MNS *i*S Motor Control Center
M*Connect* Interface Manual
System Release V7.6

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This document relates to the MNS *i*S System Release 7.6.

Table of content

General

Target Group

This document describes communication and control interfaces used in MNS *iS*.

The manual is primarily intended for those requiring information on accessing information and data provided from MNS *iS*. Furthermore the document provides information for integration of MNS *iS* as Fieldbus component into PLC or higher level Process Control Systems to control system and application engineers.

It is assumed that the reader of this manual is familiar with basic terms of Fieldbus and control communication (e.g. basic knowledge about PROFIBUS, Modbus etc.).

Use of Warning, Caution, Information and Tip Icon

This publication includes **Warning**, **Caution**, and **Information** icons where appropriate to point out safety related or other important information. It also includes **Tip** icons to point out useful hints to the reader. The corresponding symbols should be interpreted as follows:

The electrical warning icon indicates the presence of a hazard that could result in *electrical shock.*

The warning icon indicates the presence of a hazard that could result in *personal injury.*

The caution icon indicates important information or warnings related to the concept discussed in the text. It might indicate the presence of a hazard that could result in *corruption of software or damage to equipment/property.*

The information icon alerts the reader to pertinent facts and conditions.

The tip icon indicates advice on, for example, how to design your project or how to use a certain function

Although **Warning** notices are related to personal injury, and **Caution** notices are associated with equipment or property damage, it should be understood that the operation of damaged equipment could, under certain operational conditions, result in impaired process performance leading to personal injury or death. It is, therefore, imperative that you comply fully with all **Warning** and **Caution** notices.

Terminology

List of the terms, acronyms, abbreviations and definitions that the document uses.

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.)
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.
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)	A 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

Abbreviation	Term	Description
	Hardware Local	A Control Access term describing that the M*Control* accepts its commands from the Hardwired inputs, when the respective Local control input is set to true.
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 switchgear used for motor control and protection.
MNS		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
PCS	Process Control System	High level process control system
PLC	Programmable Local Controller	Low level control unit

Abbreviation	Term	Description
	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).
	PROFINET	PROFINET is an open standard for Industrial Ethernet and standardized in IEC 61158 and IEC 61784.
PNIO	PROFINET IO	PROFINET for decentralized periphery and distributed automation
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.

Related Documentation

MNS *i*S

1TGC910211 M0203 MNS iS Interface Manual MLink, Release 7.0

1TGC910111 M0201 MNS iS MLink Upgrade Kit Manual

1TGC910223 M0201 MNS iS Interface Manual Web Interface, Release 7.6

1TGC910232 M0201 MNS iS Interface Manual OPC Server, Release 7.7

1TGC910241 M0201 MNS iS Interface Manual Profibus, Release 7.0

1TGC910251 M0202 MNS iS Interface Manual Modbus, Release 7.0

1TGC910292 M0201 MNS iS Interface Manual PROFINET IO, Release 7.6

1TGC910283 M0201 MNS iS MControl Interface Manual Profibus Direct, Release 7.6

1TGC910261 M0201 MNS iS Interface Manual Redundancy, Release 7.0

1TGC910001 B0204 MNS iS System Guide

1TGC910201 M0201 MNS iS Quick Guide Installation and System Setup, Release 7.0

1TGC910090 M0210 MNavigate Help file V7.7

1TGC910018 M0208 MNS iS ATEX – Enhancements for Safety

ABB Sace circuit breakers

1SDC007108G0201 Bus communication with ABB circuit-breakers

Modbus additional specifications

[1]   Modbus Application Protocol Specification V1.1b – Modbus-IDA 28th December 2006

Related System Version

The content of this document is related to MNS *i*S System Release 7.6.

Document Revision History

Rev.	Chapter	Description of change	Date
M0201		Initial document for Release V7.6	May 2015

Basics

Hardware Requirements

The following M*Connect* hardware types are available:

ID	Main-board	AIAO	2AI	4DI2DO 24VDC	4DI2DO 230VAC	7DI0DO 110VAC-230VAC	PT100-1CH	PT100-3CH
1TGE120071R1000	✓							
1TGE120071R1001	✓	✓						
1TGE120071R1002	✓		✓					
1TGE120071R1020	✓						✓	
1TGE120071R1021	✓	✓					✓	
1TGE120071R1022	✓		✓				✓	
1TGE120071R1100	✓			✓				
1TGE120071R1101	✓	✓		✓				
1TGE120071R1102	✓		✓	✓				
1TGE120071R1120	✓			✓			✓	
1TGE120071R1121	✓	✓		✓			✓	
1TGE120071R1122	✓		✓	✓			✓	
1TGE120071R1200	✓				✓			
1TGE120071R1201	✓	✓			✓			
1TGE120071R1202	✓		✓		✓			
1TGE120071R1220	✓				✓		✓	
1TGE120071R1221	✓	✓			✓		✓	
1TGE120071R1222	✓		✓		✓		✓	
1TGE120071R1500	✓					✓		
1TGE120071R1501	✓	✓				✓		
1TGE120071R1502	✓		✓			✓		
1TGE120071R1520	✓					✓	✓	
1TGE120071R1521	✓	✓				✓	✓	
1TGE120071R1522	✓		✓			✓	✓	
1TGE120071R1600	✓							✓
1TGE120071R1601	✓	✓						✓
1TGE120071R1602	✓		✓					✓
1TGE120071R1620	✓						✓	✓
1TGE120071R1621	✓	✓					✓	✓
1TGE120071R1622	✓		✓				✓	✓

1TGE102069R0661	Control Condaptor for M*Connect*

Software Requirements

For full support of the MNS *i*S V7.6 functionality, the M*Connect* requires:

- M*Connect* base version 7.6 or higher

MConnect Device Characteristics

The MConnect device has the same appearance as the MControl. To differentiate between the 2 devices the MConnect has a different front color (RAL7035).

Main board

AIAO board or
2AI board
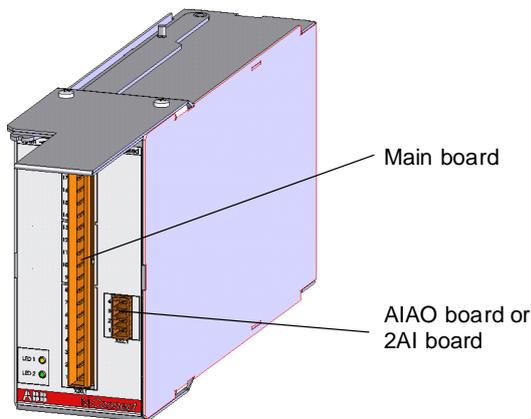
Fig. 1 M*Connect* example

Circuit breaker release units are connected by an RS485 cable to the M*Connect*. M*Connect* acts as a standard Modbus RTU Master device.

MConnect Hardware Options

MConnect standard functionality can be extended by control functionality based on analog or digital in-/outputs as well as PT100 (1 channel and 3 channel) inputs.

Note:

PT100 for MConnect is not available as protection functionality. It is available as control function only, e.g. for the use with logic blocks.

All available options are shown on page 10.

For details regarding the use of the hardware options, please see MNavigate Help.

Control Condapter

To integrate the MConnect device into the MNS iS system a special control condapter is used:
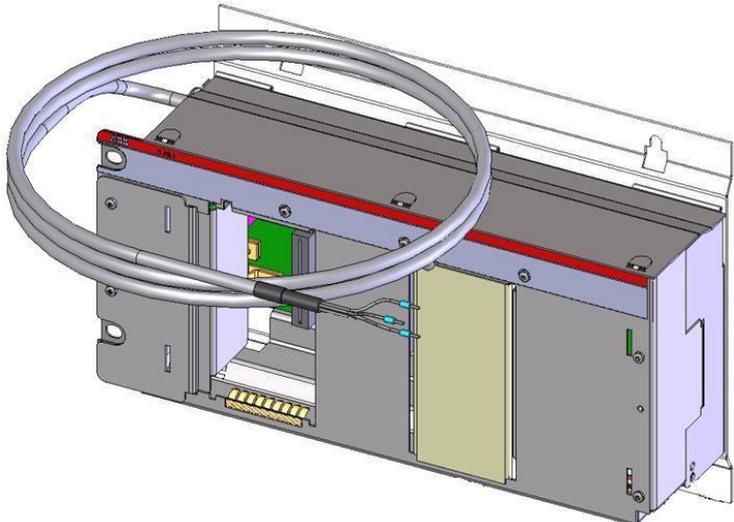
Fig. 2 MConnect control condapter

Circuit Breaker Integration

Circuit breakers (CB) are a very important part of MNS iS cubicles. Their integration into MNS iS communication networks makes it possible to supervise, control and to see measurement values of CBs in DCS, MView, OPC and Condition Monitoring.

MConnect supports following functions:

- Reading of circuit breaker status and measurement values

- Control of circuit breakers

Supported Programmable Releases

The Circuit Breaker (CB) consists of a programmable release (PR unit) and the breaker. Following types of breakers and programmable releases are supported:

Sace Breaker Type	Supported Programmable Release
Emax	PR122
	PR123
T7	PR332
X1	PR332
	PR333/P

Emax2	Ekip Touch
	Ekip Hi-Touch
	Ekip G Touch
	Ekip G Hi-Touch

Communication with Programmable Releases

Programmable Releases of Circuit Breakers are equipped with a serial Modbus RTU (RS485) interface and act as a Modbus Slave device.

MConnect is acting as a gateway. On one side it is a Modbus master and communicates to Circuit Breaker (Point-Point connection only) and on the other side it communicates to MLink on MNS *i*S internal Switchgear Bus.

Following schematic describes the communication structure:
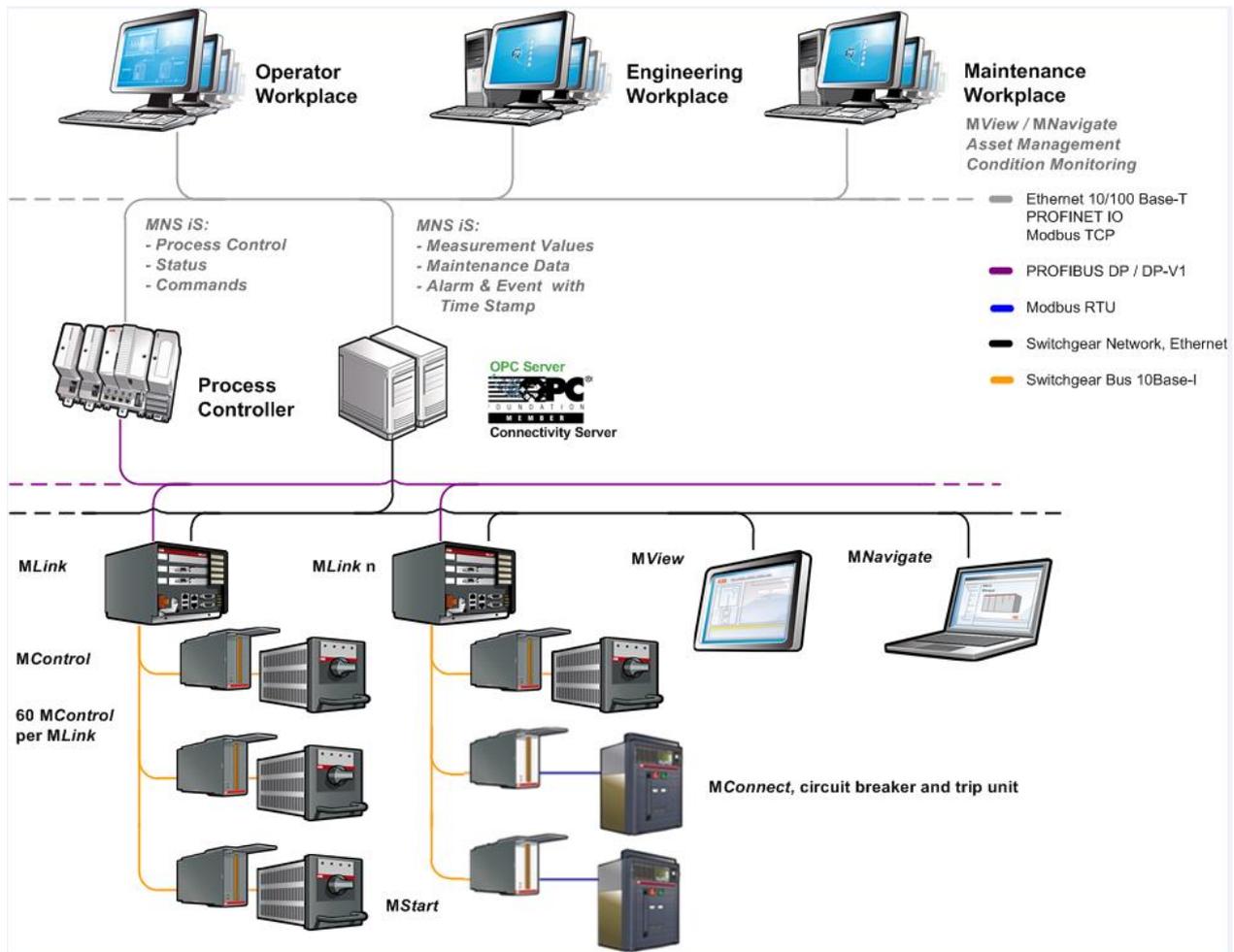
Fig. 3 System architecture with M*Connect* and Circuit breaker

The general MNS iS design rule (max. 60 devices in max. 7 cubicles per MLink) includes MConnect as well as MControl devices.

Physical Connection to Programmable Releases

The physical medium for communication between MConnect and circuit breaker is RS 485.

M*Connect* has an inbuilt resistor for bus biasing and termination. At the breaker side the RS485 bus termination requires an external resistor of 120Ohm (0.25 W).

Connection and termination example
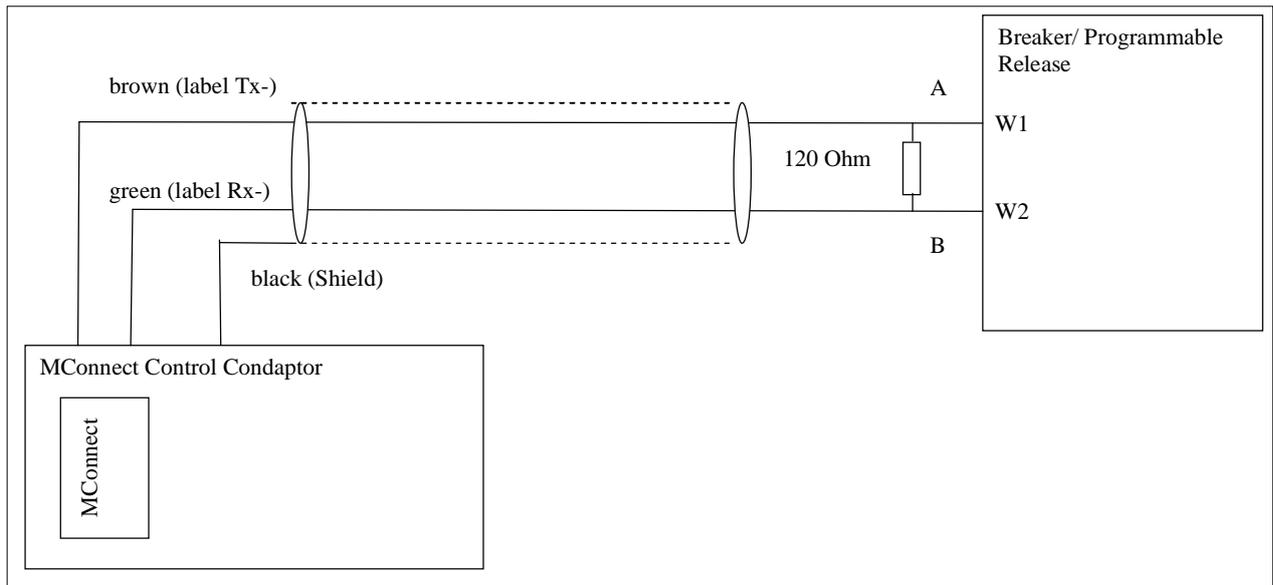
Fig. 4 M*Connect* RS485 connection and termination example

For more details regarding circuit breaker bus terminals see document: "1SDC007108G0201 Bus communication with ABB circuit-breakers"

Cicuit Breaker	Trip Unit	Terminal A	Terminal B
Emax	PR122/P PR123/P	W1	W2
Emax X1, Tmax T7/T7M	PR332/P PR333/P	W1	W2
Emax2	Ekip Touch Ekip Hi-Touch Ekip G Touch Ekip G Hi-Touch	W1	W2

Fig. 5 RS485 connection terminals of circuit breakers
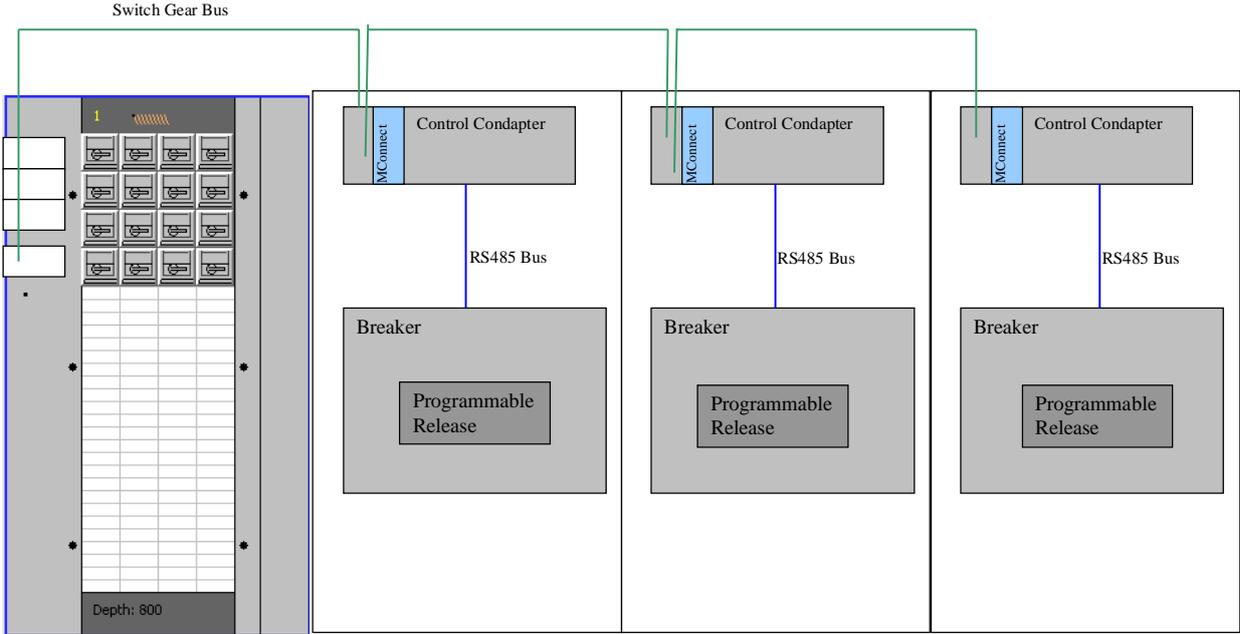
Fig. 6 M*Connect* RS485 connection and Switchgear bus

Configuration Parameters

For the Modbus Interface of M*Connect* there are few parameters to be set:

Parameter	Range	Default Setting	Comment
Slave Address	2 - 247	247	Same setting as configured in Circuit Breaker PR Release
Baudrate	9600 19200	19200	Same setting as configured in Circuit Breaker PR Release
Protocol	Even Parity, 1 Stop Bit Odd Parity, 1 Stop Bit No Parity, 2 Stop Bit No Parity, 1 Stop Bit	Even Parity, 1 Stop Bit	Same setting as configured in Circuit Breaker PR Release

Note:

- The MConnect Master address is pre-configured and has the address **1**. This setting can not be changed by the user!

- The communication between MConnect and Programmable Release is a Point to Point communication!
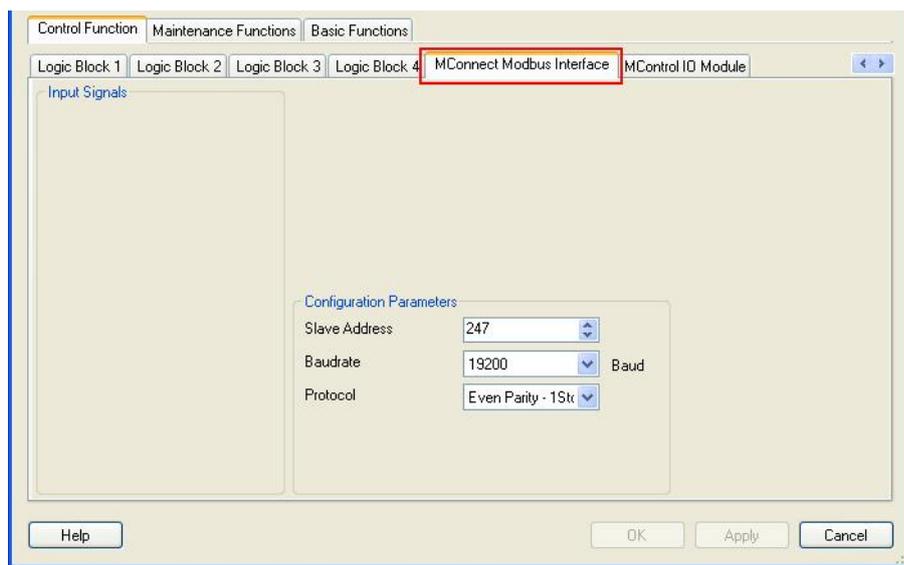
Fig. 7 M*Connect* interface configuration in M*Navigate*

Addressing of Control Condaptor

Set address of condaptor to following values:

- Cubicle is the number of cubicle of circuit breaker.

- Level is 1.

- Position is 1.

Failsafe

Failsafe is not supported by circuit breakers.

Control Access

It is important to differentiate between the Control Access in MNS *i*S system and the Control of the Circuit Breaker via MConnect. Detailed descriptions about the MNS *i*S Control Access can be found in the MNS *i*S Interface manuals for the selected Fieldbus Protocol of MLink (Profibus, Modbus, PROFINET).

In general it is only possible to send control commands to the Circuit Breaker if the operation mode at the breaker side is set to "Remote".

Data and Commands – PR12x/PR33x

Status

Information about breaker status is available from "Status" data. The Breaker Status format is of data type Unsigned 32 (4Byte, Motorola Byte order) :

Byte order	Section	Bit (Unsigned32)	Description MConnect for SACE Breaker (Information if bit value = 1)
Byte x	*Control* Access Owner	31	Remote
		30	not used (0)
		29	not used (0)
		28	not used (0)
		27	not used (0)
		26	Bus Local (MView-HMI)
		25	not used (0)
		24	Hardware Local
Byte x+1	Various input signals	23	not used (0)
		22	not used (0)
		21	not used (0)
		20	Isolated
		19	Slave Communication Running
		18	not used (0)
		17	not used (0)
		16	Test
Byte x+2		15-13	Additional information available in following table
	Failsafe	12	not used (0)
	EaroEntryT	11	not used (0)
		10	not used (0)
		9	Common Trip
		8	Common Alarm
Byte x+3	Device status	7-0	Additional information available in following table

Device specific status information

Bit	MConnect SACE Breaker
15	not used (0)
14	not used (0)
13	not used (0)
7	not used (0)
6	not used (0)
5	not used (0)
4	Discharged
3	Undefined
2	Tripped
1	Closed
0	Opened

Measurement Values

Name	Description	Notes	PR12x PR33x	Data Type	Value not available/ valid	Measurement Unit
Maximum current (rms)	[A]	Not available $\rightarrow 2^{32}$-1 I < IMIN -> 0 I > IMAX -> IMAX	2/3	ULONG	0xffffffff	A
Maximum current phase	0-> Not available, 1->L1, 2->L2, 3->L3, 4->Ne	Not available -> 0	2/3	UWORD	0	
L1 phase Current (rms)	[A]	Not available -> 2^{32}-1 I < IMIN -> 0 I > IMAX -> IMAX	2/3	ULONG	0xffffffff	A
L2 phase Current (rms)				ULONG	0xffffffff	A
L3 phase Current (rms)				ULONG	0xffffffff	A
Ne phase Current (rms)				ULONG	0xffffffff	A
Internal Ground current (rms)		Not available -> 2^{32} -1 I < IMIN ->0	2/3 G	ULONG	0xffffffff	A

Name	Description	Notes	PR12x PR33x	Data Type	Value not available/ valid	Measurement Unit
External Ground current (rms)	[A *10-2]	Not available → 2^{32}-1 I < IMIN → 0 I > IMAX → IMAX	2/3 G	ULONG_100	0xffffffff	A
V1 line to neutral voltage (rms)	[V *10-1]	Not available → 2^{16}-1 V < VMIN → 0 V > VMAX → VMAX		UWORD_10	0xffff	V
V2 line to neutral voltage (rms)	[V *10-1]			UWORD_10	0xffff	V
V3 line to neutral voltage (rms)	[V *10-1]		2/3	UWORD_10	0xffff	V
V0 residual voltage (rms)	[V *10-1]			UWORD_10	0xffff	V
V12 line to line voltage (rms)	[V *10-1]			UWORD_10	0xffff	V
V23 line to line voltage (rms)	[V *10-1]			UWORD_10	0xffff	V
V31 line to line voltage (rms)	[V *10-1]			UWORD_10	0xffff	V
L1 phase active power	[kW *10-1] (signed)	Not available → 2^{31}-1 | P | < PMIN → 0 P > PMAX → PMAX P < -PMAX → -PMAX		LONG_10	0xffffffff	kW
L2 phase active power	[kW *10-1] (signed)			LONG_10	0x7fffffff	kW
L3 phase active power	[kW *10-1] (signed)			LONG_10	0x7fffffff	kW
Total active power	[kW *10-1] (signed)			LONG_10	0x7fffffff	kW
L1 phase reactive power	[kVAR *10-1] (signed)			LONG_10	0x7fffffff	kVAR
L2 phase reactive power	[kVAR *10-1] (signed)			LONG_10	0x7fffffff	kVAR
L3 phase reactive power	[kVAR *10-1] (signed)			LONG_10	0x7fffffff	kVAR
Total reactive power	[kVAR *10-1] (signed)			LONG_10	0x7fffffff	kVAR
L1 phase apparent power	[kVA *10-1] (signed)			LONG_10	0x7fffffff	kVA
L2 phase apparent power	[kVA *10-1] (signed)			LONG_10	0x7fffffff	kVA
L3 phase apparent power	[kVA *10-1] (signed)			LONG_10	0x7fffffff	kVA
Total apparent power	[kVA *10-1] (signed)			LONG_10	0x7fffffff	kVA
Total power factor	[10-2] (signed)	Not available → 2^{15}-1		WORD_100	0x7fff	

Name	Description	Notes	PR12x PR33x	Data Type	Value not available/ valid	Measurement Unit
Frequency	[Hz *10-1]	Not available → 2^{16}-1 F < FMIN → FMIN > FMAX → FMAX		UWORD_10	0xffff	Hz
Ne phase peak factor	[10-2]			UWORD_100	0xffff	
Positive Active Energy	[KWh] (signed)		2/3	LONG		kWh
Negative Active Energy	[KWh] (signed)			LONG		kWh
Total Active Energy	[KWh] (signed)			LONG		kWh
Positive Reactive Energy	[KVARh] (signed)			LONG		kVARh
Negative Reactive Energy	[KVARh] (signed)			LONG		kVARh
Total Reactive Energy	[KVARh] (signed)			LONG		kVARh
Total Apparent Energy	[KVAh] (signed)			LONG		kVAh

Alarm and Trip Information

Name	Bit	Description	Notes	PR12x PR33x	MNS *i*S Data Type
STATE 2 FLAGS	BIT 0	Any Alarm / Timing / Warning	OR of alarms	2/3	UWORD
	BIT 1	Any Trip	OR of Trips (latched)	2/3	
	BIT 2	CB Tripped	1 = CB tripped	2/3	
	BIT 3	CB Connected / Isolated	0 = Isolated, 1 =	2/3	
	BIT 4	CB Open/Closed	0 = Open, 1 = Closed	2/3	
	BIT 5	CB Undefined	1 = Undefined	2/3	
	BIT 6	No Communication On Local Bus	1 = No communication on LB	2/3	
	BIT 7	Springs Charged/Discharged	0 = Discharged, 1 = Charged	2/3	
	BIT 8	Trip Command Fail	1 = Trip command failed	2/3	
	BIT 9	Local / Remote Operating Mode	0 = Local, 1 = Remote	2/3	
	BIT 10	Programming OK	1 = Programming OK	2/3	
	BIT 11	Programming Fail	1 = Programming Failed	2/3	
	BIT 12	Internal Bus	1 = Bus SSI session	2/3	
	BIT 13	Test Bus Programming Session	1 = Bus Test session open	2/3	
	BIT 14	Local Bus Programming Session	1 = Bus Local session open	2/3	
	BIT 15	System Bus Programming Session	1 = Bus Ext session open	2/3	

Name	Bit	Description	Notes	PR12x PR33x	MNS *iS* Data Type
STATE 3 FLAGS	BIT 0	Test Session	1 = Test session open	2/3	UWORD
	BIT 1	Test Unit Connected	1 = Test unit connected	2/3	
	BIT 2	BT Unit Present	1 = BT unit present	233x/333x	
	BIT 3	Signaling Module Present	1 = Signaling module present	2/3	
	BIT 4	Dialog Unit Present	1 = Dialog unit present	2/3	
	BIT 5	Measuring Unit Present	1 = Measuring unit	2/3	
	BIT 6	Display Off For High Temp	1 = Display Off	2/3	
	BIT 7	Waiting Trigger	1 =Waiting trigger	2/3	
	BIT 8	Data Logger Triggered	1 = Triggered	2/3	
	BIT 9	Data Logger Stopped	1 = Stopped	2/3	
	BIT 10	Active Dual Set	0 = SET1, 1 = SET2	3	
	BIT 11	Wink On	0 = OFF, 1 = ON	2/3	
	BIT 12	Signaling Module Input Status	0 = Not active, 1 = Active	233x/333x	
	BIT 13	KK Function	0 = OFF, 1 = ON	2/3	
	BIT 14	Waveform Session	1 = Busy	3	
	BIT 15	Local Bus Digital Input	0 = OFF, 1 = ON	2/3	

Name	Bit	Description	Notes	PR12x PR33x	MNS *i*S Data Type
STATE 4 ALARM	BIT 0	Harmonic Distortion > 2.1		2/3	UWORD
	BIT 1	Contact Wear Pre-alarm		2/3	
	BIT 2	Contact Wear Alarm		2/3	
	BIT 3	L Pre-Alarm		2/3	
	BIT 4	L Timing		2/3	
	BIT 5	S Timing		2/3 S	
	BIT 6	S2 Timing		3 S	
	BIT 7	G Timing		2/3 G	
	BIT 8	G Alarm (Blocked Trip)		2/3 G	
	BIT 9	G Ext Timing		2/3 G	
	BIT 10	G Ext Alarm (Blocked Trip)		2/3 G	
	BIT 11	T Pre-Alarm		2/3	
	BIT 12	T Alarm		2/3	
	BIT 13	T Alarm (Blocked Trip)		2/3	
	BIT 14	D Timing		3	
	BIT 15	U Timing		2/3	

Name	Bit	Description	Notes	PR12x PR33x	MNS *i*S Data Type
STATE 5 ALARM	BIT 0	U Alarm (Blocked Trip)		2/3	UWORD
	BIT 1	UV Timing		2/3	
	BIT 2	UV Alarm (Blocked Trip)		2/3	
	BIT 3	OV Timing		2/3	
	BIT 4	OV Alarm (Blocked Trip)		2/3	
	BIT 5	RV Timing		2/3	
	BIT 6	RV Alarm (Blocked Trip)		2/3	
	BIT 7	RP Timing		2/3	
	BIT 8	RP Alarm (Blocked Trip)		2/3	
	BIT 9	UF Timing		2/3	
	BIT 10	UF Alarm (Blocked Trip)		2/3	
	BIT 11	OF Timing		2/3	
	BIT 12	OF Alarm (Blocked Trip)		2/3	
	BIT 13	Frequency Error		2/3	
	BIT 14	Iw Warning		2/3	
	BIT 15	LC1 Alarm		2/3	

Name	Bit	Description	Notes	PR12x PR33x	MNS *i*S Data Type
STATE 6 ALARM	BIT 0	LC2 Alarm		2/3	UWORD
	BIT 1	L1 Sensor Error		2/3	
	BIT 2	L2 Sensor Error		2/3	
	BIT 3	L3 Sensor Error		2/3	
	BIT 4	Ne Sensor Error		2/3	
	BIT 5	Gext Sensor Error		2/3 G	
	BIT 6	SA Error		2/3	
	BIT 7	Rating Plug Error		2/3	
	BIT 8	Installation Error		2/3	
	BIT 9	Internal Error		2/3	
	BIT 10	Power Factor Error		2/3	
	BIT 11	Phase Cycle Error		2/3	
	BIT 12	Invalid Date		2/3	
	BIT 13	Configuration Error	(dip error, neutral setting, ….)	2/3	
	BIT 14	CB Status Error	1 = Error	2/3	
	BIT 15	Local Bus Analog Value	0 = under/equal threshold 1 = over threshold	2/3	

Name	Bit	Description	Notes	PR12x PR33x	MNS *i*S Data Type
STATE 7 INPUTS / OUTPUTS	BIT 0	Local Bus Relay 1 Contact	0 = open, 1 = closed	2/3	UWORD
	BIT 1	Local Bus Relay 2 Contact	0 = open, 1 = closed	2/3	
	BIT 2	Local Bus Relay 3 Contact	0 = open, 1 = closed	2/3	
	BIT 3	Local Bus Relay 4 Contact	0 = open, 1 = closed	2/3	
	BIT 4	---	---	---	
	BIT 5	Local Bus Relay 6 Contact	0 = open, 1 = closed	2/3	
	BIT 6	Local Bus Relay 7 Contact	0 = open, 1 = closed	2/3	
	BIT 7	Local bus Relay 8 Contact	0 = open, 1 = closed	2/3	
	BIT 8	Relay P1 Contact	0 = open, 1 = closed	2/3	
	BIT 9	Relay P2 Contact	0 = open, 1 = closed	233x/333x	
	BIT 10	Relay P3 Contact	0 = open, 1 = closed	233x/333x	
	BIT 11	Relay P4 Contact	0 = open, 1 = closed	233x/333x	
	BIT 12	S Zone Selectivity Input	1 = input active	2/3 S	
	BIT 13	S Zone Selectivity Output	1 = output active	2/3 S	
	BIT 14	G Zone Selectivity Input	1 = input active	2/3 G	
	BIT 15	G Zone Selectivity Output	1 = output active	2/3 G	

Name	Bit	Description	Notes	PR12x PR33x	MNS *i*S Data Type
STATE 8 LATCHED Note 5	BIT 0	L Tripped	1 = L trip	2/3	UWORD
	BIT 1	S Tripped	1 = S trip	2/3 S	
	BIT 2	S2 Tripped	1 = S2 trip	3 S	
	BIT 3	I Tripped	1 = I trip	2/3	
	BIT 4	Iinst Tripped	1 = Iinst trip	2/3	
	BIT 5	G Tripped	1 = G trip	2/3 G	
	BIT 6	G Ext Tripped	1 = G ext trip	2/3 G	
	BIT 7	T Tripped	1 = T trip	2/3	
	BIT 8	D Tripped	1 = D trip	3	
	BIT 9	UN Tripped	1 = UN trip	2/3	
	BIT 10	UV Tripped	1 = UV trip	2/3	
	BIT 11	OV Tripped	1 = OV trip	2/3	
	BIT 12	RV Tripped	1 = RV trip	2/3	
	BIT 13	RP Tripped	1 = RP trip	2/3	
	BIT 14	UF Tripped	1 = UF trip	2/3	
	BIT 15	OF Tripped	1 = OF trip	2/3	

Name	Bit	Description	Notes	PR12x PR33x	MNS *i*S Data Type
STATE 9 LATCHED Note 5	BIT 0	Electronic Trip Test	1 = electronic trip test	2/3	UWORD
	BIT 1	Simulated Trip From Test Unit	1 = simulated trip	2/3	
	BIT 2	External Input Trip	1 = trip from external input	233x/333x	
	BIT 3	Hardware Error Trip	1 = trip of Hardware error	2/3	
	BIT 4	---	---	---	
	BIT 5	---	---	---	
	BIT 6	---	---	---	
	BIT 7	---	---	---	
	BIT 8	---	---	---	
	BIT 9	---	---	---	
	BIT 10	---	---	---	
	BIT 11	---	---	---	
	BIT 12	---	---	---	
	BIT 13	---	---	---	
	BIT 14	---	---	---	
	BIT 15	TRIP Command Fail	1= TRIP command Failed	1/2/3	

General Information

Name	Range	Description	PR12x PR33x	MNS *i*S Data Type	Measurement Unit
Slave ID			2/3	UWORD	
SW version	Major + minor		2/3	UWORD	
Product Standard reference	0 ÷ 1	0→IEC 1→UL1066	233x/333x	UWORD	
	0 ÷ 2	0→IEC 1→UL1066 2→UL489	233x/333x		
3/4 pole CB	0 ÷ 1	0 → 3 Pole 1 → 4 Pole	2/3	UWORD	
In (nominal current)	250 ÷ 6300	[A]	2/3	UWORD	A
CB type **(*)**	TAB_CB_TYPE	TAB_CB_TYPE	233x/333x	UWORD	
	TAB_CB_TYPE_33x	TAB_CB_TYPE_33x	233x/333x		

(*) A table to decode the CB (Sace Breaker) Type is available later in this section.

Quality Code

The Quality Codes are bit fields indicating whether the measurement values are valid or not.

- If the bit is cleared ("0") the data value is valid.

- If the bit is set ("1") the data value is invalid

	Bit	QualityCode1 Bit (Unsigned32)	Data
Byte 0	7	31	Positive Active Energy
	6	30	Neutral Phase Peak Factor
	5	29	Measured Frequency
	4	28	Total Power Factor
	3	27	Total Apparent Power
	2	26	L3 Phase Apparent Power
	1	25	L2 Phase Apparent Power
	0	24	L1 Phase Apparent Power
Byte 1	7	23	Total Reactive Power
	6	22	L3 Phase Reactive Power
	5	21	L2 Phase Reactive Power
	4	20	L1 Phase Reactive Power
	3	19	Total Active Power
	2	18	L3 Phase Active Power
	1	17	L2 Phase Active Power
	0	16	L1 Phase Active Power
Byte 2	7	15	U31 Line To Line Voltage
	6	14	U23 Line To Line Voltage
	5	13	U12 Line To Line Voltage
	4	12	U0 Residual Voltage
	3	11	U3 Line To Neutral Voltage
	2	10	U2 Line To Neutral Voltage
	1	9	U1 Line To Neutral Voltage
	0	8	External Ground Current
Byte 3	7	7	Internal Ground Current
	6	6	Neutral Phase Current
	5	5	L3 Phase Current
	4	4	L2 Phase Current
	3	3	L1 Phase Current
	2	2	Maximum Current Phase
	1	1	RMS Max Current
	0	0	Reserved

	Bit	QualityCode2 Bit (Unsigned32)	Data
Byte 0	7	31	Reserved
	6	30	Reserved
	5	29	Reserved
	4	28	Reserved
	3	27	Reserved
	2	26	Reserved
	1	25	Reserved
	0	24	Reserved
Byte 1	7	23	Reserved
	6	22	Reserved
	5	21	Reserved
	4	20	Reserved
	3	19	State 9
	2	18	State 8
	1	17	State 7 Inputs Outputs
	0	16	State 6 Alarm
Byte 2	7	15	State 5 Alarm
	6	14	State 4 Alarm
	5	13	State 3 Flags
	4	12	State 2 Flags
	3	11	CB Type
	2	10	In (Nominal Current)
	1	9	3/4 Pole CB
	0	8	Product Standard Reference
Byte 3	7	7	SW Version
	6	6	Slave ID
	5	5	Total Apparent Energy
	4	4	Total Reactive Energy
	3	3	Negative Reactive Energy
	2	2	Positive Reactive Energy
	1	1	Total Active Energy
	0	0	Negative Active Energy

Sace Breaker Type decoding

Data Info value : TAB_CB_TYPE

Value	CB-Type	Value	CB-Type
0	E1B800/3P	1	E1B800/4P
2	E1B1000/3P	3	E1B1000/4P
4	E1B1250/3P	5	E1B1250/4P
6	E1B1600/3P	7	E1B1600/4P
8	E1N800/3P	9	E1N800/4P
10	E1N1000/3P	11	E1N1000/4P
12	E1N1250/3P	13	E1N1250/4P
14	E1N1600/3P	15	E1N1600/4P
16	E2B1600/3P	17	E2B1600/4P
18	E2B2000/3P	19	E2B2000/4P
20	E2N1000/3P	21	E2N1000/4P
22	E2N1250/3P	23	E2N1250/4P
24	E2N1600/3P	25	E2N1600/4P
26	E2N2000/3P	27	E2N2000/4P
28	E2S800/3P	29	E2S800/4P
30	E2S1000/3P	31	E2S1000/4P
32	E2S1250/3P	33	E2S1250/4P
34	E2S1600/3P	35	E2S1600/4P
36	E2S2000/3P	37	E2S2000/4P
38	E2L1250/3P	39	E2L1250/4P
40	E2L1600/3P	41	E2L1600/4P
42	E3N2500/3P	43	E3N2500/4P
44	E3N3200/3P	45	E3N3200/4P
46	E3S1000/3P	47	E3S1000/4P
48	E3S1250/3P	49	E3S1250/4P
50	E3S1600/3P	51	E3S1600/4P
52	E3S2000/3P	53	E3S2000/4P
54	E3S2500/3P	55	E3S2500/4P
56	E3S3200/3P	57	E3S3200/4P
58	E3H800/3P	59	E3H800/4P
60	E3H1000/3P	61	E3H1000/4P
62	E3H1250/3P	63	E3H1250/4P
64	E3H1600/3P	65	E3H1600/4P
66	E3H2000/3P	67	E3H2000/4P
68	E3H2500/3P	69	E3H2500/4P
70	E3H3200/3P	71	E3H3200/4P

Value	CB-Type	Value	CB-Type
72	E3V800/3P	73	E3V800/4P
74	E3V1250/3P	75	E3V1250/4P
76	E3V1600/3P	77	E3V1600/4P
78	E3V2000/3P	79	E3V2000/4P
80	E3V2500/3P	81	E3V2500/4P
82	E3V3200/3P	83	E3V3200/4P
84	E3L2000/3P	85	E3L2000/4P
86	E3L2500/3P	87	E3L2500/4P
88	E4S4000/3P	89	E4S4000/4P
90	---	91	E4S/f4000/4P
92	E4H3200/3P	93	E4H3200/4P
94	---	95	E4H/f3200/4P
96	E4H4000/3P	97	E4H4000/4P
98	---	99	E4H/f4000/4P
100	E4V3200/3P	101	E4V3200/4P
102	E4V4000/3P	103	E4V4000/4P
104	E6H4000/3P	105	E6H4000/4P
106	E6H5000/3P	107	E6H5000/4P
108	---	109	E6H/f5000/4P
110	E6H6300/3P	111	E6H6300/4P
112	---	113	E6H/f6300/4P
114	E6V3200/3P	115	E6V3200/4P
116	E6V4000/3P	117	E6V4000/4P
118	E6V5000/3P	119	E6V5000/4P
120	E6V6300/3P	121	E6V6300/4P
122	E1B-A800/3P	123	E1B-A800/4P
124	E1B-A1200/3P	125	E1B-A1200/4P
126	E2B-A1600/3P	127	E2B-A1600/4P
128	E2N-A1200/3P	129	E2N-A1200/4P
130	E2N-A1600/3P	131	E2N-A1600/4P
132	E2S-A1200/3P	133	E2S-A1200/4P
134	E2S-A1600/3P	135	E2S-A1600/4P
136	E3N-A2000/3P	137	E3N-A2000/4P
138	E3N-A2500/3P	139	E3N-A2500/4P
140	E3S-A1200/3P	141	E3S-A1200/4P
142	E3S-A1600/3P	143	E3S-A1600/4P
144	E3S-A2000/3P	145	E3S-A2000/4P
146	E3S-A2500/3P	147	E3S-A2500/4P
148	E3H-A1200/3P	149	E3H-A1200/4P
150	E3H-A1600/3P	151	E3H-A1600/4P

Value	CB-Type	Value	CB-Type
152	E3H-A2000/3P	153	E3H-A2000/4P
154	E3H-A2500/3P	155	E3H-A2500/4P
156	E3V-A1200/3P	157	E3V-A1200/4P
158	E3V-A1600/3P	159	E3V-A1600/4P
160	E3V-A2000/3P	161	E3V-A2000/4P
162	E3V-A2500/3P	163	E3V-A2500/4P
164	E4S-A3200/3P	165	E4S-A3200/4P
166	E4S-A3600/3P	167	E4S-A3600/4P
168	E4H-A3200/3P	169	E4H-A3200/4P
170	E4H-A3600/3P	171	E4H-A3600/4P
172	E4V-A3200/3P	173	E4V-A3200/4P
174	E4V-A3600/3P	175	E4V-A3600/4P
176	E6H-A4000/3P	177	E6H-A4000/4P
178	E6H-A5000/3P	179	E6H-A5000/4P
180	E6V-A4000/3P	181	E6V-A4000/4P
182	E6V-A5000/3P	183	E6V-A5000/4P
184	---	185	E6H/f4000/4P
186	E1N-A800/3P	187	E1N-A800/4P
188	E1N-A1200/3P	189	E1N-A1200/4P
190	E2N-A800/3P	191	E2N-A800/4P
192	E2S-A800/3P	193	E2S-A800/4P
194	E2H-A800/3P	195	E2H-A800/4P
196	E2H-A1200/3P	197	E2H-A1200/4P
198	E2H-A1600/3P	199	E2H-A1600/4P
200	E3S-A800/3P	201	E3S-A800/4P
202	E3S-A3200/3P	203	E3S-A3200/4P
204	E3H-A800/3P	205	E3H-A800/4P
206	E3H-A3200/3P	207	E3H-A3200/4P
208	E3V-A800/3P	209	E3V-A800/4P
210	E3V-A3200/3P	211	E3V-A3200/4P
212	---	213	E4H-A/f3200/4P
214	---	215	E4H-A/f3600/4P
216	E4L-A3200/3P	217	E4L-A3200/4P
218	E4L-A3600/3P	219	E4L-A3600/4P
220	---	221	E6H-A/f4000/4P
222	---	223	E6H-A/f5000/4P
224	E6L-A4000/3P	225	E6L-A4000/4P
226	E6L-A5000/3P	227	E6L-A5000/4P

Data Info value: TAB_CB_TYPE_33x

Value	CB-Type	Value	CB-Type
0	T7S800 /3P	1	T7S800/4P
2	T7S1000/3P	3	T7S1000/4P
4	T7S1250/3P	5	T7S1250/4P
6	T7S1600/3P	7	T7S1600/4P
8	T7H800 /3P	9	T7H800 /4P
10	T7H1000/3P	11	T7H1000/4P
12	T7H1250/3P	13	T7H1250/4P
14	T7H1600/3P	15	T7H1600/4P
16	T7L800 /3P	17	T7L800 /4P
18	T7L1000/3P	19	T7L1000/4P
20	T7L1250/3P	21	T7L1250/4P
22	T7L1600/3P	23	T7L1600/4P
24	T7V800 /3P	25	T7V800/4P
26	T7V1000/3P	27	T7V1000/4P
28	T7V1250/3P	29	T7V1250/4P
30	X1B800 /3P	31	X1B800 /4P
32	X1B1000/3P	33	X1B1000/4P
34	X1B1250/3P	35	X1B1250/4P
36	X1B1600/3P	37	X1B1600/4P
38	X1N800 /3P	39	X1N800 /4P
40	X1N1000/3P	41	X1N1000/4P
42	X1N1250/3P	43	X1N1250/4P
44	X1N1600/3P	45	X1N1600/4P
46	X1L800 /3P	47	X1L800/4P
48	X1L1000/3P	49	X1L1000/4P
50	X1L1250/3P	51	X1L1250/4P
52	X1V800 /3P	53	X1V800 /4P
54	X1V1000/3P	55	X1V1000/4P
56	X1V1250/3P	57	X1V1250/4P
58	T7S1200/3P	59	T7S1200/4P
60	T7H1200/3P	61	T7H1200/4P
62	T7L1200/3P	63	T7L1200/4P
64	X1B800 /3P	65	X1B800/4P
66	X1B1200/3P	67	X1B1200/4P
68	X1B1600/3P	69	X1B1600/4P

Value	CB-Type	Value	CB-Type
70	X1N800 /3P	71	X1N800/4P
72	X1N1200/3P	73	X1N1200/4P
74	X1N1600/3P	75	X1N1600/4P
76	X1L800 /3P	77	X1L800 /4P
78	X1L1200/3P	79	X1L1200/4P
80	X1V800 /3P	81	X1V800/4P
82	X1V1200/3P	83	X1V1200/4P
84	X1B800 /3P	85	X1B800/4P
86	X1B1200/3P	87	X1B1200/4P
88	X1N800 /3P	89	X1N800/4P
90	X1N1200/3P	91	X1N1200/4P
92	X1L800 /3P	93	X1L800/4P
94	X1L1200/3P	95	X1L1200/4P

Commands

When the Breaker PR Release Trip Unit was set manually from Local to Remote operating mode (requires password) then following control commands can be send via MLink fieldbus interface to control the breaker device:

CB Close	Breaker Close command
CB Open	Breaker Open command
CB Reset	Breaker Reset command
Trip Reset	Reset of in Programmable Release stored trips
Wink Toggle Command	To Identify the breaker. Display on PR Release unit at breaker starts blinking
NOP	No operation command. No action.

Data Mapping

For all data mapping possibilities, see MNS iS Interface Manuals of Modbus, Profibus, PROFINET and OPC.

Data and Commands – Ekip

Status

Information about breaker status is available from "Status" data. The Breaker Status format is of data type Unsigned 32 (4Byte, Motorola Byte order) :

Byte order	Section	Bit (Unsigned32)	Description MConnect for Emax2 (Information if bit value = 1)
Byte x	*Control* Access Owner	31	Remote
		30	not used (0)
		29	not used (0)
		28	not used (0)
		27	not used (0)
		26	Bus Local (MView-HMI)
		25	not used (0)
		24	Hardware Local
Byte x+1	Various input signals	23	not used (0)
		22	not used (0)
		21	not used (0)
		20	Isolated
		19	Slave Communication Running
		18	not used (0)
		17	not used (0)
		16	Test
Byte x+2		15-13	Additional information available in following table
	Failsafe	12	not used (0)
	EaroEntryT	11	not used (0)
		10	not used (0)
		9	Common Trip
		8	Common Alarm
Byte x+3	Device status	7-0	Additional information available in following table

Device specific status information

Bit	MConnect Emax2
15	not used (0)
14	not used (0)
13	not used (0)
7	not used (0)
6	not used (0)
5	not used (0)
4	not used (0)
3	Undefined
2	Tripped
1	Closed
0	Opened

Measurement Values

Name	Description	Notes	Ekip	Data Type	Value not available/ valid	Measurement Unit
L1 current	[A*10-1]	Not available -> 2^{32}-1 I < IMIN -> 0 I > IMAX -> IMAX	Touch Hi-Touch G Touch G Hi-Touch	ULONG_10	0xffffffff	A
L2 current				ULONG_10	0xffffffff	A
L3 current				ULONG_10	0xffffffff	A
Ne current				ULONG_10	0xffffffff	A
Internal ground current				ULONG_10	0xffffffff	A
External ground current/Rc current				ULONG_10	0xffffffff	A
V12 line to line voltage	[V *10-1]	Not available -> 2^{16}-1 V < VMIN -> 0 V > VMAX -> VMAX		UWORD_10	0xffff	V
V23 line to line voltage				UWORD_10	0xffff	V
V31 line to line voltage				UWORD_10	0xffff	V
Active power Total	[kW *10-1] (signed)	Not available -> 2^{31}-1 | P | < PMIN -> 0 P > PMAX -> PMAX P < -PMAX -> -PMAX		LONG_10	0x7fffffff	kW
Reactive power Total	[kvar *10-1] (signed)			LONG_10	0x7fffffff	kvar
Apparent power Total	[kVA *10-1] (signed)			LONG_10	0x7fffffff	kVA
Power Factor Total	[10-3] (signed)	Not available -> 2^{15}-1		WORD_1000	0x7fff	
Frequency	[Hz *10-2]	F < FMIN -> FMIN F > FMAX -> FMAX		UWORD_100		Hz
Active Energy Positive	[kWh] (signed)			LONG		kWh
Active Energy Total	[kWh] (signed)			LONG		kWh
Reactive Energy Positive	[kvarh] (signed)			LONG		kvarh
Reactive Energy Total	[kvarh] (signed)			LONG		kvarh
Apparent Energy Total	[kVAh] (signed)			LONG		kVAh

Alarm and Trip Information

Name	Bit	Description	Notes	Ekip	MNS *i*S Data Type
Status Global 1	BIT 0	CB Closed	CB status (meaningful only if CB Undefined (bit 5) = 0)	Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	CB Connected / Isolated	CB status		
	BIT 2	CB In Test	CB insulated but Trip Unit still powered		
	BIT 3	CB Tripped	CB status (meaningful only if CB Undefined (bit 5) = 0)		
	BIT 4	--	--		
	BIT 5	CB Undefined	CB undefined if Ekip Com not present or undefined information from Ekip Com		
	BIT 6	CB Open	CB is Open		
	BIT 7	--	--		
	BIT 8	Local / Remote	If anyone module are present status is forced to local		
	BIT 9	Any Warning	OR of Status-warning		
	BIT 10	Any Alarm	OR of Status-alarm		
	BIT 11	Any Timing	OR of Status-timing		
	BIT 12	Any Trip	OR of Status-trips		
	BIT 13	--	--		
	BIT 14	--	--		
	BIT 15	--	--		

Name	Bit	Description	Notes	Ekip	MNS *i*S Data Type
Status Timing 1	BIT 0	L Timing		Touch Hi-Touch G Touch G Hi-Touch	
	BIT 1	S Timing			
	BIT 2	G Timing			
	BIT 3	--	--		
	BIT 4	U Timing			
	BIT 5	D FW Timing			
	BIT 6	D BW Timing			
	BIT 7	--	--		
	BIT 8	--	--		
	BIT 9	--	--		UWORD
	BIT 10	--	--		
	BIT 11	--	--		
	BIT 12	Gext Timing			
	BIT 13	D Timing			
	BIT 14	--	--		
	BIT 15	--	--		

Name	Bit	Description	Notes	Ekip	MNS *iS* Data Type
Status Trips 1	BIT 0	L Tripped		Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	S Tripped			
	BIT 2	I Tripped			
	BIT 3	G Tripped			
	BIT 4	Iinst Tripped			
	BIT 5	--	--		
	BIT 6	UN Tripped			
	BIT 7	--	--		
	BIT 8	--	--		
	BIT 9	--	--		
	BIT 10	--	--		
	BIT 11	--	--		
	BIT 12	UV Tripped			
	BIT 13	OV Tripped			
	BIT 14	S2 Tripped			
	BIT 15	G Ext Tripped			

Name	Bit	Description	Notes	Ekip	MNS *i*S Data Type
Status Trips 2	BIT 0	D Tripped		Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	T Tripped			
	BIT 2	RV Tripped			
	BIT 3	RP Tripped			
	BIT 4	UF Tripped			
	BIT 5	OF Tripped			
	BIT 6	Test Tripped			
	BIT 7	Hardware Error Tripped			
	BIT 8	External Input Tripped			
	BIT 9	MCR Tripped			
	BIT 10	RC Tripped			
	BIT 11	RC Test Tripped			
	BIT 12	UnV Tripped			
	BIT 13	D FW Tripped			
	BIT 14	D BW Tripped			
	BIT 15	Trip Command Failed Latched			

Name	Bit	Description	Notes	Ekip	MNS *iS* Data Type
Status Trips 3	BIT 0	PWR Overload Tripped		Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	I - V Tripped			
	BIT 2	Loss Of Field Tripped			
	BIT 3	ROCOF Tripped			
	BIT 4	I-V 2 Tripped			
	BIT 5	Under Active Power Tripped			
	BIT 6	Max Reactive Power Tripped			
	BIT 7	UV2 Tripped			
	BIT 8	OV2 Tripped			
	BIT 9	UF2 Tripped			
	BIT 10	OF2 Tripped			
	BIT 11	--	--		
	BIT 12	--	--		
	BIT 13	--	--		
	BIT 14	--	--		
	BIT 15	--	--		

Name	Bit	Description	Notes	Ekip	MNS *i*S Data Type
Status Warnings Alarms 1	BIT 0	L Pre-Alarm		Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	G Pre-Alarm	L ≥ S or L ≥ I or S ≥ I		
	BIT 2	Iw Warning	Warning related to Load Control function		
	BIT 3	Gext Pre-Alarm	Electronic parameters not valid: default set is used		
	BIT 4	S Alarm (Blocked Trip)			
	BIT 5	S2 Alarm (Blocked Trip)			
	BIT 6	No Comm On Local Bus			
	BIT 7	T Pre-Alarm			
	BIT 8	Display Off For Temperature Warning			
	BIT 9	Trip Coil Disconnected			
	BIT 10	LC1 Alarm			
	BIT 11	LC2 Alarm			
	BIT 12	UV Alarm (Blocked Trip)			
	BIT 13	OV Alarm (Blocked Trip)			
	BIT 14	G Alarm (Blocked Trip)			
	BIT 15	G Ext Alarm (Blocked Trip)			

Name	Bit	Description	Notes	Ekip	MNS *i*S Data Type
Status Warnings Alarms 2	BIT 0	T Alarm		Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	T Alarm (Blocked Trip)	Alarm related to Load Control function		
	BIT 2	U Alarm (Blocked Trip)	Alarm related to Load Control function		
	BIT 3	RV Alarm (Blocked Trip)			
	BIT 4	RP Alarm (Blocked Trip)			
	BIT 5	UF Alarm (Blocked Trip)			
	BIT 6	OF Alarm (Blocked Trip)			
	BIT 7	Contact Wear Pre-alarm			
	BIT 8	Contact Wear Alarm			
	BIT 9	Harmonic Distortion Exceeds 2.1			
	BIT 10	L1 Sensor Error			
	BIT 11	L2 Sensor Error			
	BIT 12	L3 Sensor Error			
	BIT 13	Ne Sensor Error			
	BIT 14	Gext Sensor Error			
	BIT 15	Rating Plug Error			

Name	Bit	Description	Notes	Ekip	MNS *i*S Data Type
Status Warnings Alarms 3	BIT 0	Internal Error		Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	Power Factor Error			
	BIT 2	Phase Cycle Error			
	BIT 3	Invalid Date			
	BIT 4	D Alarm (Blocked Trip)			
	BIT 5	CB Status Error			
	BIT 6	Frequency Error			
	BIT 7	Rating Plug Installation Warning			
	BIT 8	SA Error			
	BIT 9	PWROVLD Alarm (BlockedTrip)			
	BIT 10	LOF Alarm (BlockedTrip)			
	BIT 11	ROCOF Alarm (BlockedTrip)			
	BIT 12	IV Alarm (BlockedTrip)			
	BIT 13	IV2 Alarm (BlockedTrip)			
	BIT 14	Iw2 Warning			
	BIT 15	PCPowerExceeded Warning	One when Power Controller failed to limit power during observayion period		

Name	Bit	Description	Notes	Ekip	MNS *iS* Data Type
Status Warnings Alarms 4	BIT 0	UnderActivePower (BlockedTrip)		Touch Hi-Touch G Touch G Hi-Touch	
	BIT 1	MaxReactivePower (BlockedTrip)			
	BIT 2	UnV Alarm (Blocked Trip)			
	BIT 3	Battery Low Warning			
	BIT 4	--	--		
	BIT 5	--	--		
	BIT 6	--	--		
	BIT 7	--	--		UWORD
	BIT 8	--	--		
	BIT 9	UV2 Alarm (BlockedTrip)			
	BIT 10	OV2 Alarm (BlockedTrip)			
	BIT 11	UF2 Alarm (BlockedTrip)			
	BIT 12	OF2 Alarm (BlockedTrip)			
	BIT 13	--	--		
	BIT 14	D FW Alarm (Blocked Trip)			
	BIT 15	D BW Alarm (Blocked Trip)			

Name	Bit	Description	Notes	Ekip	MNS *i*S Data Type
Status Warnings Alarms 5	BIT 0	--	--	Touch Hi-Touch G Touch G Hi-Touch	UWORD
	BIT 1	--	--		
	BIT 2	Configuration Error			
	BIT 3	Maintenance Warning			
	BIT 4	Selectivity Diagnostic Warning			
	BIT 5	--	--		
	BIT 6	--	--		
	BIT 7	--	--		
	BIT 8	--	--		
	BIT 9	--	--		
	BIT 10	--	--		
	BIT 11	--	--		
	BIT 12	--	--		
	BIT 13	--	--		
	BIT 14	--	--		
	BIT 15	--	--		

General Information

Name	Range	Description	Ekip	MNS *i*S Data Type	Measurement Unit
Slave ID	DIP = 130; LCD = 131; Touch = 132;	Slave ID, Modbus Device Identifier	Touch Hi-Touch G Touch G Hi-Touch	UWORD	
Core SW version	MAJOR. minor (MSB.LSB)	Trip Unit SW version		SACE_SW_VERSION	
Nominal current	100 ÷ 6300	Nominal current specified on Rating Plug		UWORD	A
CB Serial Number		16 ASCII characters CB S/N		ASCII	
Nr of CB Poles	0: 3pole; 1: 4pole; 2: 2 pole	Nr of CB Poles		UWORD	
Ekip Type	0 = DIP, 1 = Touch, 2 = Hi-Touch, 3 = G Touch, 4 = G Hi-Touch	Type of Ekip device		UWORD	
Relay Serial Number		16 ASCII characters Trip Unit S/N		ASCII	
Date Of CB Last Maintenance		Timestamp of last maintenance of CB (Seconds from 31 December 199)		SECS_SINCE1999	
Date Of CB Installation		Seconds from 31 December 1999		SECS_SINCE1999	
Product Execution	0 = LI; 1 = LSI; 2 = LSIG; 3 = LSIRc	Product execution type of relay		UWORD	
Contact Wear	0 … 65000; (100% = 65000)	contact wear in percent (100% <--> 65000)		UWORD_650	
Nr of CB operations	0 … 65535	Counter of CB operations (from closed to open)		UWORD	
Nr of CB manual openings	0 … 65535	Counter of CB operations (from closed to open) for opening command		UWORD	
Nr of CB protection trips	0 … 65535	Counter of CB operations (from closed to tripped) for Trip Unit command		UWORD	
Nr of CB protection trip fails	0 … 65535	Counter of CB operations (from closed to tripped) for Trip Unit backup command		UWORD	
Nr of CB protection trip test	0 … 65535	Counter of CB operations (from closed to tripped) for Trip Unit trip test command		UWORD	

Quality Code

The Quality Codes are bit fields indicating whether the measurement values are valid or not.

- If the bit is cleared ("0") the data value is valid.

- If the bit is set ("1") the data value is invalid

	Bit	QualityCode1 Bit (Unsigned32)	Data
Byte 0	7	31	Core SW version
	6	30	Slave ID
	5	29	Nr of CB protection trip test
	4	28	Nr of CB protection trip fails
	3	27	Nr of CB protection trips
	2	26	Nr of CB manual openings
	1	25	Nr of CB operations
	0	24	Contact Wear
Byte 1	7	23	PT100 Temperature
	6	22	PT100 Temperature 3
	5	21	PT100 Temperature 2
	4	20	PT100 Temperature 1
	3	19	Apparent Energy Total
	2	18	Reactive Energy Total
	1	17	Reactive Energy Positive
	0	16	Active Energy Total
Byte 2	7	15	Active Energy Positive
	6	14	Frequency
	5	13	Power Factor Total
	4	12	Apparent power Total
	3	11	Reactive power Total
	2	10	Active power Total
	1	9	V31 line to line voltage
	0	8	V23 line to line voltage
Byte 3	7	7	V12 line to line voltage
	6	6	External ground current/Rc current
	5	5	Internal ground current
	4	4	Ne current
	3	3	L3 current
	2	2	L2 current
	1	1	L1 current
	0	0	Reserved

	Bit	QualityCode2 Bit (Unsigned32)	Data
Byte 0	7	31	Reserved
	6	30	Reserved
	5	29	Reserved
	4	28	Reserved
	3	27	Reserved
	2	26	Reserved
	1	25	Reserved
	0	24	Reserved
Byte 1	7	23	Reserved
	6	22	Reserved
	5	21	Reserved
	4	20	Status Warnings Alarms 5
	3	19	Status Warnings Alarms 4
	2	18	Status Warnings Alarms 3
	1	17	Status Warnings Alarms 2
	0	16	Status Warnings Alarms 1
Byte 2	7	15	Status Trips 3
	6	14	Status Trips 2
	5	13	Status Trips 1
	4	12	Status Timing 2
	3	11	Status Timing 1
	2	10	Status Flags 1
	1	9	Status Glitch 1
	0	8	Status Global 1
Byte 3	7	7	Date Of CB Installation
	6	6	Date Of CB Last Maintenance
	5	5	Product Execution
	4	4	Relay Serial Number
	3	3	Ekip Type
	2	2	Nr of CB Poles
	1	1	CB serial number
	0	0	Nominal current

Commands

When the Breaker PR Release Trip Unit was set manually from Local to Remote operating mode (requires password) then following control commands can be send via MLink fieldbus interface to control the breaker device:

CB Close	Breaker Close command
CB Open	Breaker Open command
CB Reset	Breaker Reset command
Trip Reset	Reset of in Programmable Release stored trips
Wink Toggle Command	To Identify the breaker. Display on PR Release unit at breaker starts blinking
NOP	No operation command. No action.

Data Mapping

For all data mapping possibilities, see MNS iS Interface Manuals of Modbus, Profibus, PROFINET and OPC.

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