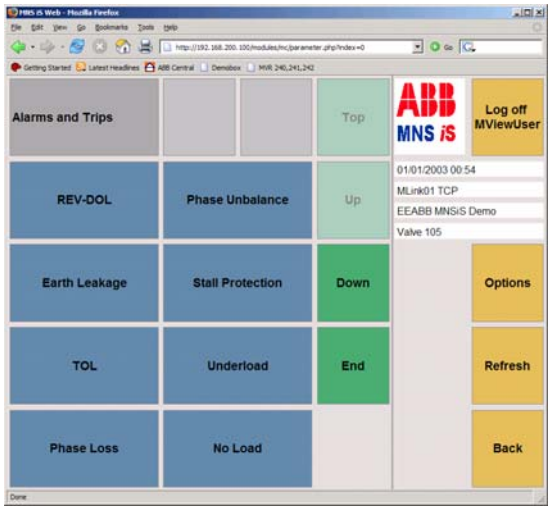


Figure 64 MC Parameter overview

9) To then view the parameter details select the required function to review.

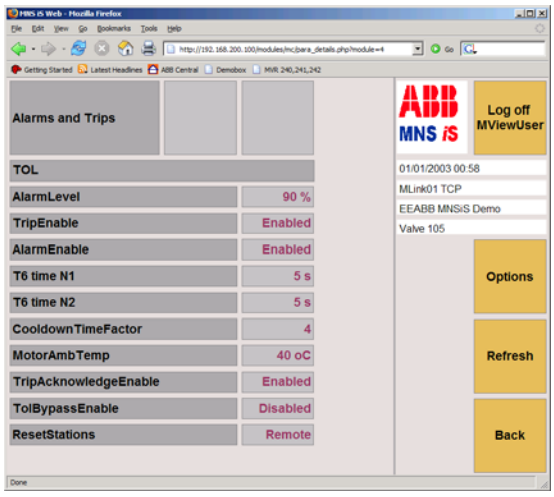


Figure 65 Parameter details

3.4 Alarms and Trips

Message	Relates to			Alarm condition	Trip condition
	Motor	Starter	System		
Power Module Communication Error		X		No communication with the power module (M*Start*/ M*Feed*) or no power module inserted **Condition** **M*Start* main switch and test switch off**	No communication with the power module (M*Start*/ M*Feed*) or no power module inserted **Condition** **M*Start* main switch or test switch on**
Power Module Identnumber Error or Range Error		X		n.a.	M*Start*/ M*Feed* ident-number or I_n differs from configuration stored in M*Link*
Location Supervision		X		n.a.	M*Control* inserted in wrong location
Motor still running	X	(X)	X	n.a.	Contactor feedback after OFF command ok, but current detected
Feeder still current	X	(X)		n.a.	Contactor feedback after OPEN command ok, but current detected
Welded		X		n.a.	Contactor feedback after OFF command missing and current detected
Motor not running	X	(X)	X	n.a.	Contactor feedback after ON command ok, but no current detected
Feedback Supervision (K1,K2,K3)	X	X		Feedback from contactor does not correspond with motor status **Condition** **Current as expected**	Feedback from contactor does not correspond with motor status **Condition** **Even current not as expected**
Testmode failure		X		n.a.	M*Start*/ M*Feed* is in test position but current detected
Main Switch Supervision		X		Main switch off (motor not running)	Main switch off while motor is running
No Load	X			Alarm level reached	Trip level reached
Underload	X			Alarm level reached **I_{Lmax}**	Trip level reached **I_{Lmax}**
Underload Cos Phi	X			Alarm level reached **Cos Phi**	Trip level reached **Cos Phi**

Message	Relates to			Alarm condition	Trip condition
	Motor	Starter	System		
TOL	X			Alarm level reached **% of thermal image**	Trip level reached **100% of thermal image** DCS bypass command available up to 200% of thermal image
TOL Eexe	X			Alarm level reached **% of thermal image**	Trip level reached **100% of thermal image** No bypass command accepted
Stall	X			Alarm level reached	Trip level reached
Phase failure	X			Alarm level reached	Trip level reached
Phase unbalance	X			Alarm level reached	Trip level reached
Undervoltage	X			Alarm level reached **U_{Lmin} / U_n**	Trip level reached **U_{Lmin} / U_n**
Control Voltage Supervision			X	Control voltage dip **< 95% U_n (fixed)**	Control voltage dip **< 65% U_n (fixed)**
PTC supervision	X			Alarm level reached **R = 1650 Ω (fixed)**	Trip level reached **R = 3600 Ω (fixed)**
PTC supervision/ short circuit	X			n.a.	Trip level reached **$R_{short\ circuit}$**
PTC supervision/ open circuit	X			n.a.	Trip level reached **$R_{open\ circuit}$ ≥ 10kΩ (fixed)**
PT100 Low (Channel 1,2,3)	X			Alarm level reached **PT100 Low Alarm Level**	Trip level reached **PT100 Low Trip Level**
PT100 High (Channel 1,2,3)	X			Alarm level reached **PT100 High Alarm Level**	Trip level reached **PT100 High Trip Level**
PT100 Card Failure			X	PT100 Measurement not working, no PT100 low/high alarms & trips initiated **Condition** **PT100 Card Failure Trip disabled**	PT100 Measurement not working, no PT100 low/high alarms & trips initiated **Condition** **PT100 Card Failure Trip enabled**
PT100 short circuit (Channel 1,2,3)	X			n.a.	Trip level reached **PT100 short circuit**
PT100 open circuit (Channel 1,2,3)	X			n.a.	Trip level reached **PT100 open circuit**
Start Limitation	X			Alarm level reached **Number of starts per time limit**	Trip level reached **Number of starts per time limit** and motor stopped
Autorestart Inhibit			X	Autorestart Inhibit is active	n.a.

Message	Relates to			Alarm condition	Trip condition
	Motor	Starter	System		
Star/Delta Transition failure		X		n.a.	Trip level reached **I_L/I_N ≤ Changeover Current [%]**
Actuator Both end switch active		X		n.a.	Both end switches active
Actuator Torque open		X		n.a.	Torque open direction
Actuator Torque close		X		n.a.	Torque close direction
Emergency Stop	X			n.a.	Emergency Stop activated
Earth Leakage	X			Alarm level reached **I_O**	Trip level reached **I_O**
Contact Temperature Unbalance		X		Alarm level reached **T_{diff}**	Trip level reached **T_{diff}**
Fuse Supervision (L1,L2,L3)		X		n.a.	One of the fuses blown
Contact Temperature Supervision (L1A,L2A,L3A)		X		Alarm level reached **T**	Trip level reached **T**
Switch Cycle Supervision (K1,K2,K3)		X		Alarm level reached	n.a.
Operating Hours	X			Alarm level reached	n.a.
M*Start* Insertion Cycles		X		Alarm level reached	n.a.
IRF Hardware (alternative 1) NOTE: This message is generated due to internal hardware house keeping tasks within the MNS *i*S System			X	n.a.	**Incorrect Application Download** Should an application be utilized requiring an Extended I/O card, AIAO, PTC, DI/DO and that application downloaded to an M*Control* without the extended I/O card present, the M*Control* will issue the IRF Hardware Trip. Please ensure the correct firmware application and the correct M*Control* hardware are utilised.

Message	Relates to			Alarm condition	Trip condition
	Motor	Starter	System		
IRF Hardware (alternative 2) NOTE: This message is generated due to internal hardware house keeping tasks within the MNS *i*S System			X	n.a.	**PTC Load Not Connected** Should the PTC application be selected and enabled and no field wiring or load connected to the PTC terminals, the M*Control* will issue the IRF Hardware Trip. Connect the required PTC field wiring.
IRF Hardware (alternative 3) NOTE: This message is generated due to internal hardware house keeping tasks within the MNS *i*S System		X		n.a.	**Internal Hardware Error MStart** The M*Start* modules constantly perform house keeping checks. Should M*Start* detect an internal hardware problem, this information is then relayed to the M*Control*. The M*Control* will issue the IRF Hardware Trip. This M*Start* related trip may clear if the M*Start* is withdrawn and re-inserted. Should the problem persist please replace the M*Start*.

4 Technical Data

4.1 Control and Communication components

	M*Start*	M*Control*	M*Link*	M*View*
Electrical Data				
Auxiliary supply voltage(s)				
Supply voltage	24 VDC	24 VDC	24 VDC	24 VDC
Voltage range	19 – 31 VDC	19 – 31 VDC	19 – 31 VDC	19 – 28 VDC
Power consumption				
Typical	200 mA	150 mA	1000 mA	1200 mA
Maximum	240 mA	270 mA	1700 mA	1500 mA
Mechanical Data				
Dimensions (HxWxD) mm	Depending on starter type	125x53x260	110x265x230	247x185x82
Weight	Depending on starter type	0.7 kg	2.0 kg	5.0 kg
Environmental conditions				
Storage temperature	-20 …+70°C	-20 …+70°C	-20 …+70°C	- 20 … 60°C
Operation temperature	-5 … +55°C	-5 … +55°C	0 … +55°C	0 … +40°C *
Degree of protection	IP20	IP20	IP20	IP20
Reliability				
MTBF (Meantime between failures) at 40°C	48 years	19 years	15 years	8 years
	In combination: 13 years			

* Max. operation temperature for MView display (switchgear room temperature)

In-/ Output connection on M*Control* front				
	Input (optical isolated, one common)	**Output (two outputs share one common)**		
Over voltage class	II	II		
Pollution severity	3	3		
Nominal voltage	24 VDC	250 VAC 50/60 Hz		
Impulse voltage withstand level	0.33 kV	2.5 kV		
Nominal current (cosphi 0.4)	10 mA (16mA)	1 A		
Nominal cross-section of connector	1.5 mm^2	1.5 mm^2		
Minimum operations		5 * 10^6 mechanical 3 * 10^4 electrical		
Max switching voltage		230V AC	230 VDC	24 VDC
Max switching current		1 A	150 mA	6 A
Max switching capacity		500 VA		

4.2 Certificates

Low Voltage Switchgear		
Standard	**Subject**	**Note**
IEC 61439-1	Low voltage switchgear and controlgear assemblies – General rules	Verified Design in accordance with standard
IEC 61439-2	Low voltage switchgear and controlgear assemblies – Power switchgear and controlgear assemblies	Verified Design in accordance with standard
IEC/EN 60947-1	Low voltage switchgear and controlgear – General rules	
IEC/EN 60947-4-1	Low voltage switchgear and controlgear – Contactors and motor-starters – Electromechanical contactors and motor-starters	

Electromagnetic Compatibility		
Standard	**Subject**	**Performance Criterion**
EN 55011	Radio Interference Voltage	Level A
EN 55011	Radio Interference Field Strength	Level A
IEC 61000-6-2	Electromagnetic compatibility (EMC) – Generic standard – Immunity for industrial environments	Criteria for applications in industrial environment are met or even exceeded, see following results of IEC 61000-4-x
IEC 61000-4-2	Electrostatic Discharge - Contact Discharge - Air Discharge	 Level A Level A
IEC 61000-4-3	Radiation	Level A
IEC 61000-4-4	Burst	Level A
IEC 61000-4-5	Surge	Level A
IEC 61000-4-6	Inlet	Level A
IEC 61000-4-8	Power Frequency magnetic field	Level A
IEC 61000-4-11	Voltage Dips 230 V	Not applicable, for power supply only

5 Annex

5.1 Related Documentation

Document	Publication Number
MNS *i*S System Guide	1TGC910001B0204
MNS *i*S Interface Manual M*Link* - Release 5.4	1TGC910127M0201
MNS *i*S Interface Manual Web Interface - Release 5.4	1TGC910137M0201
MNS *i*S Interface Manual OPC Server - Release 5.4	1TGC910147M0201
MNS *i*S Interface Manual Profibus - Release 5.4	1TGC910157M0201
MNS *i*S M*Control* Interface Manual Profibus Direct – Release 5.4	1TGC910187M0201
MNS *i*S Interface Manual Modbus - Release 5.4	1TGC910167M0201
MNS *i*S Dual Redundancy Manual – Release 5.4	1TGC910177M0201
MNS *i*S M*Navigate* Help file V5.4	1TGC910069M0201

5.2 Terminology

Abbreviation	Term	Description
	Aspect Object	ABB technology. An Aspect Object is a computer representation of a real object such as a pump, a valve, an order or a virtual object such as a service or an object type. An Aspect Object is described by its aspects and is organized in structures.
	Alarm	Alarm is defined as status transition from any state to abnormal state. Status transition to abnormal state can be data crossing over the pre-defined alarm limit.
	Bus Local	A Control Access term describing that the M*Control* accepts its commands from a device on the switchgear control network, e.g. the Web Interface, M*View*.
COTS	Commercial off the shelf	Commercial off the shelf product, term to describe products available on the market, ready to use.
DCS	Distributed Control System	See also PCS
DTM	Device Type Manager	Software module used to manage devices via fieldbus (e.g. PROFIBUS) using frame application environment (e.g. PactWare, ABB Fieldbus Builder etc.)

Abbreviation	Term	Description
Eth.	Ethernet	Ethernet is a local area network (LAN) technology. The Ethernet standard specifies the physical medium, access control rules and the message frames.
	Event	An event is a status transition from one state to another. It can be defined as alarm, if the state is defined as abnormal or as warning as a pre-alarm state.
FBP	FieldBusPlug	ABB technology for exchangeable fieldbus interface on intelligent field devices (e.g. transmitter, simple motor starter)
FD	Field Device	Term for devices connected to the fieldbus (e.g. motor control units or circuit breaker protection)
GSD file	Geräte Stamm Datei (German abbreviation)	Hardware description file for a PROFIBUS-DP or PROFIBUS-DP/V1 slave type
GPS	Global Positioning System	System to detect local position, universal time and time zone, GPS technology provides accurate time to a system
HMI	Human Machine Interface	Generic expression
LVS	Low voltage switchgear	A factory built assembly built to conform with IEC 60439-1
MCC	Motor Control Centre	Common term for a switchgear used for motor control and protection.
MNS		The Modular Low Voltage Switchgear family from ABB
MNS *i*S		The integrated intelligent switchgear solution from ABB
	M*Start* M*Feed* M*Control* M*Link* M*View* M*Navigate*	MNS *i*S components integrated in the switchgear, see the MNS *i*S System Guide for technical details
	MODBUS	Fieldbus communication protocol
	MODBUS RTU	Fieldbus communication protocol
	Motor Starter	Consists of motor controller and electrical components to control and protect a motor, part of Motor Control Center.
NLS	Native Language Support	Providing the ability to change the language of software tools in order to support native languages (English is basis, others are optional)
OPC		OLE for Process Control, an industrial standard for exchange of information between components and process control application

Abbreviation	Term	Description
PCS	Process Control System	High level process control system
PLC	Programmable Local Controller	Low level control unit
	PROFIBUS-DP	Fieldbus communication protocol with cyclic data transfer (V0).
	PROFIBUS-DP/V1	Fieldbus communication protocol, extension of PROFIBUS-DP allowing acyclic data transfer and multi master (V1).
	PROFIBUS-DP/V2	Fieldbus communication protocol, extension of PROFIBUS-DP allowing time stamp and communication between master and slave (V2).
RCU	Remote Control Unit	Local control unit with pushbutton and indicator to operate a device (e.g. motor) from field level
RS232		Standard No. 232 for PC communication, established by EIA (Electronics Industries Association, USA)
RS485		Communication interface standard from EIA (Electronics Industries Association, USA), operating on voltages between 0V and +5V. RS-485 is more noise resistant than RS-232C, handles data transmission over longer distances, and can drive more receivers
RTC	Real Time Clock	Integrated clock function in devices used to generate time and date information if a remote clock system is not present
	Software Local	A Control Access term describing that the M*Control* accepts its commands from the hardwired inputs as a result of either the PCS or M*View* passing the Control Access Authority to Soft-Local. Note: Does not require the hardwired local input to be set to true.
SNTP	Simple Network Time Protocol	A protocol used for time synchronization in Control Network through Ethernet
	Switchgear Bus Network	Term used to describe the internal switchgear communication network, between M*Link* and M*Control*
TCP/IP	Transmission Control Protocol / Internet Protocol	TCP/IP is a high-level connection oriented, reliable, full duplex communication protocol developed for integration of the heterogenous systems.

Abbreviation	Term	Description
	Trip	A consequence of an alarm activated or an external trip command from another device to stop the motor or trip the circuit breaker.
UTC	Coordinated Universal Time	Coordinated Universal Time is the international time standard. It is the current term for what was commonly referred to as Greenwich Meridian Time (GMT). Zero (0) hours UTC is midnight in Greenwich England, which lies on the zero longitudinal meridian. Universal time is based on a 24 hour clock.
	Warning	A warning is defined as status transition from any state to pre-alarm state to inform in advance before an alarm level is reached.

Contact us

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