MITSUBISHI ELECTRIC

MELSEC System Q

Programmable Logic Controllers

User's Manual

CANopen® Module
ME3CAN1-Q

Art. no.: 279871
09 10 2014
Version A

MITSUBISHI ELECTRIC INDUSTRIAL AUTOMATION

Version check

About this Manual

The texts, illustration, diagrams and examples in this manual are provided for information purposes only. They are intended as aids to help explain the installation, operation, programming and use of the programmable logic controllers of the MELSEC System Q

If you have any questions about the installation and operation of any of the products described in this manual please contact your local sales office or distributor (see back cover).
You can find the latest information and answers to frequently asked questions on our website at
https://eu3a.mitsubishielectric.com.

MITSUBISHI ELECTRIC EUROPE BV reserves the right to make changes to this manual or the technical specifications of its products at any time without notice.

CANopen® Module ME3CAN1-Q User's Manual Art.-no.: 279871	
Version	**Changes / Additions / Corrections**
A 10/2014 pdp-dk	First edition

Safety Guidelines

For use by qualified staff only

This manual is only intended for use by properly trained and qualified electrical technicians who are fully acquainted with the relevant automation technology safety standards. All work with the hardware described, including system design, installation, configuration, maintenance, service and testing of the equipment, may only be performed by trained electrical technicians with approved qualifications who are fully acquainted with all the applicable automation technology safety standards and regulations. Any operations or modifications to the hardware and/or software of our products not specifically described in this manual may only be performed by authorised Mitsubishi Electric staff.

Proper use of the products

The programmable logic controllers of the MELSEC System Q are only intended for the specific applications explicitly described in this manual. All parameters and settings specified in this manual must be observed. The products described have all been designed, manufactured, tested and documented in strict compliance with the relevant safety standards. Unqualified modification of the hardware or software or failure to observe the warnings on the products and in this manual may result in serious personal injury and/or damage to property. Only peripherals and expansion equipment specifically recommended and approved by Mitsubishi Electric may be used with the programmable logic controllers of the MELSEC System Q.

All and any other uses or application of the products shall be deemed to be improper.

Relevant safety regulations

All safety and accident prevention regulations relevant to your specific application must be observed in the system design, installation, configuration, maintenance, servicing and testing of these products. The installation should be carried out in accordance to applicable local and national standards.

Safety warnings in this manual

In this manual warnings that are relevant for safety are identified as follows:

DANGER:
Failure to observe the safety warnings identified with this symbol can result in health and injury hazards for the user.

WARNING:
Failure to observe the safety warnings identified with this symbol can result in damage to the equipment or other property.

General safety information and precautions

The following safety precautions are intended as a general guideline for using PLC systems together with other equipment. These precautions must always be observed in the design, installation and operation of all control systems.

DANGER:

- ***Observe all safety and accident prevention regulations applicable to your specific application. Always disconnect all power supplies before performing installation and wiring work or opening any of the assemblies, components and devices.***
- ***Assemblies, components and devices must always be installed in a shockproof housing fitted with a proper cover and fuses or circuit breakers.***
- ***Devices with a permanent connection to the mains power supply must be integrated in the building installations with an all-pole disconnection switch and a suitable fuse.***
- ***Check power cables and lines connected to the equipment regularly for breaks and insulation damage. If cable damage is found immediately disconnect the equipment and the cables from the power supply and replace the defective cabling.***
- ***Before using the equipment for the first time check that the power supply rating matches that of the local mains power.***
- ***Take appropriate steps to ensure that cable damage or core breaks in the signal lines cannot cause undefined states in the equipment.***
- ***You are responsible for taking the necessary precautions to ensure that programs interrupted by brownouts and power failures can be restarted properly and safely. In particular, you must ensure that dangerous conditions cannot occur under any circumstances, even for brief periods.***
- ***EMERGENCY OFF facilities conforming to EN 60204/IEC 204 and VDE 0113 must remain fully operative at all times and in all PLC operating modes. The EMERGENCY OFF facility reset function must be designed so that it cannot ever cause an uncontrolled or undefined restart.***
- ***You must implement both hardware and software safety precautions to prevent the possibility of undefined control system states caused by signal line cable or core breaks.***
- ***When using modules always ensure that all electrical and mechanical specifications and requirements are observed exactly.***

Symbols used in the Manual

Use of notes

Notes concerning important information are marked separately and are displayed as follows:

NOTE | Note text

Use of examples

Examples are marked separately and are displayed as follows:

Example ▽ Example text

The end of an example is marked with the following symbol:

△

Use of numbering in the figures

Numbering within the figures is displayed by white numbers within black circles and is explained in a table following it using the same number, e.g.:

❶ ❷ ❸ ❹

Use of handling instructions

Handling instructions are steps that must be carried out in their exact sequence during startup, operation, maintenance and similar operations.

They are numbered consecutively (black numbers in white circles):

① Text.

② Text.

③ Text.

Use of footnotes in tables

Instructions in tables are explained in footnotes underneath the tables (in superscript). There is a footnote character at the appropriate position in the table (in superscript).

If there are several footnotes for one table then these are numbered consecutively underneath the table (black numbers in white circle, in superscript):

① Text

② Text

③ Text

Writing conventions and guidance notes

Keys or key-combinations are indicated in square brackets, such as [Enter], [Shift] or [Ctrl]. Menu names of the menu bar, of the drop-down menus, options of a dialogue screen and buttons are indicated in italic bold letters, such as the drop down menu ***New*** in the ***Project*** menu or the option ***Serial USB*** in the "Transfer Setup Connection" screen.

Registration

- CiA® and CANopen® are registered Community Trademarks of CAN in Automation e.V.
- The company name and the product name to be described in this manual are the registered trademarks or trademarks of each company.

Contents

1 Overview

This User's Manual describes the specifications, handling and programming methods for the CANopen® Module ME3CAN1-Q (hereinafter referred to as the ME3CAN1-Q) which is used with the programmable controllers of the MELSEC System Q.

Before using the ME3CAN1-Q, please read this manual and the relevant manuals carefully and develop familiarity with the functions and performance of the MELSEC System Q series programmable controller to handle the product correctly.

1.1 Introduction

The ME3CAN1-Q is a network module of the MELSEC System Q. It is used to connect a MELSEC System Q PLC system to CANopen® and CAN Layer 2 networks. CAN (**C**ontroller **A**rea **N**etwork) is a serial bus system especially for networking devices as well as sensors and actuators.

1.2 Features of the ME3CAN1-Q

D-sub connector for connection to CAN

The connection to the CANopen® network is made via a D-sub 9-pin connector according to CiA®-303-1 V1.8.

Various bit rates

- Pre-defined (according to CANopen® standard):

  10 kbps, 20 kbps, 50 kbps, 100 kbps, 125 kbps, 250 kbps, 500 kbps, 800 kbps, 1 Mbps

CANopen® services according to CiA®-301 V4.2

- 256 TPDO (1024 word write)

  The Process Data Object (PDO) is sent by a node (the *producer*) and will be received by other nodes (the *consumers*) which subscribed to it. The Transmit PDO (TPDO) is used to send input data of the node.

- 256 RPDO (1024 word read)

  The Receive PDO (RPDO) is used to receive output data.

- SDO service

  The Service Data Object can be used to read/write data to the Object Dictionary. This command can be used to set network parameters and also to initiate CANopen® functionality.

- SYNC service

  The SYNC service provides the basic network synchronization mechanism.

- TIME service

  The TIME service provides a simple network clock. CANopen® devices that operate a local clock may use the TIME object to adjust their own time base to that of the time stamp object producer.

- EMCY object service

  Emergency objects are triggered by the occurrence of a CANopen® device internal error situation and are transmitted from an emergency producer on the CANopen® device.

- Network management (NMT)
  - General NMT services
  - Boot-up Message
  - Node guarding Master/Slave
  - Heartbeat Consumer/Producer

CANopen® services according to CiA®-302 V4.1

- NMT master

  The network management provides services for controlling the network behavior of CANopen® devices as defined in CiA®-301 and CiA®-302. All CANopen® devices of a network referred to as NMT slaves are controlled by services provided by an NMT master.

- Flying master

  The flying master mechanism provides services for a hot stand-by NMT master within a CANopen® network.

- Configuration manager

  The Configuration manager provides mechanisms for configuration of CANopen® devices in a CANopen® network.

- SYNC producer

  The SYNC producer broadcasts the SYNC object. The SYNC service provides the basic network synchronization mechanism.

- Layer Setting Services master (LSS) according to the Standard CiA®-305 V2.2

  It is necessary to set the baud rate and node number of the CANopen® devices. But some CANopen® devices, e.g. devices with high IP protection like rotary encoders, waterproof sensor, etc. don't have DIP-switches for these setting. Such devices must be configured by CAN using this LSS.

CANopen® device/application profiles according to CiA® standards

Interface and Device Profile CiA®-405 V2.0 for IEC 61131-3 Programmable Devices.

Setting back up in non-volatile memory

The following setting values will be backed up in the Flash-ROM:

- Setting values stored in the buffer memory;
- Module configuration stored in the Object Dictionary;
- Setting values of Concise Device Setting File (CDCF).

CAN layer 2 communication

Besides the CANopen® mode, the ME3CAN1-Q can be switched to CAN layer 2 communication mode, and be set up so that it can be used for the customer's own CAN based communication protocol.

1.3 Abbreviations and Generic Terms

Unless otherwise specified, this manual uses the following generic terms and abbreviations to describe the CANopen® Module ME3CAN1-Q.

General term / Abbreviation	Description
ME3CAN1-Q	Abbreviation for the CANopen® Module ME3CAN1-Q.
MELSEC System Q CPU	Generic term for CPU modules of the MELSEC System Q
QCPU	
PLC CPU	Generic term for programmable controller.
CPU module	
GX Works2	Generic product name for the programming and configuration software GX Works2.
CAN	Controller Area Network
CANopen®	CAN based higher-layer protocol
CiA®	CAN in Automation Non-profit organization for standardization of CAN protocols. The CiA® Members develop specifications which are published as CiA® specifications. (http://can-cia.org/)
RPDO	Receive Process Data Objects are data read from other nodes via the CAN bus.
TPDO	Transmit Process Data Objects are data send to other nodes via the CAN bus.
CIF	Command interface; used to access the Object Dictionary of the local node or a network node.
SDO	Service Data Object
SYNC	Synchronization object
EMCY	Emergency object
NMT	Network management
LSS	Layer Setting Services
RTR	Remote transmission request
OD	Object dictionary The object dictionary is an array of variables with a 16-bit index. Additionally, each variable can have an 8-bit subindex. The variables can be used to configure the device and reflect its environment, i.e. contain measurement data.

Tab. 1-1: *Abbreviations and general terms*

2 System Configuration

2.1 Overview

The ME3CAN1-Q can be combined with a CPU module of the MELSEC System Q or mounted to a MELSECNET/H remote station. In either case it can be mounted on the main base unit or on an extension base unit.

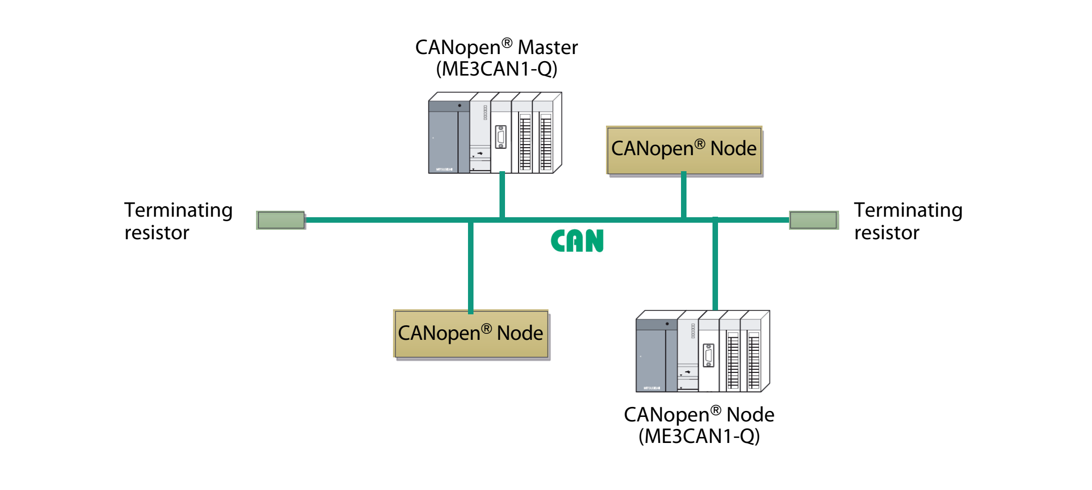


Fig. 2-1: *ME3CAN1-Q mounted to QCPU directly*

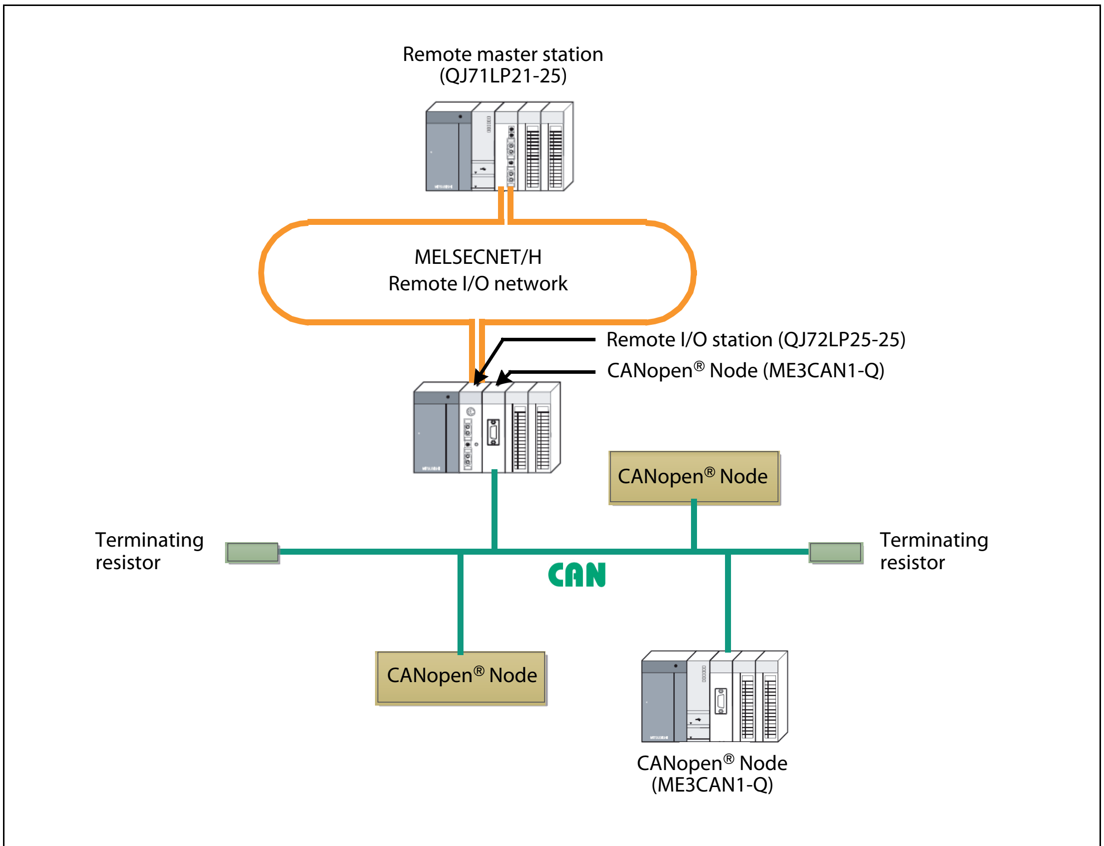


Fig. 2-2: *ME3CAN1-Q controlled by QCPU via MELSECNET/H remote I/O network*

2.2 Applicable Systems

Applicable modules, base units, and No. of modules

- When mounted with a CPU module

The table below shows the CPU modules and base units applicable to the CANopen® module ME3CAN1-Q and quantities for each CPU model.

Depending on the combination with other modules or the number of mounted modules, the power supply capacity may be insufficient. Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable CPU module			Number of ME3CAN1-Q that can be installed ①	Base unit ②	
CPU type		CPU model		Main base unit	Extension base unit
Programmable controller CPU	Basic model QCPU	Q00JCPU	Up to 16	●	●
		Q00CPU	Up to 24		
		Q01CPU			
	High performance model QCPU	Q02CPU	Up to 64	●	●
		Q02HCPU			
		Q06HCPU			
		Q12HCPU			
		Q25HCPU			
	Process CPU	Q02PHCPU	Up to 64	●	●
		Q06PHCPU			
		Q12PHCPU			
		Q25PHCPU			
	Redundant CPU	Q12PRHCPU	—	○	○
		Q25PRHCPU			
	Universal model QCPU	Q00UJCPU	Up to 16	●	●
		Q00UCPU	Up to 24	●	●
		Q01UCPU			
		Q02UCPU	Up to 36		
		Q□UD(E)CPU	Up to 64		
		Q50UDEHCPU			
		Q100UDEHCPU			
	Safety CPU	QS001CPU	—	○	○
C Controller module		Q06CCPU-V-H01	Up to 64	●	●
		Q06CCPU-V			
		Q06CCPU-V-B			
		Q12DCCPU-V			

Tab 2-1: *Applicable base units and number of mountable modules*

●: Applicable, ○: Not applicable

① Limited within the range of I/O points for the CPU module.

② The ME3CAN1-Q can be installed to any I/O slot of a base unit.

- Mounting to a MELSECNET/H remote I/O station

  The table below shows the network modules and base units applicable to the CANopen® module ME3CAN1-Q and quantities for each network module model.

  Depending on the combination with other modules or the number of mounted modules, power supply capacity may be insufficient. Pay attention to the power supply capacity before mounting modules, and if the power supply capacity is insufficient, change the combination of the modules.

Applicable network module	Number of ME3CAN1-Q that can be installed ①	Base unit ②	
		Main base unit of remote I/O station	Extension base unit of remote I/O station
QJ72LP25-25	Up to 64	●	●
QJ72LP25G			
QJ72LP25GE			
QJ72BR15			

Tab 2-2: *Applicable base units and number of mountable modules in a MELSECNET/H remote I/O station*

●: Applicable, ○: Not applicable

① Limited within the range of I/O points for the network module.

② The ME3CAN1-Q can be installed to any I/O slot of a base unit.

NOTE The Basic model QCPU or C Controller module cannot create the MELSECNET/H remote I/O network.

Support of the multiple CPU system

The function version of the CANopen® module supports the multiple CPU system. When using the ME3CAN1-Q in a multiple CPU system, refer to the following manual first.

– QCPU User's Manual (Multiple CPU System)

- Intelligent function module parameters

  Write intelligent function module parameters to only the control CPU of the ME3CAN1-Q.

Compatibility with online module change

An online module change is a function that allows the module of the MELSEC System Q mounted on the main base unit or extension base unit to be changed during system control executed by a Process CPU.

The ME3CAN1-Q does not support online module change.

Supported software packages

For setting the PLC parameters for a system containing the ME3CAN1-Q and programming the software package GX Works2 can be used.

Depending on the CPU module used, a certain version of the software is needed since newly CPU modules are not supported by previous versions.

2.3 How to Check the Function Version and Serial No. of the Modules

Using the programming software GX Works2, the serial No. and the function version can be checked while the PLC is operating.

From the ***Diagnostics*** menu select ***System Monitor*** and then select ***Product Inf. List.***

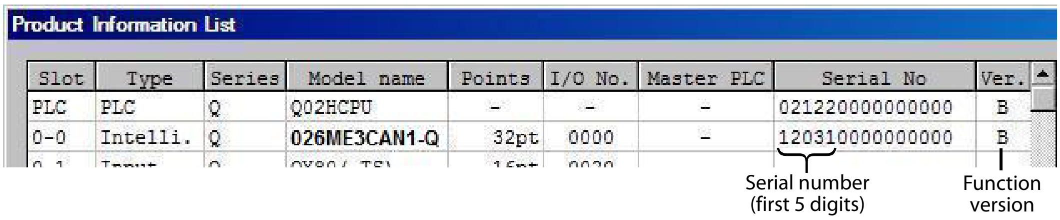


Fig. 2-3: *Product Information List for a PLC with a ME3CAN1-Q*

NOTE

The serial number displayed on the product information screen of GX Works2 describes the function information of the product. The function information of the product is updated when a new function is added.

2.4 System Equipment

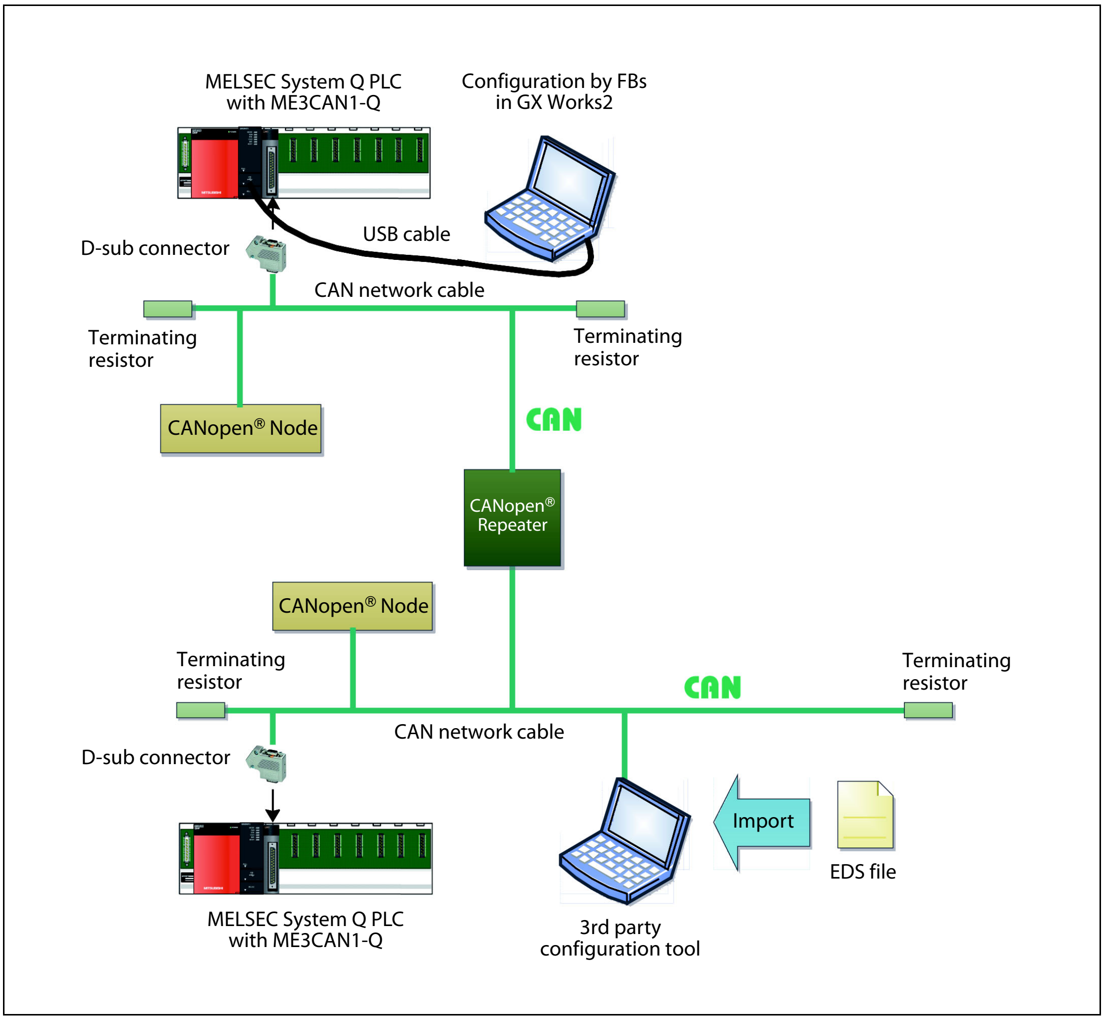


Fig. 2-4: *Example for a system configuration with ME3CAN1-Q*

Product	Description	Note
ME3CAN1-Q	Module for CANopen® communication	—
Configuration tool integrated in GX Works2	Used to configure ME3CAN1-Q (and CANopen® network)	—
3rd party configuration tool		—
D-sub connector	Connector to connect ME3CAN1-Q to the CANopen® network	—
Terminating resistor	Resistor to terminate the CANopen® network. It is integrated in some D-sub connector.	Resistors are required to terminate the CAN network at both ends.
CANopen® cable	Communication cable for CANopen® network	—
CANopen® node	CANopen® node from other manufacturer	—
CANopen® repeater	Repeater for CANopen® network	—
EDS file	Electronic data sheet (EDS) to describe the module. Used for 3rd party configuration tool.	—

Tab 2-3: *System Equipment*

3 Detailed Description of the Module

3.1 Part Names

This section explains the names of the components for the ME3CAN1-Q.

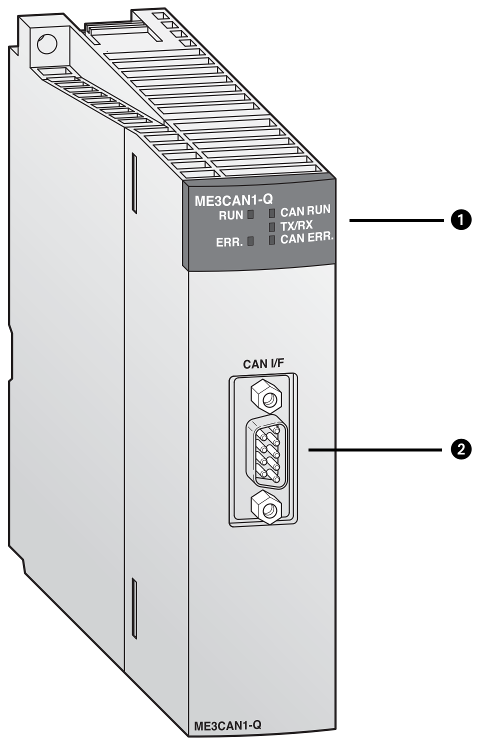


Fig. 3-1: *Names of parts*

No.	Name	Description
❶	Indicator LEDs	Used to indicate the status of the ME3CAN1-Q. For a detailed description, please refer to section 3.1.1.
❷	CANopen® interface connector (D-sub 9-pin male connector)	This connector connects the communication cable to the ME3CAN1-Q. For details, refer to section 3.1.2.

Tab. 3-1: *Description of the LEDs and the connector of the ME3CAN1-Q*

3.1.1 Indicator LEDs

The LEDs are arranged in two groups:

- General LEDs are arranged on the left side.
- LEDs for CANopen® communication are arranged on the right side.

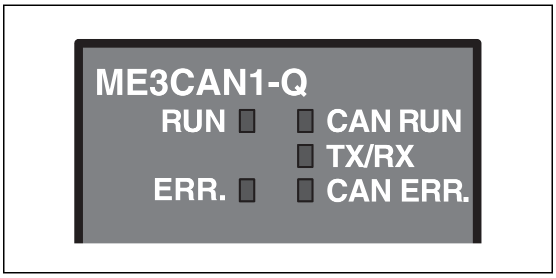
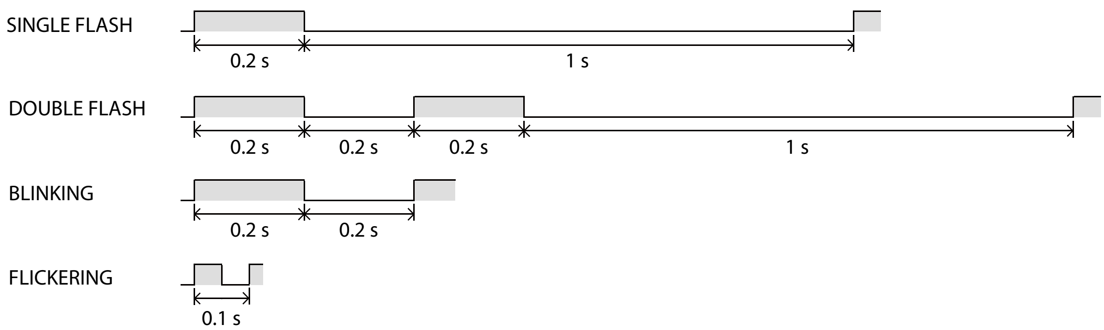


Fig. 3-2:
Indicator LEDs of the ME3CAN1-Q

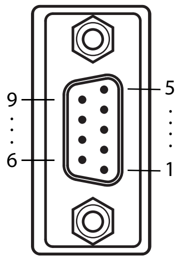
LED	Color	Status	Description
RUN	Green	ON	Normally operating
		OFF	Hardware error (watch dog timer error) or power failure
ERR.	Red	ON	An module error has occurred.
		OFF	Normally operating
CAN RUN	Green	ON	• CANopen® mode: The device is in CANopen® state *Operational*. • Layer 2 mode: The device is in Layer 2 online mode.
		FLICKERING*	LSS services in progress.
		BLINKING*	CANopen® mode: The device is in CANopen state *Pre-operational*.
		SINGLE FLASH*	The device is in CANopen® state *Stopped*.
		OFF	Layer 2 mode: The device is in Layer 2 offline mode.
TX/RX	Green	ON	Module is transmitting/receiving CAN message
		OFF	Module is not transmitting/receiving CAN message
CAN ERR	Red	ON	• The CAN controller is Bus-OFF-state. • The CAN controller has too many transmission errors.
		FLICKERING*	LSS Services in progress.
		BLINKING*	General error.
		DOUBLE FLASH*	Error control event. A NMT guarding failure (NMT-Slave or NMT-Master) or a heartbeat failure (heartbeat consumer) has occurred.
		SINGLE FLASH*	Warning limit reached.
		OFF	No error.

Tab. 3-2: *Indicator LEDs*

* The LEDs CAN RUN and CAN ERR have four kinds of flicker states (according to CiA®-303-3 V1.4): single flash, double flash, blinking, and flickering. These LEDs flicker as follows.



3.1.2 Signal Layout of the Connector

CANopen® interface connector	Pin no.	Signal	Description
	1	—	Reserved
	2	CAN_L	CAN_L bus line (dominant low)
	3	CAN_GND	CAN ground
	4	—	Reserved
	5	CAN_SHLD	CAN shield
	6	—	Reserved
	7	CAN_H	CAN_H Bus line (dominant high)
	8	—	Reserved
	9	—	Reserved

Tab. 3-3: *Pin assignments of the CANopen® interface connector (D-sub 9-pin male connector) on the ME3CAN1-Q*

WARNING:
Leave the "reserved" pins unconnected.

NOTE An inch screw thread (#4-40UNC) is used to fix the connector to the ME3CAN1-Q.

For the wiring of the CANopen® module ME3CAN1-Q please refer to section 6.4.2.

3.2 Specifications

The specifications for the ME3CAN1-Q are shown in the following table. For general specifications, refer to the operation manual for the CPU module being used.

Specification	ME3CAN1-Q
Transmission type	CAN Bus network (RS-485, CSMA/CR)
Applicable functions	• CANopen® Node • CAN Layer 2 Node
CANopen® communication services according to CiA® standards	• CiA®-301 V4.2 • CiA®-302 V4.1 • CiA®-305 V2.2
CANopen® device and application profiles according to CiA® Standards	Interface and Device Profile CiA®-405 V2.0 for IEC 61131-3 Programmable Devices
Remote Transmit Request (RTR)	• Layer 2 mode: supported • CANopen® mode: not supported for PDO
Node number	Selectable from 1 to 127
Communication method	Acyclic, cyclic or event-driven
Supported transmission speed / maximum bus length	The maximum bus length varies depending on the transmission speed. • 1 Mbps / 25 m • 800 kbps / 50 m • 500 kbps / 100 m • 250 kbps / 250 m • 125 kbps / 500 m • 100 kbps / 600 m • 50 kbps / 1,000 m • 20 kbps / 2,500 m • 10 kbps / 5,000 m
Connection cable	The cable should conform to ISO11898. Recommended is a shielded 2x2 twisted pair cable with an impedance of about 120 Ω (refer to section 6.4.2).
Connection to CANopen® network	via 9-pin D-sub connector
Insulation method	• Photocouplers are used to insulate the CAN input from the PLC. • A DC/DC converter is used to insulate the power supply from the CAN input.
Number of occupied I/O points	32 points (I/O assignment: Intelligent 32 points)
Online module change	Not supported
Internal current consumption (5 V DC)	0.34 A
Weight	0.12 kg

Tab. 3-4: *Specifications of the ME3CAN1-Q*

3.2.1 External Dimensions

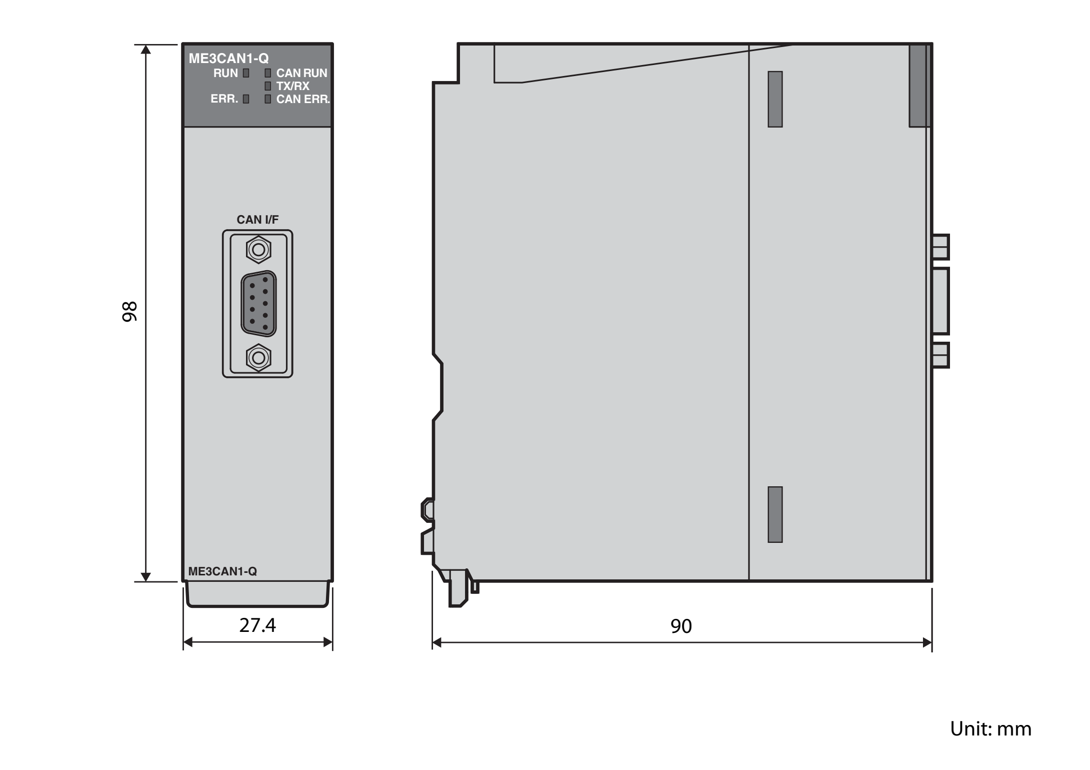


Fig. 3-3: *Dimensions of the ME3CAN1-Q*

3.3 I/O Signals for the Programmable Controller CPU

3.3.1 List of I/O signals

Note that the I/O numbers (X/Y) shown in this section and thereafter depends on the mounting position resp. on the start I/O number or head address of the ME3CAN1-Q. This head address has to be added to the shown I/O numbers.

For example, if the ME3CAN1-Q occupies the range from X/Y040 to X/Y05F the head address is X/Y040. However the least significant digit is omitted and the head address "n" in this case reads as "4". The "module ready" input (Xn0) will be X40 and the "EMCY message available" signal (X(n+1)1) will be X51.

Signal direction CPU Module ⟵ ME3CAN1-Q		Signal direction CPU Module ⟶ ME3CAN1-Q	
Device No. (Input)	**Signal name**	**Device No. (Output)**	**Signal name**
Xn0	Module ready	Yn0	Use prohibited
Xn1	Data exchange completed	Yn1	Data exchange request
Xn2	Module restart completed	Yn2	Module restart
Xn3	Module in Layer 2 online mode (Layer 2 modes only)	Yn3	Layer 2 online mode request (Layer 2 modes only)
Xn4	Message transmit trigger completed (Layer 2 modes only)	Yn4	Message transmit trigger request (Layer 2 modes only)
Xn5	Use prohibited	Yn5	Use prohibited
Xn6		Yn6	
Xn7		Yn7	
Xn8		Yn8	
Xn9		Yn9	
XnA		YnA	
XnB		YnB	
XnC		YnC	
XnD		YnD	
XnE		YnE	
XnF	ME3CAN1-Q error	YnF	ME3CAN1-Q error clear request
X(n+1)0	NMT Error Control failure available (CANopen® mode only)	Y(n+1)0	NMT Error Control failure clear request (CANopen® mode only)
X(n+1)1	EMCY message available (CANopen® mode only)	Y(n+1)1	EMCY message area clear request (CANopen® mode only)
X(n+1)2	Time stamp setting completed (CANopen® mode only)	Y(n+1)2	Time stamp set request (CANopen® mode only)
X(n+1)3	Time stamp information is available in buffer memory (CANopen® mode only)	Y(n+1)3	Time stamp read request (CANopen® mode only)
X(n+1)4	Use prohibited	Y(n+1)4	Use prohibited
X(n+1)5		Y(n+1)5	
X(n+1)6		Y(n+1)6	
X(n+1)7	Command 1 execution completed	Y(n+1)7	Command 1 execution request
X(n+1)8	Use prohibited	Y(n+1)8	Use prohibited
X(n+1)9		Y(n+1)9	
X(n+1)A		Y(n+1)A	
X(n+1)B		Y(n+1)B	
X(n+1)C		Y(n+1)C	
X(n+1)D		Y(n+1)D	
X(n+1)E		Y(n+1)E	
X(n+1)F	Save configuration / restore factory default completed	Y(n+1)F	Save configuration / restore factory default configuration request

Tab. 3-5: *I/O signals of the ME3CAN1-Q*

NOTE

The "Use prohibited" signals cannot be used by the user since they are for system use only. If these are turned ON/OFF by the sequence program, the performance of the CANopen® module cannot be guaranteed.

3.3.2 Details of I/O signals

Module ready signal (Xn0)

- This signal turns ON when the ME3CAN1-Q is enabled for access from the CPU module.
- This signal turns OFF when the ME3CAN1-Q is disabled for access from the CPU module due to a module watchdog timer error or hardware fault.

Data exchange completed (Xn1), Data exchange request (Yn1)

- These signals are used to exchange data between the buffer memory of the ME3CAN1-Q and the CANopen® object dictionary/Layer 2 message buffer.
- To ensure that the ME3CAN1-Q can handle the CANopen® data in a consistent way, it is necessary to set the data exchange request (Yn1) to ON after writing the data. The data exchange control signal ensures, by internal buffer exchange, which data from the PLC will be transmitted by PDO.
- PDO transmit data will only be sent to the CAN bus if the module is in NMT state *Operational* and after setting Yn1 to ON. As long as the reading of the previous data is not finished and a new data exchange command has not been sent, data will not be overwritten by further PDO.

  If the module is in NMT state *Operational*, the received PDO data from other nodes can be read by the MELSEC System Q CPU by using a FROM instruction and the transmit PDO data can be written to the module and sent to the network by using a TO instruction. The data exchange completed signal (Xn1) will be turned ON when the data exchange between buffer memory and Object Dictionary/Data exchange buffer is finished.
- Depending on the bits turned ON in the Data Exchange Control (Un\G20), OD data and/or EMCY data will be exchanged.

NOTE

If Xn1 is turned ON and the module is not in CANopen® state *Pre-operational* or *Stopped*, the PDO data will be exchanged after going into *Operational* state.

Module restart completed (Xn2), Module restart request (Yn2)

- A restart is necessary to activate the following new settings:
  - Function mode (Un\G21), refer to section 3.5.2
  - Baud rate (Un\G24), refer to section 3.5.4
  - Node-ID (Un\G27), refer to section 3.5.6
  - NMT master setting, refer to section 4.8.5.

  All not saved settings will be lost.
- To restart the module, please set the module restart request (Yn2) signal to ON. The module will be set to initialization state as indicated by the Un\G25 bit 7 (refer to section 3.5.5). After the module is restarted, the module restart completed (Xn2) will be set to ON. The module restart request (Yn2) signal can be reset to OFF. Not setting this signal back to OFF will cause that the module will be restarted again and again. The restart procedure will take approx. 6 seconds to complete.

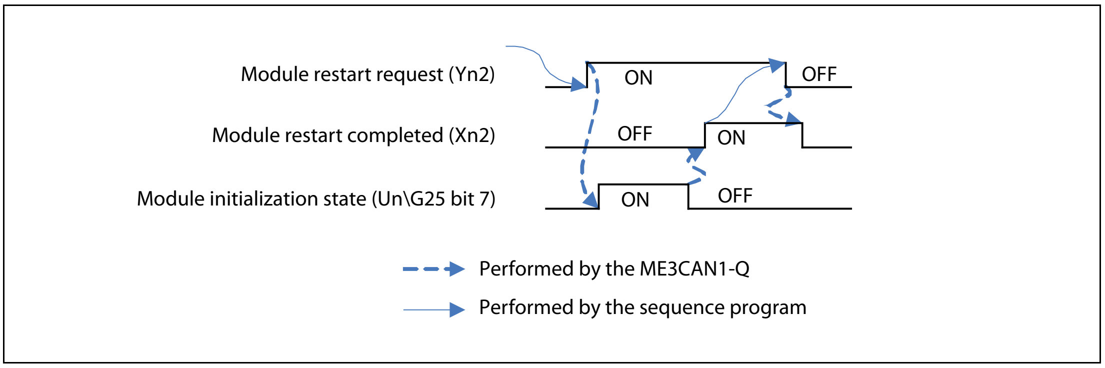


Fig. 3-4: *Timing of the signals Xn2 and Yn2*

Module in Layer 2 online mode (Xn3), Layer 2 online mode request (Yn3)

- The Layer 2 online mode request signal (Yn3) must be set to ON to start data exchange with other network nodes.
- The module in Layer 2 online mode signal (Xn3) will turn ON if the module can be set to online mode. The configuration of the module can only be changed while this signal is OFF..

NOTE In case a configuration buffer memory was changed during online mode, Un\G29 bit 5 is set to ON.

Message transmit trigger completed (Xn4), Message transmit trigger request (Yn4)

- The transmission trigger of a message in Layer 2 mode which is set in Un\G8400 to Un\G8402 must be started with a message transmit trigger request (Yn4).
- The message transmit trigger completed signal (Xn4) will turn ON when all the messages have been written into the transmit buffer. Please refer also to section 3.6.4.

ME3CAN1-Q error (XnF), ME3CAN1-Q error clear request (YnF)

- If one or more of the following bits in the buffer memory address Un\G29 (error state) are turned ON, XnF will be turned ON: Bits 1, 2, 4, 5, 6, 8, or 15. Please refer to section 3.5.7.
- If XnF is turned ON, if necessary please take corrective action to remove the error cause and then turn ON YnF to clear the error signals XnF and the bits in the error state (Un\G29).
- If a new error is generated while the ME3CAN1-Q error clear request (YnF) is ON, this will be cleared automatically.
- After the ME3CAN1-Q error clear request (YnF) is turned OFF, the ME3CAN1-Q will check for new errors again.

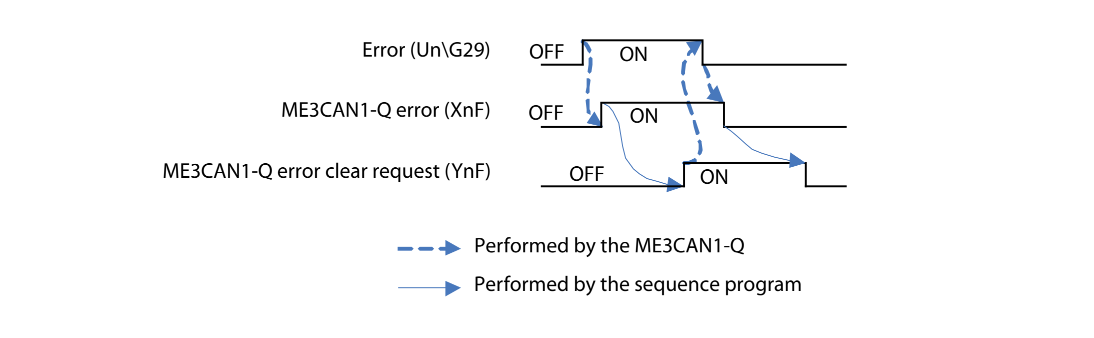


Fig. 3-5: *Timing of the signals XnF and YnF*

NMT Error Control failure available (X(n+1)0), NMT Error Control failure clear request (Y(n+1)0)

- If there is at least one CANopen® NMT Error Control failure (at least one of the assigned NMT slaves failed during NMT Error Control), the NMT error of CANopen® node available (X(n+1)0) will turn ON.
- How to clear the error of all nodes

  To clear the error of all nodes, write 0000H to Un\G400 (this is the default setting of Un\G400) and turn ON the Clear NMT Error Control failure request (Y(n+1)0). The NMT error control failures of all nodes will be then cleared and the NMT Error Control failure available (X(n+1)0) will be turned OFF.
- How to clear the error of a certain node

  To clear the error of a node, write the node number to Un\G400 and turn ON NMT Error Control failure clear request (Y(n+1)0). The NMT error control failures of this node will be cleared and if there no other NMT error control failures the NMT Error Control failure available (X(n+1)0) will also be turned OFF.
- If a new error is generated while the NMT Error Control failure clear request (Y(n+1)0) is ON, this will be cleared automatically.
- After the NMT Error Control failure Clear request (Y(n+1)0) is turned OFF, the ME3CAN1-Q will check for new errors again.
- For more error details on NMT Error Control failure, please refer to section 3.5.15.

EMCY message available (X(n+1)1), EMCY message area clear request (Y(n+1)1)

- If there is at least one CANopen® emergency received (reception of an Emergency message from at least one activated EMCY consumer objects), the EMCY message available (X(n+1)1) will turn ON.
- To clear all EMCY messages, turn ON the EMCY message area clear request (Y(n+1)1). All EMCY messages will be then cleared and the EMCY message available (X(n+1)1) will be turned OFF.
- If a new EMCY message is received while the EMCY message area clear request (Y(n+1)1) is ON, this will be cleared automatically.
- After the EMCY message area clear request (Y(n+1)1) is turned OFF, the ME3CAN1-Q will store the newly received EMCY messages again.

For more error details, please refer to the sections 4.6.12 and 3.5.17.

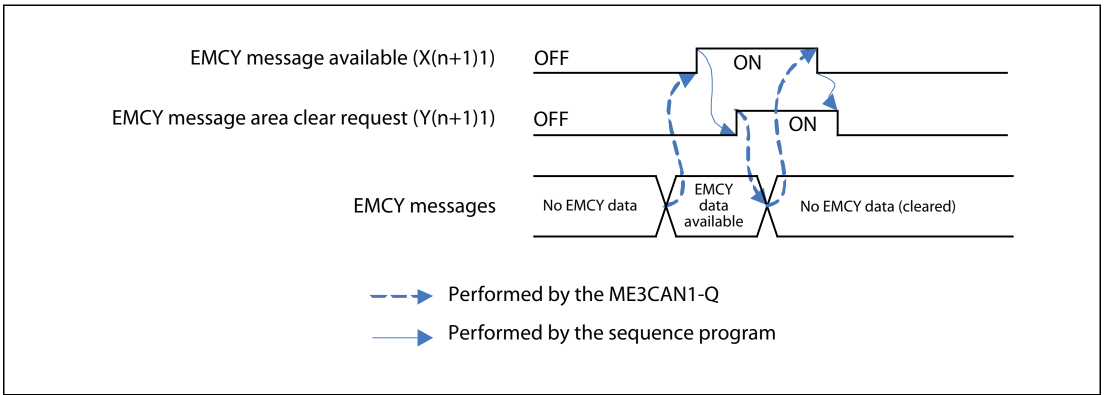


Fig. 3-6: *Timing of the signals X(n+1)1 and Y(n+1)1*

Time stamp setting completed (X(n+1)2), Time stamp set request (Y(n+1)2)

After setting the necessary time stamp information in Un\G50 to Un\G58, please turn ON the time stamp set request (Y(n+1)2).

After the setting is finished, the time stamp setting completed signal (X(n+1)2) will be turned ON, and the request signal can be turned OFF. When the ME3CAN1-Q is the current network master and Producer, then the first time stamp will be sent.

Time stamp information is available in buffer memory (X(n+1)3), Time stamp read request (Y(n+1)3)

To read the time stamp, please set the time stamp read request (Y(n+1)3) to ON.

The time stamp information will be stored in the buffer memory addresses Un\G50 to Un\G58 and the time stamp information is available in buffer memory (X(n+1)3) signal will be turned ON to indicate that actual time stamp information is available.

Command 1 execution completed (X(n+1)7, Command 1 execution request (Y(n+1)7)

- These signals are used for execution of Command Interface 1.
- After writing the necessary command parameter (refer to section 3.5.18), turn ON Y(n+1)7 to execute the command. If the command execution is finished, X(n+1)7 will be turned ON.

Save configuration/Restore factory default completed (X(n+1)F), Save configuration/Restore factory default configuration request (Y(n+1)F)

These signals are used to execute the save configuration / restore factory default request. The request must be specified in Un\G22 (Save/Restore Configuration, refer to section 3.5.3). After that the request can be executed by setting Y(n+1)F to ON. When the request is completed, the corresponding bits in Un\G22 will be cleared, and X(n+1)F will be turned ON.

NOTE

- If both bits Un\G22.0 and Un\G22.1 are set simultaneously the buffer memory and Flash ROM will be reset to factory defaults.
- If only bit Un\G22.1 is set, factory default values are written to the configuration buffer memory but not stored in Flash ROM. In order to store changes made to the configuration execute the Save configuration request (Un\G22.0 then Y(n+1)F) after changing the configuration.

3.4 Buffer Memory Overview

The CANopen® module has a memory range assigned as a buffer for temporary storage of data, such as Received Process Data or CAN transmission error counter. The PLC CPU can access this buffer and both read the stored values from it and write new values to it which the module can then process (Transmit Process Data etc.).

Each buffer memory address consists of 16 bits.

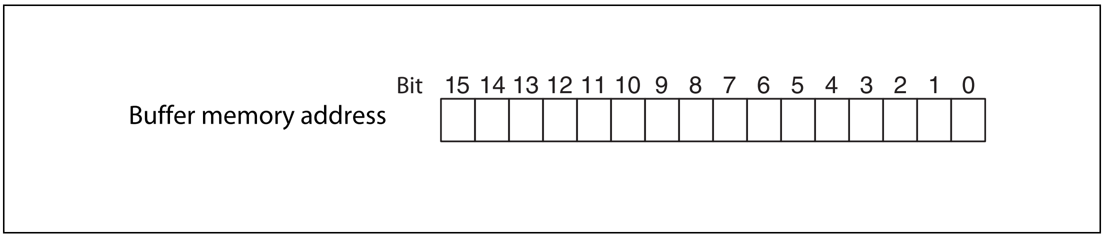


Fig. 3-7: *Assignments of bits to a buffer memory address*

NOTE

Do not write data in the "system areas" of the buffer memory. If data is written to any of the system areas, the PLC system may not be operated properly. Some of the user areas contain partially system areas. Care must be taken when reading/writing to the buffer memory.
Also, do not write data (e.g. in a sequence program) to the buffer memory area where writing is disabled. Doing so may cause malfunction.

The "Default" value indicated in the following tables is the initial value set after the power is turned on or the PLC CPU is reset.

Instructions for data exchange with the buffer memory

Communication between the PLC CPU and the buffer memory of special function modules is performed with FROM and TO instructions.

The buffer memory of a special function module can also be accessed directly, e. g. with a MOV instruction. The special function module addressed in this way can be mounted on a base unit or an extension base unit but not in remote I/O stations.

Format of the device address: Un\Gn

– Un: Head address of the special function module
– Gn: Buffer memory address (decimal)

For example the device address U3\G11designates the buffer memory address 11 in the special function module with the head address 3 (X/Y30 to X/Y3F).

In this User's Manual the latter form of addressing is used throughout.

For full documentation of all the instructions with examples please refer to the Programming Manual for the MELSEC System Q and the L series.

NOTE

As long as Un\G25 bit 7 is ON ("Module is in initialization state"), any write access to the buffer memory is prohibited and will generate a Un\G29 bit 5 error. Refer to section 3.5.7.

3.4.1 Buffer Memory Assignment

Address (Decimal)	Description		Default	R/W ①	Stored to Flash ROM ②	Reference (Section)
0–19	System area		—	—	—	—
20	Data Exchange Control		0H	R/W	—	3.5.1
21	Function mode		405	R/W	✔	3.5.2
22	Save/Restore Configuration		0H	R/W	—	3.5.3
23	System area		—	—	—	—
24	Baud Rate		250	R/W	✔	3.5.4
25	Communication Status		80H	R/W	—	3.5.5
26	System area		—	—	—	—
27	Node Address (CANopen® modes only)		127	R/W	✔	3.5.6
28	System area		—	—	—	—
29	Error Status		0H	R/W	—	3.5.7
30–34	System area		—	—	—	—
35	CAN transmission error counter		0H	R	—	3.5.8
36	CAN reception error counter		0H	R	—	3.5.9
37	Baud Rate display Diagnose display for the current baud rate of the CAN Controller in multiples of 0.1kbps.		2500	R	—	—
38	Sampling Point display Diagnose Display for the current sampling point of the CAN Controller in multiples of 0.1%.		875	R	—	—
39	Buffer memory setting error display		0H	R	—	3.5.10
40	Buffer memory initialization/online mode write error display		0H	R	—	3.5.10
41–49	System area		—	—	—	—
50	Time stamp (CANopen® modes only)	Producer/consumer	1	R/W	—	3.5.11
51	Time stamp (CANopen® modes only)	Year	14	R/W	—	3.5.11
52	Time stamp (CANopen® modes only)	Month	8	R/W	—	3.5.11
53	Time stamp (CANopen® modes only)	Day	1	R/W	—	3.5.11
54	Time stamp (CANopen® modes only)	Hour	0	R/W	—	3.5.11
55	Time stamp (CANopen® modes only)	Minute	0	R/W	—	3.5.11
56	Time stamp (CANopen® modes only)	Second	0	R/W	—	3.5.11
57	Time stamp (CANopen® modes only)	Day-of-the-week	5	R	—	3.5.11
58	Time stamp (CANopen® modes only)	Transmission interval	0	R/W	—	3.5.11
59	Daily correction (CANopen® modes only)		0	R/W	✔	3.5.11
60–69	System area		—	—	—	—
70	NMT Start all Nodes delay (CANopen® modes only)		500	R/W	✔	3.5.12
71	SDO Time out (CANopen® modes only)		500	R/W	✔	3.5.13
72–399	System area		—	—	—	
400	NMT error clear node		0H	R/W	—	3.5.14
401–527	NMT Error Control Status (CANopen® modes only)		0H	R/W	—	3.5.15
528–600	System area		—	—	—	—
601–726	NMT State (CANopen® modes only)		0H	R	—	3.5.16
727	NMT State (CANopen® modes only)		7FH	R	—	3.5.16
728–749	System area		0H	—	—	—
750–859	EMCY Message Buffer (CANopen® modes only)		0H	—	—	3.5.17
860–999	System area		—	—	—	—
1000–1066	Command Interface		0H	R/W	—	3.5.18
1067–5000	System area		—	—	—	—
5001–5042	Message Slot error code list (Layer 2 function modes only)		0H	R/W	—	3.6.1

Tab. 3-6: *Buffer memory assignment of the ME3CAN1-Q*

Address (Decimal)	Description	Default	R/W ①	Stored to Flash ROM ②	Reference (Section)
5043–5999	System area	—	—	—	—
6000–8167	Pre-defined Layer 2 message configuration (Layer 2 modes only)	—	R/W	✔	3.6.2
8168–8349	System area	—	—	—	—
8350–8352	Layer 2 RTR flags (Layer 2 modes only)	0H	R	—	3.6.3
8353–8399	System area	—	—	—	—
8400–8402	Message transmit trigger flags (Layer 2 modes only)	0H	R/W	—	3.6.4
8403–8449	System area	—	—	—	—
8450–8477	PLC RUN>STOP messages (Layer 2 modes only)	0H	R/W	✔	3.6.5
8478–9999	System area	—	—	—	—
Layer 2 modes only					
10000–10293	Receive / Transmit Process Data	0H	R/W	—	3.6.6
From 10294	System area	—	—	—	—
405 Mode only					
10000–11023	Receive Process Data (RPDO)	0H	R	—	3.5.19
11024–12999	System area	—	—	—	—
13000–15047	Transmit Process Data (TPDO)	0H	R/W	—	3.5.19
From 15048	System area	—	—	—	—

Tab. 3-6: *Buffer memory assignment of the ME3CAN1-Q*

① Indicates whether reading from and writing to a sequence program are enabled.
R: Read enabled
W: Write enabled

② Only in Layer 2 mode the contents of some buffer memory addresses is stored into the Flash-ROM (Refer to section 3.6.6).

3.5 Buffer Memory Details: CANopen® Mode

3.5.1 Data Exchange Control (Un\G20)

Bit	Description	
	Read Access	**Write Access**
0–7	Reserved	
8	Only in CANopen® modes: Data exchange status (only OD data) Bit = 0: Data exchange between buffer memory's and Data Exchange Buffer completed Bit = 1: Module exchanges data between buffer memory's and Data exchange buffer	Only in CANopen® modes: Data exchange mode setting (only OD data) Bit = 0: No data exchange between buffer memory and CANopen® object dictionary Bit = 1: Activate data exchange between buffer memory and CANopen® object dictionary **NOTES:** • The data will be also exchanged if this entire buffer memory address is set to 0 (default value). • If the bit is set and the module is not in CANopen® state *Operational*, the PDO data will be exchanged after going into *Operational* state.
9–11	Reserved	
12	Reserved	Data exchange status (only EMCY data) Bit = 0: No data exchange between Emergency Message buffer memories and EMCY Receive Buffer Bit = 1: Exchange data between Emergency Message buffer memories and EMCY Receive Buffer For more information please refer to section 3.5.17 **NOTE:** • The data will be also exchanged if this entire buffer memory address is set to 0 (default value).
13–15	Reserved	

Tab. 3-7: *Assignment of the bits in buffer memory address Un\G20*

To ensure that the ME3CAN1-Q can handle the CANopen® data in a consistent way, it is necessary to set Yn1 to ON after writing data. This data exchange control signal ensures, by internal buffer exchange, which data from the PLC will be transmitted by PDO.

PDO transmit data will only be sent to the CAN bus if the module is in NMT state *Operational* and after setting Yn1 to ON. As long as the reading of the previous data is not finished and a new exchange command has not been sent by setting Yn1, data will not be overwritten by further PDO.

If the module is in NMT state *Operational*, the received PDO data from other nodes can be read by the MELSEC QCPU by using a FROM instruction and the transmit PDO data can be written to the module and sent to the network by using a TO instruction. Xn1 will turn ON when the data exchange between buffer memory and Object Dictionary/Data exchange buffer is finished.

3.5.2 Function Mode (Un\G21)

The ME3CAN1-Q chooses the communication function corresponding to the function mode set in the buffer memory address 21.

Possible buffer memory settings:

- 405: CiA®-405 IEC 61131-3 Programmable Device Profile
- 11: 11 bit CAN ID Layer 2 Message Mode
- 29: 29 bit CAN ID Layer 2 Message Mode

All other settings will generate an error (in this case bit 6 in Un\G29 is set (Refer to section 3.5.7)).

The buffer memory setting needs to be stored by Un\G22 bit 0 and afterwards to be restarted by Yn2 to make the new settings effective (Refer to section 3.5.3 and section 3.3.2).

NOTE

During a restart, all Object Dictionary (OD) settings will be deleted when the CANopen® mode is changed.

3.5.3 Save/Restore Configuration (Un\G22)

This buffer memory specifies two bits that allow to restore the factory default configuration in the buffer memory and to store the buffer memory configuration into the Flash ROM. To execute the request, please set Y(n+1)F to ON (refer to section 3.3.2).

Both bits will be reset automatically if the restore or save procedure is completed, and X(n+1)F will turn ON.

Bit	Description	
	Read Access	**Write Access**
0	Reserved	Bit = 1: Save configuration to Flash ROM
1	Reserved	Bit = 1: Restore factory default configuration (not saved to Flash ROM)
2–15	Reserved	

Tab. 3-8: *Assignment of the bits in buffer memory address Un\G22*

NOTES

If both bit 0 and bit 1 are set simultaneously the buffer memory and Flash ROM will be reset to the factory defaults.

If only bit 1 is set, factory default values are written to the configuration buffer memory but not stored in the Flash ROM. In order to store changes made to the configuration buffer memory, set Un\G22 bit 0 after changing the configuration.

3.5.4 Baud Rate (Un\G24)

In Un\G24 the baud rate is set. The current baud rate can be found in Un\G37.

Value in Un\G24	Baudrate
10	10 kbps
20	20 kbps
50	50 kbps
100	100 kbps
125	125 kbps
250	250 kbps
500	500 kbps
800	800 kbps
1000	1000 kbps

Tab. 3-9:
Settings for the baud rate

NOTES

The baud rate must be equal for all nodes in the network.

The new value needs to be stored by Un\G22. Then Y(n+1)F has to be turned ON and the module has to be restarted to make the new setting effective.

At low baud rates a too fast data exchange and/or high bus load can result in a transmission data queue overflow error (bit 8 in Un\G29, refer to section 3.5.7).

3.5.5 Communication Status (Un\G25)

The buffer memory address Un\G25 displays the ME3CAN1-Q communication status.

Bit	Description	
	Read Access	**Write Access**
0	**CANopen® modes:** Bit = 0: Not in *Operational* State Bit = 1: *Operational* State	—
1	Bit = 0: The error counter is below the warning level, in error passive or in bus-off. (Refer to sections 3.5.8 and 3.5.9) Bit = 1: The error counter of the CAN controller has reached the warning level.	—
2	Reserved	
3		
4		
5		
6	Bit = 0: No NMT Reset received. Bit = 1: The CANopen® Application was reset by an NMT Reset communication or NMT Reset Application command. All unsaved changes in the Object dictionary are lost and are set to factory default or to the former stored value. Write a 0 to reset the bit. (Refer to sections 4.8.8 and 4.6.10). The bit is set to 0 in the beginning of the reset process.	

Tab. 3-10: *Assignment of the bits in buffer memory address Un\G25*

<table>
<tr><th rowspan="2">Bit</th><th colspan="2">Description</th></tr>
<tr><th>Read Access</th><th>Write Access</th></tr>
<tr><td>7</td><td>Module initialization state
Bit = 0: Module initialization finished
Bit = 1: Module is in initialization state
The module is initializing the internal data structures and the buffer memory.
While this bit is on, it is recommended to execute a read access to Un\G25 and Un\G29 only.
In case of a module restart request with Yn2 or over a CANopen® NMT command this bit will be set.
This bit shall be monitor in the PLC program all the time to prohibit Un\G29 failures.</td><td>—</td></tr>
<tr><td>8
9</td><td>CANopen® Network state
Bit 9 Bit 8 Description
0 0 Stopped State
0 1 Pre-operational State
1 0 Operational State
1 1 Reserved</td><td>—</td></tr>
<tr><td>10</td><td>Bit = 0: LSS Master routine inactive
Bit = 1: LSS Master routine active
This bit is only "1" when the LSS Master is searching and configuring LSS Slaves.</td><td>—</td></tr>
<tr><td>11</td><td colspan="2">Reserved</td></tr>
<tr><td>12</td><td colspan="2">Bit = 0: No Time Stamp object received or bit is reset
Bit = 1: Time Stamp object received (Only if Consumer is set)
Write a 0 to reset the bit. (Refer to sections 4.6.9 and 3.5.11)</td></tr>
<tr><td>13</td><td colspan="2">Reserved</td></tr>
<tr><td>14</td><td>Bit = 0: NMT Start-up Master:
No Slave start-up in progress
Bit = 1: NMT Start-up Master: Slave start-up in progress
(Refer to section 4.8.5)
Note:
This bit goes on during the NMT master/slave startup and any time when a NMT slave error occurs and the NMT startup master tries to re-start the faulty NMT slave.</td><td>—</td></tr>
<tr><td>15</td><td>Bit = 0: Module works as NMT Slave
Bit = 1: Module works as NMT Master</td><td>—</td></tr>
</table>

Tab. 3-10: *Assignment of the bits in buffer memory address Un\G25*

3.5.6 Node Address (Un\G27)

The buffer memory address 27 sets the CANopen® Node-ID. The setting value range is 1 to 127.

The buffer memory setting needs to be stored by Un\G22 bit 0 and afterwards to be restarted by Yn2 to make the new setting effective (Refer to section 3.5.3).

A setting out of the above range or a write access in Layer-2 function mode will generate a failure message in Un\G29 bit 6.

3.5.7 Error state (Un\G29)

The following table shows the description of the error if a bit in the buffer memory address Un\G29 is set.

Bit	Error	Description/Corrective action
0	Reserved	
1	Hardware error	This bit can only be reset by switching the power OFF/ON. Contact your Mitsubishi Electric representative.
2	Reserved	
3	The CAN controller is bus OFF.	The CAN controller has too many transmission errors (Refer to section 3.5.8). Restart the Module (Refer to section 3.3.2).
4	FLASH memory error	Invalid data in the Flash memory might be caused by power loss during a write operation to the Flash ROM. If this bit is not cleared after a module restart (Yn2) or another power cycle, please contact your Mitsubishi Electric representative.
5	Invalid write access in Layer 2 mode	Invalid write access to configuration buffer memory while in ONLINE/INIT mode. Check user program, do not write into configuration buffer memory when module is ONLINE. ① In Un\G40 the buffer memory address where this failure occurred will be displayed.
6	Buffer memory setting error	This bit is set if an attempt to write an invalid value into a buffer memory is detected. The target buffer memory address of the invalid write access is displayed in Un\G39 (Refer to section 3.5.10). Check Un\G39 for buffer memory address and correct set value to valid range.
7	Reserved	
8	Internal data queue overflow	Extreme bus load can cause the internal queues to overflow. Decrease the bus load. At a low baud rate a too fast data exchange (refer to section 3.5.1) can overflow the CAN Transmit Buffer (Depends also on the bus-load of the CAN).
9	Reserved	
10		
11		
12		
13		
14	CAN error passive state	This bit shows the CAN error active state/passive state. Bit = 0: Error active state Bit = 1: Error passive state ② This bit will be reset automatically if the internal error counters return back below 128. (Refer to sections 3.5.8 and 3.5.9)
15	Layer 2 Message Slot specific error exists.	Check the Message Slot specific error code in Un\G5001–Un\G5584 (Refer to section 3.6.1).

Tab. 3-11: *Assignment of the bits in buffer memory address Un\G29*

① Layer 2 modes: The configuration must not be changed when the module is set to ONLINE, before changing the configuration set Yn0 to OFF (configuration mode) and wait until Xn0 is OFF (module OFFLINE/INIT). The affected configurations buffer memories are Un\G10000 to Un\G10293, Un\G6000 to Un\G6167 and Un\G8400 to Un\G8402.

② Any CANopen® node will check all CAN messages on the bus for errors. Depending on the error state the action that the node will take is different:

- In error active state:
  The node will actively mark the frame as invalid.
- In error passive state:
  The node will not actively mark the frame as invalid to avoid bus disturbance if the node itself has an H/W problem.

If one or more of the bits 1, 4, 6, 8, or 15 in UN\G29 are set, XnF will be turned ON.

The bits 5 6, 8, and 15 are latched and it is necessary to set YnF to ON which will clear all latched error bits in Un\G29. All other bits are reset automatically if the cause for the error is solved.

3.5.8 CAN transmission error counter (Un\G35)

The ME3CAN1-Q stores the current value of the CAN transmit error counter. The displayed value range is 0 to 256.

The counter counts 8 up if a transmission error is detected. For each transmission without error, the counter counts 1 down.

Value in Un\G35	Description
0 to 127	Error active state
96 to 127	Warning level
128 to 255	Error passive state
256	Bus OFF state

Tab. 3-12:
Meaning of the values for the transmission error counter

NOTE The warning level is also shown by bit 1 in Un\G25, error passive and Bus OFF are shown in Un\G29.

3.5.9 CAN reception error counter (Un\G36)

The ME3CAN1-Q stores the current value of the CAN reception error counter. The displayed value range is 0 to 128 and 256.

The counter counts 8 up if a reception error is detected. For each reception without error, the counter counts 1 down.

Value in Un\G36	Description
0 to 127	Error active state
96 to 127	Warning level
128	Error passive state
256	Bus OFF state

Tab. 3-13:
Meaning of the values for the reception error counter

NOTE The warning level is also shown by bit 1 in Un\G25, error passive and Bus OFF are shown in Un\G29.

3.5.10 Buffer memory setting error display (Un\G39, Un\G40)

Buffer memory setting error display (Un\G39)

Bit 6 of Un\G29 is set to ON if an attempt to write an invalid value into a buffer memory address is detected. The contents of Un\G39 shows the buffer memory address where this failure occurred. In case of a multiple write error, the first failure will be display. The buffer memory will be reset by writing 0 to Un\G29.

Buffer memory initialization / online mode write error display (Un\G40)

If a write access is done while the module is in ONLINE status, bit 5 of Un\G29 is set to "1" and Un\G40 indicates the buffer memory address, where this failure has occurred. In case of a multiple write error, the first failure will be display. The display will be reset by setting YnF to ON.

3.5.11 Time stamp (Un\G50–Un\G59)

CANopen® devices which operate a local clock may use the TIME object to adjust their own time base to the time of the time stamp producer.

After each power up or restart the date and time are set to the default values and the counting is stopped.

If the ME3CAN1-Q is set to "consumer", the clock starts counting after receiving the first time stamp object.

When the module is setup as "producer", the counter starts after setup of Un\G50 to Un\G58 and turning ON the Time stamp set request (Y(n+1)2) signal (refer to section 3.3.2). The time stamp will only be produced if the ME3CAN1-Q is active NMT Master and in CANopen® state *Operational* or *Pre-operational*.

The lowest counting resolution of the time stamp object at the ME3CAN1-Q is in seconds. If a time stamp object is received, bit 12 in Un\G25 will be set (Refer to section 3.5.5).

To keep the consistency of the time, the time stamp data will be read from the clock data when time stamp read request (Y(n+1)3) is set to ON and the time stamp data will be written to the clock data when the time stamp set request (Y(n+1)2) is set to ON. (For a description of the signals (Y(n+1)2) and (Y(n+1)3) please refer to section 3.3.2.)

The date and time will be checked when the time stamp set request (Y(n+1)2) is set to ON. If a value is outside of the allowed range Un\G29 bit 6 will be set to "1" (Refer to section 3.5.7).

The clock data will start to run after the time stamp set request (Y(n+1)2) is set to ON.

In the PLC program, use DATERD/DATEWR commands to read/write the clock data of the PLC. (Refer to the MELSEC Q/L Series Programming Manual).

NOTES

Since the ME3CAN1-Q gets the clock data from the PLC, it doesn't support summer time calculation.

Caused by delays during writing to the buffer memory and during the transmission over the CAN bus there is always a delay in the time.

A leap year correction is provided.

Address (Decimal)	Name		Description / Value range
50	Time stamp	Producer/consumer	The buffer memory directly accesses the Consumer/Producer bits of the Time COB-ID in the Object Dictionary (Refer to section 4.6.9). • 0: Time stamp disabled • 1: Consumer • 2: Producer ① • 3: Producer ① / Consumer
51		Year	Value range: 1980 to 2079 ②
52		Month	Value range: 1 to 12 ②
53		Day	Value range: 1 to 31 ② A setting outside of the range, such as "February 30", is prohibited.
54		Hour	24 hour format Value range: 0 to 23 ②

Tab. 3-14: *Buffer memory addresses for the time stamp*

Address (Decimal)	Name		Description / Value range
55	Time stamp	Minute	Value range: 0 to 59 ②
56		Second	Value range: 0 to 59 ②
57		Day-of-the-week	Display range: 0 to 6 (0: Sunday to 6: Saturday) ② The Day of the week will be calculated during the setup of the clock data automatically.
58		Transmission interval	Set the transmission time interval for the Time stamp Object in multiples of minutes. ② Setting range: 0 = Time stamp transmission disabled 1 to 1440 = 1 min to 1440 Minutes (24 hours)
59	Daily correction		A constant miscount of the clock can be corrected in steps of 1 sec per day. Setting range: -60 to +60

Tab. 3-14: *Buffer memory addresses for the time stamp*

① Timestamp will be only produced if the module is active NMT Master.

② If the ME3CAN1-Q is setup as "consumer " this buffer memory addresses will be ignored.

3.5.12 NMT Start all Nodes delay (Un\G70)

During the NMT master startup, the NMT master sends, depending on the configuration, a NMT *Reset communication all Nodes* and NMT *Start all Nodes*.

The value in Un\G70 sets the minimum time between these two NMT messages, to ensure that a slow NMT Slave recognizes the NMT *Start all Nodes* message.

The value can be set in ms (default: 500 ms).

The setting range is 0 ms to 65535 ms.

NOTE For the NMT Startup process please refer to section 4.8.5.

3.5.13 SDO Time out (Un\G71)

In Un\G71 the time out for SDO communication is set.

The value can be set in ms (default: 500 ms).

The setting range is 50 ms to 32767 ms.

NOTE For SDO please refer to section 4.6.4.

3.5.14 NMT Error Clear Node (Un\G400)

Un\G400 specifies the number of the node, whose NMT errors are to be cleared.

To clear the NMT errors of all nodes (Un\G401–Un\G527), write 0000H to this buffer memory address. This is also the default setting.

After writing a value to this Un\G400, please execute the NMT error clear by setting the output Y(n+1)0 to ON (Please refer to section 3.3.2).

3.5.15 NMT Error Control Status (Un\G401–Un\G527)

The buffer memory addresses Un\G401 to Un\G527 display the Node Guarding and Heartbeat status.

Address (Decimal)	Description
401	Node 1 status
402	Node 2 status
403	Node 3 status
404	Node 4 status
:	:
526	Node 126 status
527	Node 127 status

Tab. 3-15:
Allocation of the buffer memory addresses Un\G401 to Un\G527

The bit allocation of each buffer memory address is as follows. The description applies to the case that the relevant bit is set to "1".

Bit	Description	
0	Guarding	Node Guarding is active
1	Heartbeat	Heartbeat is active (Will be set after the reception of the first heartbeat message.)
2	Guarding	One node guarding message is missed or toggle bit error.
3	Guarding	No response and lifetime of NMT Slave elapsed
4	NMT startup failed.	
5	Guarding	The node has not the expected state.
6	Guarding	Guarding failed. Node Guarding remote requests of the NMT Master was not received in the expected time.
7	Heartbeat	Heartbeat is missing
8 to 15	Reserved	

Tab. 3-16: *Assignment of the bits in the buffer memory addresses 401 to 527*

If one of the bits 2 to 7 is turned ON, the signal "NMT error of CANopen® node available" (X(n+1)0) will turn ON.

Clearance of errors

- To clear the error of all nodes, write 0000H to Un\G400 and turn ON the Clear NMT error of CANopen® node request (Y(n+1)0).
- To clear the error of a node, write the node number to Un\G400 and turn ON the Clear NMT error of CANopen® node request (Y(n+1)0).

3.5.16 NMT State (Un\G601–Un\G727)

The buffer memory addresses Un\G601 to Un\G727 display the NMT status of the CANopen® nodes (Index 1F82H, Sub index 0–127 of the CANopen® Object Dictionary (Refer to section 4.8.8)).

If no Heartbeat Consuming or Node Guarding is configured and the module is active NMT Master the buffer memory displays the NMT states of all slaves, which were sent by the active NMT Master to the slaves.

If the module is using Heartbeat Consuming or Node Guarding, the current NMT State of the NMT Slave is showing the actual NMT State as long as the error control messages are received.

Node Guarding can be only processed by the active NMT Master.

Refer to sections 4.6.8 and 4.6.7 about how to setup Heartbeat and Node Guarding.

NOTE

If no error control service is configured or if error control messages are missing, it's possible that not the actual remote NMT state will be displayed.

Use these buffer memories in connection with the NMT Error Control Status in Un\G401 to Un\G527 and the error bits in Un\G29 to detect error control service failures. (Refer to sections 3.5.15 and 3.5.7.)

Address (Decimal)	Description
601	Node 1
602	Node 2
603	Node 3
604	Node 4
:	:
726	Node 126
727	Node 127

Tab. 3-17:
Allocation of the buffer memory addresses Un\G601 to Un\G727

3.5.17 Emergency Message Buffer (Un\G750–Un\G859)

The ME3CAN1-Q will store the Emergency messages which are received from the bus to an internal buffer. This buffer can store up to 22 emergency messages and is separated in an 11 message stack buffer (Un\G750 to Un\G804) and an 11 message ring buffer (Un\G805 to Un\G859).

The stack buffer will store the first 11 emergency messages received after power on or after the Emergency message buffer was cleared the last time. The ring buffer will store the next eleven Emergency messages; all further received Emergency telegrams will overwrite the oldest message in the ring buffer. The stack buffer will not be overwritten.

To ensure that the EMCY data are handled in a consistent way, it is necessary to refresh the data before reading the EMCY data (turn Xn1 ON, refer to section 3.3.2).

To clear the entire buffer, write 0H to Un\G750.

Address (Decimal)	Name	Description		
			High byte	**Low byte**
750	Node ID	Stack buffer	The node-ID number which sent the emergency message to the network is displayed.	
751	EMERGENCY data		Emergency Error code ① (oldest message)	
752			Byte 0 of manufacturer-specific error code (msef)	Error register
753			Byte 2 of msef	Byte 1 of msef
754			Byte 4 of msef	Byte 3 of msef
:	:		:	
800	Node ID		The node-ID number which sent the emergency message to the network is displayed.	
801	EMERGENCY data		Emergency Error code ① (newest message)	
802			Byte 0 of msef	Error register
803			Byte 2 of msef	Byte 1 of msef
804			Byte 4 of msef	Byte 3 of msef
805	Node ID	Ring buffer	The node-ID number which sent the emergency message to the network is displayed.	
806	EMERGENCY data		Emergency Error code ① (oldest message)	
807			Byte 0 of manufacturer-specific error code (msef)	Error register
808			Byte 2 of msef	Byte 1 of msef
809			Byte 4 of msef	Byte 3 of msef
:	:		:	
855	Node ID		The node-ID number which sent the emergency message to the network is displayed.	
856	EMERGENCY data		Emergency Error code ① (newest message)	
857			Byte 0 of msef	Error register
858			Byte 2 of msef	Byte 1 of msef
859			Byte 4 of msef	Byte 3 of msef

Tab. 3-18: *Buffer memory addresses allocated to the Emergency Message Buffer*

① For emergency error codes please refer to section 8.2.1.

3.5.18 Command Interface (Un\G1000–Un\G1066)

The Command Interface (CIF) can be used to access the Object Dictionary of the local node or a network node. The access is performed by commands for SDO read/write, Emergency Messages, etc.

After writing the command parameter, turn ON Y(n+1)7 to execute the command. If the command execution is finished, X(n+1)7 will be turned ON (refer to section 3.3.2).

NOTES

The addresses will not be cleared after command execution. The former written transmit data will be displayed by making new write accesses or using the Display current parameter command (Refer to section 5.3).

Before a write access to the CIF, always check if Un\G1000 does not display FFFFH (CIF Busy)!

If a write access is made during the CIF busy display, a "Command or Parameter change while CIF was busy" error is generated (Refer to section 5.4.2).

Address (Decimal)	Description	
	Transmit message	Receive message
1000	Command code (trigger for command execution)	Command execution result code
1001–1066	Command parameter	Command parameter read back or detailed error information

Tab. 3-19: *Buffer memory addresses allocated to the Command Interface*

Command Interface	Reference (Section)
SDO read ①	5.1.1
SDO multi read ①	5.1.2
SDO write ①	5.1.3
SDO multi write ①	5.1.4
Send an Emergency Message	5.2
Display current parameter	5.3
Clear/Reset the "CIF was busy" error	5.4.3
Sending Layer 2 Message	3.6.7

Tab. 3-20: *Commands*

① This command uses SDO communication. If the NMT Startup Master is active it can happen that the NMT Startup Master has already occupied the SDO connection to the remote Node.

During the first initial network startup the NMT Startup Master occupies up to 126 SDO connections at the same time. If an NMT Slave fails after the initial Network Startup the NMT Startup Master occupies the SDO connection to the specific NMT Slave. If the NMT Startup master is active for one or more NMT slaves, bit 14 in Un\G25 is ON (Refer to section 3.5.5).

3.5.19 RPDO (Un\G10000–Un\G11023), TPDO (Un\G13000–Un\G14023)

For data transfer, the buffer memory addresses Un\G10000 to Un\G11023 are used for Receive Process Data Objects (RPDO) and Un\G13000 to Un\G14023 are used for Transmit Process Data Objects (TPDO).

To ensure that the CANopen® data are handled in a consistent way, it is necessary to use the data exchange by Yn1 before reading PDO data and after writing PDO data. The data exchange control signal ensures, by internal buffer exchange, which transmit data from the PLC will be transmitted within the same corresponding PDO at the same time (Refer to section 3.3.2).

NOTE The data will only be exchanged when the ME3CAN1-Q is in Operational state.

Direct receive buffer memory access to the CiA®-405 Object

Use a FROM or MOV instruction to read data from the following locations.

The default RPDO mapping is assigned to unsigned 16 bit objects. To change this setting please use the SDO command in the CIF (Refer to sections 4.6.5 and 5.1) or a CANopen® network configuration software.

NOTE If data are written with an SDO into the Object Dictionary to one of the buffer memory corresponding Index/Sub-index only the last written data are visible in the buffer memory. The data of the corresponding Indexes/Sub-indexes are not synchronized to each other.

- Signed and unsigned 8 bit object

Index (Hexadecimal)		Sub-index (Hex.)	Buffer memory address (Decimal)	
Unsigned 8 bit object	Signed 8 bit object			
A4C0	A480	01	10000	lower 8 bit
		02		higher 8 bit
		03	10001	lower 8 bit
		04		higher 8 bit
		:	:	
		FD	10126	lower 8 bit
		FE		higher 8 bit
A4C1	A481	01	10127	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	10253	lower 8 bit
		FE		higher 8 bit
A4C2	A482	01	10254	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	10380	lower 8 bit
		FE		higher 8 bit
A4C3	A483	01	10381	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	10507	lower 8 bit
		FE		higher 8 bit

Tab. 3-21: *Direct receive buffer memory access for unsigned and signed 8 bit objects*

Index (Hexadecimal)		Sub-index (Hex.)	Buffer memory address (Decimal)	
Unsigned 8 bit object	Signed 8 bit object			
A4C4	A484	01	10508	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	10634	lower 8 bit
		FE		higher 8 bit
A4C5	A485	01	10635	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	10761	lower 8 bit
		FE		higher 8 bit
A4C6	A486	01	10762	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	10888	lower 8 bit
		FE		higher 8 bit
A4C7	A487	01	10889	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	11015	lower 8 bit
		FE		higher 8 bit
A4C8	A488	01	11016	lower 8 bit
		02		higher 8 bit
		:	:	
		0F	11023	lower 8 bit
		10		higher 8 bit

Tab. 3-21: *Direct receive buffer memory access for unsigned and signed 8 bit objects*

- Signed and unsigned 16 bit object

Index (Hexadecimal)		Sub-index (Hex.)	Buffer memory address (Decimal)
Unsigned 16 bit object	Signed 16 bit object		
A580	A540	1	10000
		2	10001
		:	:
		FE	10253
A581	A541	1	10254
		:	:
		FE	10507
A582	A542	1	10508
		:	:
		FE	10761
A583	A543	1	10762
		:	:
		FE	11015
A584	A544	1	11016
		:	:
		08	11023

Tab. 3-22: *Direct receive buffer memory access for unsigned and signed 16 bit objects*

- Signed, unsigned and float 32 bit object

Index (Hexadecimal)			Sub-index (Hex.	Buffer memory address (Decimal)
Float 32 bit object	Unsigned 32 bit object	Signed 32 bit object		
A6C0	A680	A640	1	10000
				10001
			2	10002
				10003
			:	:
			FE	10506
				10507
A6C1	A681	A641	1	10508
				10509
			:	:
			FE	11014
				11015
A6C2	A682	A642	1	11016
				11017
			:	:
			04	11022
				11023

Tab. 3-23: *Direct receive buffer memory access for float, unsigned and signed 32 bit objects*

Direct transmit buffer memory access to the CiA®-405 Object

Use a TO or MOV instruction to write data to the following locations.

The default TPDO mapping is assigned to unsigned 16 bit objects. To change this setting, please use the SDO command in the CIF (Refer to sections 4.6.5 and 5.1) or CANopen® network configuration software.

NOTE

The data which are written to the buffer memory will only copy into the Object Dictionary (OD) when they are mapped into a PDO.

Example: Un\G13000 is assigned to the OD Indexes/Sub-indexes A240H/01H, A200H/01H, A1C0H/01H, A100H/01H, A0C0H/01H, A040H/01H, 02H and A000H/01H, 02H. If non of this indexes are mapped into a TPDO the data will not copy from the buffer memory into one of the assigned OD Indexes/Sub-indexes.

- Signed and unsigned 8 bit object

Index (Hexadecimal)		Sub-index (Hex.)	Buffer memory address (Decimal)	
Unsigned 8 bit object	Signed 8 bit object			
A040	A000	01	13000	lower 8 bit
		02		higher 8 bit
		03	13001	lower 8 bit
		04		higher 8 bit
		:	:	
		FD	13126	lower 8 bit
		FE		higher 8 bit
A041	A001	01	13127	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	13253	lower 8 bit
		FE		higher 8 bit
A042	A002	01	13254	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	13380	lower 8 bit
		FE		higher 8 bit
A043	A003	01	13381	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	13507	lower 8 bit
		FE		higher 8 bit
A044	A004	01	13508	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	13634	lower 8 bit
		FE		higher 8 bit
A045	A005	01	13635	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	13761	lower 8 bit
		FE		higher 8 bit

Tab. 3-24: *Direct transmit buffer memory access for unsigned and signed 8 bit objects*

Index (Hexadecimal)		Sub-index (Hex.)	Buffer memory address (Decimal)	
Unsigned 8 bit object	Signed 8 bit object			
A046	A006	01	13762	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	13888	lower 8 bit
		FE		higher 8 bit
A047	A007	01	13889	lower 8 bit
		02		higher 8 bit
		:	:	
		FD	14015	lower 8 bit
		FE		higher 8 bit
A048	A008	01	14016	lower 8 bit
		02		higher 8 bit
		:	:	
		0F	14023	lower 8 bit
		10		higher 8 bit

Tab. 3-24: *Direct transmit buffer memory access for unsigned and signed 8 bit objects*

- Signed and unsigned 16 bit object

Index (Hexadecimal)		Sub-index (Hex.)	Buffer memory address (Decimal)
Unsigned 16 bit object	Signed 16 bit object		
A100	A0C0	1	13000
		2	13001
		:	:
		FE	13253
A101	A0C1	1	13254
		:	:
		FE	13507
A102	A0C2	1	13508
		:	:
		FE	13761
A103	A0C3	1	13762
		:	:
		FE	14015
A104	A0C4	1	14016
		:	:
		08	14023

Tab. 3-25: *Direct transmit buffer memory access for unsigned and signed 16 bit objects*

- Signed, unsigned and float 32 bit object

Index (Hexadecimal)			Sub-index (Hex.	Buffer memory address (Decimal)
Float 32 bit object	Unsigned 32 bit object	Signed 32 bit object		
A240	A200	A1C0	1	13000
				13001
			2	13002
				13003
			:	:
			FE	13506
				13507
A241	A201	A1C1	1	13508
				13509
			:	:
			FE	14014
				14015
A242	A202	A1C2	1	14016
				14017
			:	:
			04	11022
				11023

Tab. 3-26: *Direct transmit buffer memory access for float, unsigned and signed 32 bit objects*

3.6 Buffer Memory Details: Layer 2 Message Mode

In Layer 2 Message mode it is possible to transmit and receive Layer 2 CAN messages with 11-Bit or 29-Bit identifier. To activate this mode, write the value "11" or "29" into Un\G21 and the value "1" to Un\G22. Then switch Y(n+1)F ON to store the buffer memory configuration and restart the module.

NOTES

All CANopen® Functions are deactivated in Layer 2 Message mode!

The buffer memory addresses Un\G20, 24, 25, 29, 35, 36 and the CIF have the same function like in the CANopen® Modes with exception of the CANopen® functions in these buffer memory addresses.

The buffer memory addresses of the Emergency Message Buffer and the Heartbeat/Node Guarding Status are not active and not accessible.

3.6.1 Message Slot specific error code list (Un\G5001–Un\G5042)

The Message Slot specific error code list contains an error for each message slot.

Address (Decimal)	Description
5001	Message 1 error code
5002	Message 2 error code
:	:
5042	Message 42 error code

Tab. 3-27:
Allocation of the buffer memory addresses Un\G5001 to Un\G5042

Error code	Description
0000H	No error code
2000H	Receive buffer overflow

Tab. 3-28:
Error code in Layer 2 messages

3.6.2 Pre-defined Layer 2 message configuration (Un\G6000–Un\G6167)

The parameters of a Layer 2 message number are used to define if the corresponding Layer 2 message number in Un\G10000–Un\G10293 is a transmit or receive message.

Address (Decimal)	Description		Default ①	Remark
6000	Layer 2 message 1 parameter A	Layer 2 message 1 parameter	FFFFH	R/W ②
6001	Layer 2 message 1 parameter B		FFFFH	
6002	Layer 2 message 1 parameter C		0000H	
6003	Layer 2 message 1 parameter D		0000H	
6004	Layer 2 message 2 parameter A	Layer 2 message 2 parameter	FFFFH	R/W ②
6005	Layer 2 message 2 parameter B		FFFFH	
6006	Layer 2 message 2 parameter C		0000H	
6007	Layer 2 message 2 parameter D		0000H	
:	:	:	:	:
6160	Layer 2 message 41 parameter A	Layer 2 message 41 parameter	FFFFH	R/W ②
6161	Layer 2 message 41 parameter B		FFFFH	
6162	Layer 2 message 41 parameter C		0000H	
6163	Layer 2 message 41 parameter D		0000H	
6134	Layer 2 message 42 parameter A	Layer 2 message 42 parameter	FFFFH	R/W ②
6165	Layer 2 message 42 parameter B		FFFFH	
6166	Layer 2 message 42 parameter C		0000H	
6167	Layer 2 message 42 parameter D		0000H	

Tab. 3-29: *Allocation of the buffer memory addresses Un\G6000 to Un\G6167*

① The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

② Reading from and writing to a sequence program are enabled. However, write access to these buffer memory addresses is possible in "Layer 2 configuration mode" only. Refer to Xn3 and Yn3 (section 3.3.1).

NOTES

Transmit and receive messages are described below.

When a Layer 2 message number is not used, set the parameters A and B of the message to FFFFH to disable the message slot.

If an invalid value is written to one of the buffer memory addresses Un\G6000 to Un\G6167, bit 6 in Un\G29 is set and the buffer memory address is displayed in Un\G39.

Pre-defined Layer 2 transmit messages

The meaning of the parameters A to D for a transmit message is as follows:

Parameter	Description	Default ①	Remark
Layer 2 message n parameter A	Constant FFFFH ②	FFFFH	R/W ③
Layer 2 message n parameter B	7FFFH (auto RTR response) 6FFFH (manual RTR response) 5FFFH (disable RTR handling) FFFFH (message disabled) ②	FFFFH	
Layer 2 message n parameter C	Transmission type	0000H	
Layer 2 message n parameter D	Cycle time in [10 ms]	0000H	

Tab. 3-30: *Parameters A to D of transmit messages*

① The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

② Set Parameter A and B to FFFFH in order to disable the message.

③ Reading from and writing to a sequence program are enabled.

- Transmission: Layer 2 message n parameter A and B

  A message buffer in Un\G10000–Un\G10293 is assigned to a Layer 2 transmit message by writing FFFFH in parameter A and 7FFFH, 6FFFH or 5FFFH in parameter B.

  – Auto RTR response

    If parameter B is set to 7FFFH the ME3CAN1-Q will automatically respond to Remote Transmit Requests (RTRs) if the 11/29 bit CAN-ID (i.e. set in Un\G10000 or Un\G10001) matches the ID in the RTR message. The RTR will not be stored to the RTR flag list (Refer to section 3.6.3).

  – Manual RTR response

    If parameter B is set to 6FFFH the ME3CAN1-Q will NOT automatically respond to Remote Transmit Requests, but the RTR will be added to the RTR flag list (Refer to section 3.6.3).

  – Disable RTR handling

    If parameter B is set to 5FFFH the ME3CAN1-Q will discard any incoming RTR telegrams matching the CAN-ID of this Layer 2 message slot.

NOTE

The Layer 2 implementation of the ME3CAN1-Q can handle up to 28 transmit slots with RTR handling (Parameter B = 7FFFH or 6FFFH). If the configuration violates this rule, the first 28 transmit message configurations remain as they are and any further transmit messages parameter B is forced to 5FFFH (Refer to section 3.6.3).

- Transmission: Layer 2 message n parameter C "transmission type"

The transmission type defines under which conditions a transmit message is sent.

"Transmission type" value	Description/transmission trigger event
0	When Yn1 is set to ON, the Layer 2 message is always transmitted.
1	When Yn1 is set to ON, the Layer 2 message is transmitted. However, if data has not been changed, it is not transmitted.
2	Time triggered • Data consistency/refresh via Yn1 • Time set by parameter D "cycle time"
3	Time triggered • Data consistency/refresh via Yn1 • Time set by parameter D "cycle time" • Message is not sent if data did not change
4	On request or PLC/User trigger only ①

Tab. 3-31: *Description of the setting values for "transmission type"*

① The request via RTR frames works for a maximum of 28 transmit messages.

Additionally the transmission can be triggered if the corresponding flag in Un\G8350–Un\G8352 is set to ON. (Refer to section 3.6.3)

- Transmission: Layer 2 message n parameter D "cycle time"

The parameter "cycle time" is valid only if the parameter "transmission event" is set to 2 or 3 (time triggered).

The cycle time sets the interval for message transmission in units of ms. A value of 0 will be forcibly set to 1 (1 ms).

– "Transmission type" = 2 will trigger the transmission every interval.

– "Transmission type" = 3 will trigger the transmission only if the data was changed since the last transmission.

Pre-defined Layer 2 receive messages

The meaning of the parameters A to D for a receive message is as follows:

Parameter	Description		Default ①	Remark
Layer 2 message n parameter A	Reception CAN-ID	low word	FFFFH	R/W
Layer 2 message n parameter B		high word	FFFFH	
Layer 2 message n parameter C	Reception ID filter bit mask	low word	0000H	
Layer 2 message n parameter D		high word	0000H	

Tab. 3-32: *Parameters A to D of receive messages*

① The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

- Reception: Layer 2 message n parameter A and B

  Set the 11/29 bit CAN ID of the message to be received and stored in the corresponding Layer 2 message n message slot.

  Set both parameters A and B to FFFFH to disable the message slot.

- Reception: Layer 2 message n parameter C and D

  Set the filter for the ID set in parameter A and B. If the filter is set to 0000 0000H incoming messages are checked for an exact match with the ID set in parameter A and B. Any bit set in the filter will be omitted when comparing received IDs with the ID set in parameter A and B.

Example 1 ▽ Filter setting: 0000 0000H

– Layer 2 message 1 parameter A/B = 0000 0181H

– Layer 2 message 1 parameter C/D = 0000 0000H

Un\G10000 to Un\G10006 store received messages with the CAN-ID 181H only. Relation between received CAN message, Yn1 and "RTR/new/DLC" high byte is shown below.

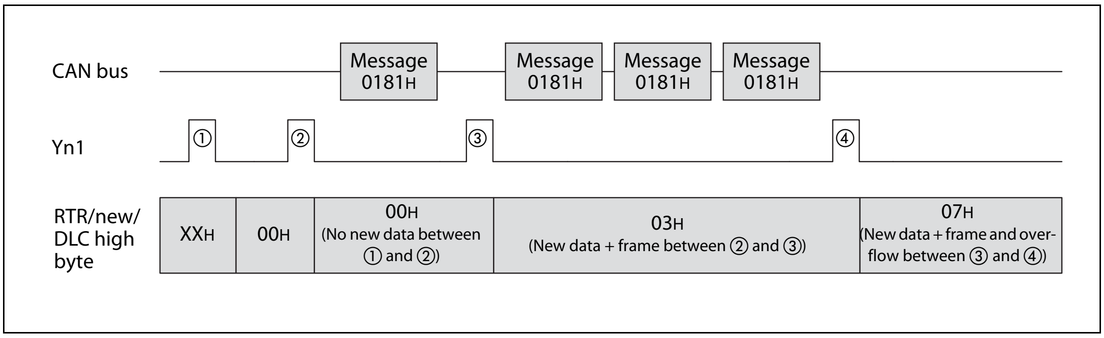


Fig. 3-8: *Relationships for example 1*

The flags "RTR/new/DLC" are cleared by the PLC program after ①. They remain 00H after ②, because there was no message stored between ① and ②.

The first received CAN message that matches parameter A/B and C/D is stored into the internal buffers, and as this is the only message between ② and ③, the high byte value is set to 03H.

The high byte value 07H after ④ shows that the buffer was overwritten at least once (in this example two times) since ③. The data bytes in the buffer memory are the data received with the last message.

NOTE In this example, it is expected that the PLC program resets the "RTR/new/DLC" flags after reading the data at ①, ②, ③ and ④.

△

Example 2 ▽

Filter setting: 0000 0006H

– Layer 2 message 1 parameter A/B = 0000 0180H

– Layer 2 message 1 parameter C/D = 0000 0006H

Un\G10007 to Un\G10013 store received messages with the CAN-IDs 180H, 182H, 184H and 186H because the ID bits 1 and 2 are not evaluated.

NOTE

Please remember that in this case all four messages are stored in the same location!
If more than one of the messages with the ID 180H, 182H, 184H or 186H is received between two write operations (Yn1 ON), only the last received CAN-ID, DLC, and data is available in Un\G10007 to Un\G10013.

Relation between received CAN message, Yn1 and "RTR/new/DLC" high byte is shown below.

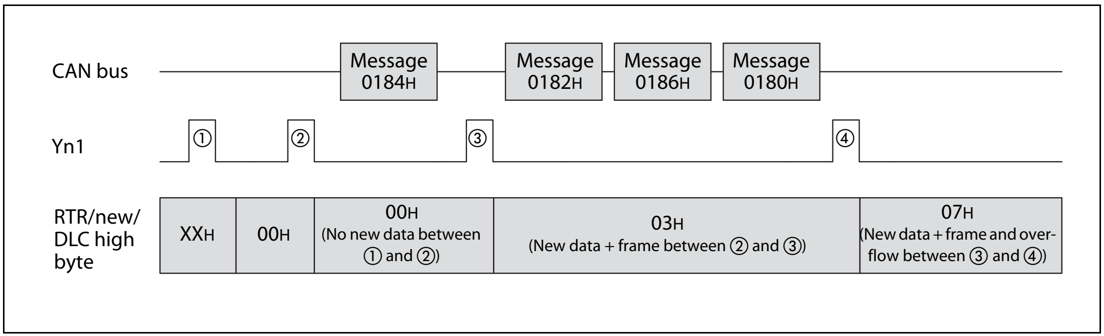


Fig. 2-9: *Relationships for example 2*

The behavior until ④ is similar to that described in example 1.

As in the first example, the high byte value 07H after ④ shows that the buffer was overwritten at least once since ③ and the data bytes in the buffer memory are also the data received with the last message.

But this time it is required to check the 11/29 bit CAN-ID in the corresponding Layer 2 message slot (Un\G10000–Un\G10293) to determine which message ID was received. In this case the last message is 0180H and the data of this message is stored to the data buffer memory. The data of the messages 0182H and 0186H is lost.

NOTE

In this example, it is expected that the PLC program resets the "RTR/new/DLC" flags after reading the data at ①, ②, ③ and ④.

△

3.6.3 Layer 2 RTR flags (Un\G8350–Un\G8352)

If the ME3CAN1-Q is set to Layer 2 communication mode, an incoming RTR message is indicated in the buffer memory if the following conditions are satisfied:

– Matching the "CAN-ID n" of one of the Layer 2 message slots.

– The message slot "n" is configured as a transmit message slot.

– The message slot "n" is set to "no auto RTR response" (6FFFH).

("n" is one of the message slots 1 to 42.)

The bits in the "RTR message reception list" are updated independently from the output signal Yn1.

A bit is set if a valid RTR message has been received. Now the bit can be evaluated by the PLC program and the required changes to the message data can be done (Yn1 must be turned ON in order to refresh the internal data buffer and trigger the transmission). Yn1 is automatically reset when a message is transmitted from the message slot.

RTR message reception list

Address (Decimal)	Bit No.	Description	R/W ①
8350	Bit 0	RTR message for Layer 2 message slot 1 received	R
	Bit 1	RTR message for Layer 2 message slot 2 received	
	: :	: :	
	Bit 14	RTR message for Layer 2 message slot 15 received	
	Bit 15	RTR message for Layer 2 message slot 16 received	
8351	Bit 0	RTR message for Layer 2 message slot 17 received	
	Bit 1	RTR message for Layer 2 message slot 18 received	
	: :	: :	
	Bit 14	RTR message for Layer 2 message slot 31 received	
	Bit 15	RTR message for Layer 2 message slot 32 received	
8352	Bit 0	RTR message for Layer 2 message slot 33 received	
	Bit 1	RTR message for Layer 2 message slot 34 received	
	: :	: :	
	Bit 7	RTR message for Layer 2 message slot 42 received	
	Bit 8	Not used	—
	: :	: :	
	Bit 15	Not used	

Tab. 3-33: *Allocation of the buffer memory addresses Un\G8350 to Un\G8352*

① Indicates whether reading from and writing to a sequence program are enabled.
R: Read enabled
W: Write enabled

3.6.4 Message transmit trigger flags (Un\G8400–Un\G8402)

The transmission of a message in Layer 2 mode can be triggered via the following flags. Transmit requests on receive message slots are discarded.

After setting these flags, turn on Message transmit trigger request (Yn4) to start triggering the message transmission.

If a bit is set to ON, the corresponding transmit message will be sent as soon as a transmit buffer is available.

The flags are reset automatically as soon as the message is written into the transmit buffer. Message transmit trigger completed (Xn4) will turn ON if all the messages are written into the transmit buffer. Please refer also to section 3.3.1.

Message trigger list

Address (Decimal)	Bit No.	Transmit request message slot	R/W ①
8400	Bit 0	Message slot 1	R/W
	Bit 1	Message slot 2	
	: :	: :	
	Bit 14	Message slot 15	
	Bit 15	Message slot 16	
8401	Bit 0	Message slot 17	
	Bit 1	Message slot 18	
	: :	: :	
	Bit 14	Message slot 31	
	Bit 15	Message slot 32	
8402	Bit 0	Message slot 33	
	Bit 1	Message slot 34	
	: :	: :	
	Bit 9	Message slot 42	
	Bit 10	Reserved	—
	: :	: :	
	Bit 15	Reserved	

Tab. 3-34: *Allocation of the buffer memory addresses Un\G8400 to Un\G8402*

3.6.5 PLC RUN>STOP messages (Un\G8450–Un\G8477)

In order to send messages in case of critical events when changing the PLC state from RUN to STOP the ME3CAN1-Q supports up to 4 messages that can be predefined to be sent.

The RUN>STOP messages 1 to 4 are sent when the PLC state has changed from RUN to STOP.

WARNING:

Depending on PLC Type, bit rate and bus load there are cases where not all or no messages can be sent. So please ensure a save system behaviour by additional H/W and/or S/W.

If possible use only one "RUN>STOP message" which will increase the possibility that the information is transmitted when the event "RUN>STOP" occurs. If more than one message is defined the messages are transmitted in the priority "message 1" to "message 4".

Address (Decimal)	Function	Description		Message slot	Default ①	Remark
		High Byte	Low Byte			
8450	CAN-ID 1 LW	11/29 bit CAN-Identifier (low word)		RUN>STOP message 1	FFFFH	R/W ②
8451	CAN-ID 1 HW	11/29 bit CAN-Identifier (high word)			FFFFH	
8452	DLC	Data length count			0H	
8453	Data bytes	Data byte 2	Data byte 1		0H	
8454		Data byte 4	Data byte 3		0H	
8455		Data byte 6	Data byte 5		0H	
8456		Data byte 8	Data byte 7		0H	
:	:	:		:	:	:
8471	CAN-ID 4 LW	11/29bit CAN-Identifier (low word)		RUN>STOP message 4	FFFFH	R/W ②
8472	CAN-ID 4 HW	11/29 bit CAN-Identifier (high word)			FFFFH	
8473	DLC	Data length count			0H	
8474	Data bytes	Data byte 2	Data byte 1		0H	
8475		Data byte 4	Data byte 3		0H	
8476		Data byte 6	Data byte 5		0H	
8477		Data byte 8	Data byte 7		0H	

Tab. 3-35: *Allocation of the buffer memory addresses Un\G8450 to Un\G8477*

① The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

② Reading from and writing to a sequence program are enabled.

The function of the buffer memories addresses listed above is described in the following table.

Buffer memory function	Description
CAN-ID n	CAN-ID used to transmit this message into the network. Set low and high word to FFFFH to disable the message.
DLC	High byte: 00H = Send data frame ①
	Low byte: Number of data bytes to transmit (0 to 8)
Data bytes	Data bytes 1 to 8. The number of attached data bytes is defined by DLC.

Tab. 3-36: *Function of Un\G8450 to Un\G8477*

① RTR is prohibited for these messages.

3.6.6 Receive/Transmit Process Data (Un\G10000–Un\G10293)

In Layer 2 message mode the ME3CAN1-Q can send/receive up to 42 messages pre-defined by the user.

Transmission of Layer 2 messages is also possible via the CIF: Sending Layer 2 Message (Refer to section 3.6.7).

NOTE The buffer memory addresses are refreshed every time the signal Yn1 is turned ON (refer to section 3.3.2).

Address (Decimal)	Function	Description			Default ①	Remark
		High Byte	Low Byte			
10000	CAN-ID 1 LW	11/29 bit CAN-Identifier (low word)		Layer 2 message 1	FFFFH	R/W ②
10001	CAN-ID 1 HW	11/29 bit CAN-Identifier (high word)			FFFFH	
10002	RTR / new / DLC	Remote Transmission Request	Data length count		0H	
10003	Data bytes	Data byte 2	Data byte 1		0H	R/W ③
10004		Data byte 4	Data byte 3		0H	
10005		Data byte 6	Data byte 5		0H	
10006		Data byte 8	Data byte 7		0H	
:	:	:		:	:	:
10287	CAN-ID 42 LW	11/29 bit CAN-Identifier (low word)		Layer 2 message 42	FFFFH	R/W ②
10288	CAN-ID 42 HW	11/29 bit CAN-Identifier (high word)			FFFFH	
101289	RTR / new / DLC	Remote Transmission Request	Data length count		0H	
10290	Data bytes	Data byte 2	Data byte 1		0H	R/W ③
10291		Data byte 4	Data byte 3		0H	
10292		Data byte 6	Data byte 5		0H	
10293		Data byte 8	Data byte 7		0H	

Tab. 3-37: *Allocation of the buffer memory addresses Un\G10000 to Un\G10293*

② The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

② Write access to these buffer memory addresses is possible in "Layer 2 configuration mode" only. Refer to bit 4 in Un\G25 (section 3.5.5). The contents of these buffer memory addresses will be stored into the Flash ROM when the save command is executed (Refer to section 3.5.3).

③ This information is read only for receive messages and read/write for transmit messages.

The function of the buffer memory addresses listed above is described in the following table.

Buffer memory function	Description	
	Transmit messages	**Receive messages**
CAN-ID n	CAN-ID used to transmit this message into the network (11 or 29 bit according to mode set in Un\G21)	Received CAN-ID ①
RTR / new / DLC	High byte • Bit 12 = 1: Strict DLC check for RTR • Bit 15 = 0: Send data frame Bit 15 = 1: Send RTR frame ②	High byte • 00H = No new data received • Bit 9 = 1: New frame received • Bit 8 = 1: New data received • Bit 10 = 1: Overflow ③
	Low byte Number of data bytes to transmit (0 to 8) ②	Low byte Data length count (DLC) of the received CAN frame
Data bytes	Data bytes 1 to 8. The number of attached data bytes is defined by DLC.	Received data bytes ④

Tab. 3-38: *Function of Un\G10000 to Un\G10293*

① In case more than one ID can pass the filter set in Un\G6000 to Un\G6167 (Refer to section 3.6.2) the received CAN-ID might change and will always display the CAN-ID, DLC and data of the latest received message.

② Bit 15 defines if the message is transmitted as a data frame (Bit 15 = 0) or a Remote Transmit Request frame (Bit 15 = 1). Bit 12 = 1 enables a strict DLC check for received RTR frames. If Bit 12 is "0", only the CAN-ID of an inbound RTR frame is checked for a match with a user message, if the bit is "1", the CAN-ID and the DLC of the RTR frame must match the user message to cause a response or Un\G8350 to Un\G8352 flag to be set.

Bit 15 and Bit 12 cannot be set to "1" at the same time.

Bit 15 can be set to "1" if the parameter B (refer to section 3.6.2) is set to 5FFFH.

Bit 12 can be set to "1" if the parameter B (refer to section 3.6.2) is set to 6FFFH or 7FFFH.

③ If bit 8 of "RTR/new/DLC" is "1", a new message including new data has been received and stored. If bit 9 is "1" but bit 8 is "0", the same message (same ID, DLC and data) has been received. If bit 10 is "1" at least one more message has been stored in this message buffer while bit 8 was "1" which caused an overflow condition.

The RTR flag will not be displayed in case of receive messages. For details of the handling for received RTR messages refer to section 3.6.3.

The various cases for the bits 8 to 10 are shown in the following table.

RTR / new / DLC	**Receive messages only**				
	New frame No new data	**New frame New data**	**New frame No new data Overflow**	**New frame New data Overflow**	**No data received**
New data (bit 8)	○	●	○	●	X
New frame (bit 9)	●	●	●	●	○
Overflow (bit 10)	○	○	●	●	X

○: Bit = 0, ●: Bit = 1, X: Bit status is "don't care"

④ In case the received DLC is lower than 8, unused data bytes are set to 00H.

3.6.7 CIF: Sending Layer 2 Message

Using this function, the PLC can send any Layer 2 message to the CAN bus. This function is accessible in Layer 2 Mode only.

Execution procedure

- Write the command code, CAN-ID, RTR, DLC and the data byte to Un\G1000 to Un\G1008.
- Turn ON Y(n+1)7 to execute the command.
- If the command execution is finished, X(n+1)7 will be turned ON.

Buffer memory allocation

Address (Decimal)	Description	
	Transmit message	Receive message
1000	Command 000CH: Send Layer 2 Message	• 000DH: Data written to transmit buffer • F00CH: Setting error • FFFFH: CIF Busy
1001	11/29 bit CAN-Identifier (low word)	Diagnosis Data • 0000H: No error • F00CH: Setting error • All other values: Displays the error cause. Any of the addresses Un\G1001 to Un\G1004 with a value unequal to 0 refers to a setting error.
1002	11/29 bit CAN-Identifier (high word)	
1003	RTR (Remote Transmission Request) ①	
1004	DLC (Data Length Count) ②	
1005–1008	Data bytes	Unused
1008–1066	Unused	Unused

Tab. 3-39: *Buffer memory allocation for CIF SDO read access*

① Set Un\G1003 to "0" for normal transmission. If Un\G1003 is set to "1", a remote transmit request frame is sent. This request makes the producer of the associated CAN-ID specified in Un\G1001 and Un\G1002 send the actual data.

② The data length is given in the unit "bytes" (0 to 8).

Data structure in Un\G1005 to Un\G1008

Address (Decimal)	Description	
	High Byte	Low Byte
1005	2nd data byte	1st data byte
1006	4th data byte	3rd data byte
1007	6th data byte	5th data byte
1008	8th data byte	7th data byte

Tab. 3-40:
Data structure for transmit messages

4 Functions

4.1 Function Summary

Function	Description	Reference (Section)
Function modes	Different function modes of the module	4.2
Object Dictionary	Link between CANopen® network and PLC	4.3
Command interface	Module interface to the Object Dictionary	4.4
SDO	Service Data Object	4.6.4
RPDO / TPDO	Receive / Transmit Process Data Object	4.6.5
SYNC	Synchronization object	4.6.6
Node guarding	Node guarding service	4.6.7
Heartbeat	Heartbeat service	4.6.8
TIME	Time stamp object	4.6.9
EMCY	Emergency object	4.6.12
General NMT	General Network Management service	4.8
NMT master	Network Management Master service	
Boot-up	Device boot-Up message service	4.8.2
Flying master	Flexible network management	4.8.10
LSS	Layer Setting Service for devices	4.8.11
Configuration manager	Mechanism for the configuration of the Object Dictionary of other CANopen® devices	4.8.12
Profile CiA®-405 V2.0	Device profile for IEC 61131-3 programmable device	4.9
Layer 2 Message mode	Layer 2 message transmission and receive mode	3.6

Tab. 4-1: *Function list*

4.2 Function Modes

The ME3CAN1-Q has three different function modes. The function mode is set up by Un\G21. For further information on how to set the function mode, refer to section 3.5.2.

Function mode	Description
11 bit CAN-ID Layer 2 mode	This mode supports full access to layer 2 of the CAN communication protocol. Layer 2 messages with 11 bits identifier can be sent and received in this mode.
29 bit CAN-ID Layer 2 mode	This mode supports full access to Layer 2 of the CAN communication protocol. Layer 2 messages with 29 bits identifier can be sent and received in this mode.
CANopen® 405 mode	This mode supports the CANopen® CiA® 405 IEC 61131-3 Programmable Device Profile.

Tab. 4-2: *Function modes of the ME3CAN1-Q*

4.3 Object Dictionary

The Object Dictionary (OD) is a structure for data organization within the CANopen® network. The data within the Object Dictionary is used to set CAN bus parameters, initialize special functions, control data flow, store data in many formats and send emergency messages.

The Object Dictionary is structured in indexes and sub-indexes. Each index addresses a single parameter, a set of parameters, network input/output data or other data. A sub-index addresses a subset of the parameter or data of the index.

Index (hex)	Object	Reference (Section)
0000	Not used	—
0001–009F	Data type definitions	4.5
00A0–0FFF	Reserved	—
1000–1FFF	Communication profile area (CiA®-301/CiA-302)	4.6 4.8
2000–5FFF	Manufacturer-specific profile area	
6000–9FFF	Reserved	—
A000–AFFF	Standardized profile area (CiA®-405)	4.9
B000–FFFF	Reserved	—

Tab. 4-3: *General layout of the CANopen® standard Object Dictionary*

4.4 Command Interface

The Command Interface (CIF) provides access to the Object Dictionary of the ME3CAN-Q and other CANopen® nodes in the network. The various CIF functions can be used for SDO read/write, configuring/mapping RPDO and TPDO, configuring Node Guarding, Heartbeat, Emergency Messages and others.

For details, please refer to chapter 5.

Command interface	Function mode			Reference (Section)
	Mode 405	Layer 2 mode		
		11 bit	29 bit	
SDO request	●	○	○	5.1
Send Emergency Message	●	○	○	5.2
Display current parameter	●	●	●	5.3
Sending Layer 2 Message	○	●	●	3.6.7

Tab. 4-4: *Overview of command interface*

●: Applicable, ○: Not applicable

4.5 Data Type Definition Area

Static data types are placed in the Object Dictionary for definition purposes only. Indexes 0002H to 0008H may be mapped in order to define the appropriate space in the RPDO as not being used by the device. An SDO access results in an error.

For details, please refer to section 4.6.5.

Index (hex)	Sub-index (hex)	Object	Description		Data type
0001	00	Data type definition	Reserved		—
0002	00		Signed	8 bit	I8
0003	00			16 bit	I16
0004	00			32 bit	I32
0005	00		Unsigned	8 bit	U8
0006	00			16 bit	U16
0007	00			32 bit	U32
0008	00		Float	32 bit	Real32
0009–009F	00		Reserved		—

Tab. 4-5: *Data type definition*

4.6 Communication Profile Area

The table below provides a brief description and reference information for the ME3CAN1-Q CANopen® Object Dictionary.

Index (hex)	Sub-index (hex)	Object	Description	Data type	Initial value ①	R/W ②	Stored to Flash ROM ③
1000	00	Device Type	Describes the device profile or the application profile. Can be changed by setting the mode value in Un\G21.	U32	405	R	—
1001	00	Error Register	Refer to section 4.6.2	U8	0H	R	—
1002	00	Reserved	—	—	—	—	—
1003	00	Pre-defined error field	Refer to section 4.6.3	U8	0H	R/W	—
	01–0F			U32	0H	R	
1004	00	Reserved	—	—	—	—	—
1005	00	COB-ID of SYNC message	Refer to section 4.6.6	U32	H80	R/W	✔
1006	00	Communication Cycle Period	Refer to section 4.6.6	U32	0H	R/W	✔
1007	00	Reserved	—	—	—	—	—
1008	00	Device Name	9 Byte ASCII String	Visible String	ME3CAN1-Q	R	—
1009	00	Hardware Version	4 Byte ASCII String		1.00	R	—
100A	00	Software Version	4 Byte ASCII String		1.00	R	—
100B	00	Reserved	—	—	—	—	—
100C	00	Guard time	Refer to section 4.6.7	U16	0H	R/W	✔
100D	00	Life time factor	Refer to section 4.6.7	U8	0H	R/W	✔
100E–100F	00	Reserved	—	—	—	—	—
1010	00	Store parameters	Highest sub-index	U8	01H	R	—
	01		Save all parameters Refer to section 4.6.10	U32	1H	R/W	
1011	00	Restore default parameters	Highest sub-index	U8	01H	R	—
	01		Restore all parameters Refer to section 4.6.11	U32	1H	R/W	
1012	00	COB-ID Time	Refer to section 4.6.9	U32	8000H 0100	R/W	✔
1013	00	Reserved	—	—	—	—	—
1014	00	COB-ID EMCY	Refer to section 4.6.12	U32	80H + Node ID	R	—
1015	00	Inhibit Time EMCY	Refer to section 4.6.12	U16	0H	R/W	✔
1016	00	Consumer heartbeat time	Highest sub-index	U8	7FH	R	—
	01–7F		Refer to section 4.6.8	U32	0H	R/W	✔
1017	00	Producer heartbeat time	Refer to section 4.6.8	U16	0	R/W	✔
1018	00	Identity Object	Highest sub-index	U8	03H	R	—
	01		Vendor-ID	U32	71H		
	02		Product Code	U32	ED63H		
	03		Revision Number	U32	10000H		
1019–101F	00	Reserved	—	—	—	—	—
1020	00	Verify Configuration	Highest sub-index	U8	02H	R	—
	01		Refer to section 4.8.12	U32	0H	R/W	✔
	02			U32	0H	R/W	✔
1021–1027	00	Reserved	—	—	—	—	—
1028	00	Emergency consumer object	Highest sub-index	U8	7FH	R	—
	01–7F		Refer to section 4.6.12	U32	80H + Node ID	R/W	✔
1029	00	Error behavior	Highest sub-index	U8	01H	R	—
	01		Refer to section 4.7	U8	0H	R/W	✔
102A	00	NMT inhibit time	Refer to section 4.8.6	U16	0H	R	—

Tab. 4-6: *Communication profile area of the ME3CAN1-Q*

Index (hex)	Sub-index (hex)	Object	Description		Data type	Initial value ①	R/W ②	Stored to Flash ROM ③
102B–13FF	00	Reserved	—		—	—	—	—
1400–14FF	00	RPDO communication parameter	Highest sub-index		U8	Refer to table 4-7		—
	01		Refer to section 4.6.5	COB-ID	U32			✔
	02			Transmission type	U8			✔
1500–15FF	00	Reserved	—		—	—	—	—
1600–17FF	00	RPDO mapping parameter	Refer to section 4.6.5	Number of valid object entries	U8	Refer to table 4-8		✔
	01			1st mapped object	U32			
	02			2nd mapped object	U32			
	03			3rd mapped object	U32			
	04			4th mapped object	U32			
	05			5th mapped object	U32			
	06			6th mapped object	U32			
	07			7th mapped object	U32			
	08			8th mapped object	U32			
1800–18FF	00	TPDO communication parameter	Highest sub-index		U8	Refer to table 4-9		—
	01		Refer to section 4.6.5	COB–ID	U32			✔
	02			Transmission type	U8			✔
	03			Inhibit time	U16			✔
	04			Compatibility entry	U8			—
	05			Event timer	U16			✔
1900–19FF	00	Reserved	—		—	—	—	—
1A00–1BFF	00	TPDO mapping parameter	Refer to section 4.6.5	Number of valid object entries	U8	Refer to table 4-10		✔
	01			1st Mapped object	U32			
	02			2nd Mapped object	U32			
	03			3rd Mapped object	U32			
	04			4th Mapped object	U32			
	05			5th Mapped object	U32			
	06			6th Mapped object	U32			
	07			7th Mapped object	U32			
	08			8th Mapped object	U32			
1C00–1F21	00	Reserved	—		—	—	—	—
1F22	00	Concise DCF	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.12	Node ID value	DOMAIN	—	R/W	
1F23–1F24	00	Reserved	—		—	—	—	—
1F25	00	Configuration request	Highest sub-index		U8	80H	R	—
	01–7F		Refer to section 4.8.12	Node ID value	U32	0H	W	
	80			All Nodes				
1F26	00	Expected configuration date	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.12	Node ID value	U32	0H	R/W	

Tab. 4-6: *Communication profile area of the ME3CAN1-Q*

Index (hex)	Sub-index (hex)	Object	Description		Data type	Initial value ①	R/W ②	Stored to Flash ROM ③
1F27	00	Expected configuration time	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.12	Node ID value	U32	0H	R/W	✔
1F28–1F7F	00	Reserved	—		—	—	—	—
1F80	00	NMT start-up	Refer to section 4.8.5		U32	0H	R/W	✔
1F81	00	NMT slave assignment	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.6	Node ID value	U32	0H	R/W	✔
1F82	00	Request NMT	Highest sub-index		U8	80H	R	—
	01–7F		Refer to section 4.8.8	Node ID value	U8	0H	R/W	
	80			All Nodes		—	W	
1F83	00	Request node guarding	Highest sub-index		U8	80H	R	—
	01–7F		Refer to section 4.8.9	Node ID value	U8	0H	R/W	
	80			All Nodes			W	
1F84	00	Device type	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.4		U32	0H	R/W	✔
1F85	00	Vendor identification	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.4		U32	0H	R/W	✔
1F86	00	Product code	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.4		U32	0H	R/W	✔
1F87	00	Revision number	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.4		U32	0H	R/W	✔
1F88	00	Serial number	Highest sub-index		U8	7FH	R	—
	01–7F		Refer to section 4.8.4		U32	0H	R/W	✔
1F89	00	Boot time	Refer to section 4.8.6		U32	0H	R/W	✔
1F8A–1F8F	00	Reserved	—		—	—	—	—
1F90	00	NMT flying master timing parameters	Highest sub-index		U8	06H	R	—
	01		Refer to section 4.8.10	NMT master time out	U16	100	R/W	✔
	02			NMT master negotiation time delay	U16	500	R/W	
	03			NMT master priority	U16	1	R/W	
	04			Priority time slot	U16	1500	R/W	
	05			CANopen® device time slot	U16	10	R/W	
	06			Multiple NMT master detect cycle time	U16	4000 + 10 * Node ID	R/W	
1F91–1FFF	00	Reserved	—		—	—	—	—

Tab. 4-6: *Communication profile area of the ME3CAN1-Q*

① The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

② Indicates whether reading from and writing to CAN bus are enabled.
R: Read enabled
W: Write enabled

③ Data will be saved in the Flash ROM by using the Store Parameter command in index 1010H. Be careful with write handling. The maximum number of writes to the built-in flash ROM is 10,000 times.

Mode 405 RPDO communication parameter

Index (hex)	Default value of Sub-index (hex)		
	00H R ①	01H R/W ①②	02H R/W ①②
1400	2	200 + Node ID	FE
1401	2	300 + Node ID	FE
1402	2	400 + Node ID	FE
1403	2	500 + Node ID	FE
1404–14FF	2	80000000	FE

Tab. 4-7: *Mode 405 RPDO communication parameter*

① R = Read access

② W = Write access

Mode 405 RPDO mapping parameter

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1600	4	A5800110	A5800210	A5800310	A5800410	0	0	0	0
1601	4	A5800510	A5800610	A5800710	A5800810	0	0	0	0
1602	4	A5800910	A5800A10	A5800B10	A5800C10	0	0	0	0
1603	4	A5800D10	A5800E10	A5800F10	A5801010	0	0	0	0
1604	4	A5801110	A5801210	A5801310	A5801410	0	0	0	0
1605	4	A5801510	A5801610	A5801710	A5801810	0	0	0	0
1606	4	A5801910	A5801A10	A5801B10	A5801C10	0	0	0	0
1607	4	A5801D10	A5801E10	A5801F10	A5802010	0	0	0	0
1608	4	A5802110	A5802210	A5802310	A5802410	0	0	0	0
1609	4	A5802510	A5802610	A5802710	A5802810	0	0	0	0
160A	4	A5802910	A5802A10	A5802B10	A5802C10	0	0	0	0
160B	4	A5802D10	A5802E10	A5802F10	A5803010	0	0	0	0
160C	4	A5803110	A5803210	A5803310	A5803410	0	0	0	0
160D	4	A5803510	A5803610	A5803710	A5803810	0	0	0	0
160E	4	A5803910	A5803A10	A5803B10	A5803C10	0	0	0	0
160F	4	A5803D10	A5803E10	A5803F10	A5804010	0	0	0	0
1610	4	A5804110	A5804210	A5804310	A5804410	0	0	0	0
1611	4	A5804510	A5804610	A5804710	A5804810	0	0	0	0
1612	4	A5804910	A5804A10	A5804B10	A5804C10	0	0	0	0
1613	4	A5804D10	A5804E10	A5804F10	A5805010	0	0	0	0
1614	4	A5805110	A5805210	A5805310	A5805410	0	0	0	0
1615	4	A5805510	A5805610	A5805710	A5805810	0	0	0	0
1616	4	A5805910	A5805A10	A5805B10	A5805C10	0	0	0	0
1617	4	A5805D10	A5805E10	A5805F10	A5806010	0	0	0	0
1618	4	A5806110	A5806210	A5806310	A5806410	0	0	0	0
1619	4	A5806510	A5806610	A5806710	A5806810	0	0	0	0
161A	4	A5806910	A5806A10	A5806B10	A5806C10	0	0	0	0
161B	4	A5806D10	A5806E10	A5806F10	A5807010	0	0	0	0
161C	4	A5807110	A5807210	A5807310	A5807410	0	0	0	0
161D	4	A5807510	A5807610	A5807710	A5807810	0	0	0	0
161E	4	A5807910	A5807A10	A5807B10	A5807C10	0	0	0	0
161F	4	A5807D10	A5807E10	A5807F10	A5808010	0	0	0	0
1620	4	A5808110	A5808210	A5808310	A5808410	0	0	0	0
1621	4	A5808510	A5808610	A5808710	A5808810	0	0	0	0
1622	4	A5808910	A5808A10	A5808B10	A5808C10	0	0	0	0

Tab. 4-8: *Mode 405 RPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1623	4	A5808D10	A5808E10	A5808F10	A5809010	0	0	0	0
1624	4	A5809110	A5809210	A5809310	A5809410	0	0	0	0
1625	4	A5809510	A5809610	A5809710	A5809810	0	0	0	0
1626	4	A5809910	A5809A10	A5809B10	A5809C10	0	0	0	0
1627	4	A5809D10	A5809E10	A5809F10	A580A010	0	0	0	0
1628	4	A580A110	A580A210	A580A310	A580A410	0	0	0	0
1629	4	A580A510	A580A610	A580A710	A580A810	0	0	0	0
162A	4	A580A910	A580AA10	A580AB10	A580AC10	0	0	0	0
162B	4	A580AD10	A580AE10	A580AF10	A580B010	0	0	0	0
162C	4	A580B110	A580B210	A580B310	A580B410	0	0	0	0
162D	4	A580B510	A580B610	A580B710	A580B810	0	0	0	0
162E	4	A580B910	A580BA10	A580BB10	A580BC10	0	0	0	0
162F	4	A580BD10	A580BE10	A580BF10	A580C010	0	0	0	0
1630	4	A580C110	A580C210	A580C310	A580C410	0	0	0	0
1631	4	A580C510	A580C610	A580C710	A580C810	0	0	0	0
1632	4	A580C910	A580CA10	A580CB10	A580CC10	0	0	0	0
1633	4	A580CD10	A580CE10	A580CF10	A580D010	0	0	0	0
1634	4	A580D110	A580D210	A580D310	A580D410	0	0	0	0
1635	4	A580D510	A580D610	A580D710	A580D810	0	0	0	0
1636	4	A580D910	A580DA10	A580DB10	A580DC10	0	0	0	0
1637	4	A580DD10	A580DE10	A580DF10	A580E010	0	0	0	0
1638	4	A580E110	A580E210	A580E310	A580E410	0	0	0	0
1639	4	A580E510	A580E610	A580E710	A580E810	0	0	0	0
163A	4	A580E910	A580EA10	A580EB10	A580EC10	0	0	0	0
163B	4	A580ED10	A580EE10	A580EF10	A580F010	0	0	0	0
163C	4	A580F110	A580F210	A580F310	A580F410	0	0	0	0
163D	4	A580F510	A580F610	A580F710	A580F810	0	0	0	0
163E	4	A580F910	A580FA10	A580FB10	A580FC10	0	0	0	0
163F	4	A580FD10	A580FE10	A5810110	A5810210	0	0	0	0
1640	4	A5810310	A5810410	A5810510	A5810610	0	0	0	0
1641	4	A5810710	A5810810	A5810910	A5810A10	0	0	0	0
1642	4	A5810B10	A5810C10	A5810D10	A5810E10	0	0	0	0
1643	4	A5810F10	A5811010	A5811110	A5811210	0	0	0	0
1644	4	A5811310	A5811410	A5811510	A5811610	0	0	0	0
1645	4	A5811710	A5811810	A5811910	A5811A10	0	0	0	0
1646	4	A5811B10	A5811C10	A5811D10	A5811E10	0	0	0	0
1647	4	A5811F10	A5812010	A5812110	A5812210	0	0	0	0
1648	4	A5812310	A5812410	A5812510	A5812610	0	0	0	0
1649	4	A5812710	A5812810	A5812910	A5812A10	0	0	0	0
164A	4	A5812B10	A5812C10	A5812D10	A5812E10	0	0	0	0
164B	4	A5812F10	A5813010	A5813110	A5813210	0	0	0	0
164C	4	A5813310	A5813410	A5813510	A5813610	0	0	0	0
164D	4	A5813710	A5813810	A5813910	A5813A10	0	0	0	0
164E	4	A5813B10	A5813C10	A5813D10	A5813E10	0	0	0	0
164F	4	A5813F10	A5814010	A5814110	A5814210	0	0	0	0
1650	4	A5814310	A5814410	A5814510	A5814610	0	0	0	0
1651	4	A5814710	A5814810	A5814910	A5814A10	0	0	0	0
1652	4	A5814B10	A5814C10	A5814D10	A5814E10	0	0	0	0
1653	4	A5814F10	A5815010	A5815110	A5815210	0	0	0	0
1654	4	A5815310	A5815410	A5815510	A5815610	0	0	0	0
1655	4	A5815710	A5815810	A5815910	A5815A10	0	0	0	0
1656	4	A5815B10	A5815C10	A5815D10	A5815E10	0	0	0	0
1657	4	A5815F10	A5816010	A5816110	A5816210	0	0	0	0

Tab. 4-8: *Mode 405 RPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1658	4	A5816310	A5816410	A5816510	A5816610	0	0	0	0
1659	4	A5816710	A5816810	A5816910	A5816A10	0	0	0	0
165A	4	A5816B10	A5816C10	A5816D10	A5816E10	0	0	0	0
165B	4	A5816F10	A5817010	A5817110	A5817210	0	0	0	0
165C	4	A5817310	A5817410	A5817510	A5817610	0	0	0	0
165D	4	A5817710	A5817810	A5817910	A5817A10	0	0	0	0
165E	4	A5817B10	A5817C10	A5817D10	A5817E10	0	0	0	0
165F	4	A5817F10	A5818010	A5818110	A5818210	0	0	0	0
1660	4	A5818310	A5818410	A5818510	A5818610	0	0	0	0
1661	4	A5818710	A5818810	A5818910	A5818A10	0	0	0	0
1662	4	A5818B10	A5818C10	A5818D10	A5818E10	0	0	0	0
1663	4	A5818F10	A5819010	A5819110	A5819210	0	0	0	0
1664	4	A5819310	A5819410	A5819510	A5819610	0	0	0	0
1665	4	A5819710	A5819810	A5819910	A5819A10	0	0	0	0
1666	4	A5819B10	A5819C10	A5819D10	A5819E10	0	0	0	0
1667	4	A5819F10	A581A010	A581A110	A581A210	0	0	0	0
1668	4	A581A310	A581A410	A581A510	A581A610	0	0	0	0
1669	4	A581A710	A581A810	A581A910	A581AA10	0	0	0	0
166A	4	A581AB10	A581AC10	A581AD10	A581AE10	0	0	0	0
166B	4	A581AF10	A581B010	A581B110	A581B210	0	0	0	0
166C	4	A581B310	A581B410	A581B510	A581B610	0	0	0	0
166D	4	A581B710	A581B810	A581B910	A581BA10	0	0	0	0
166E	4	A581BB10	A581BC10	A581BD10	A581BE10	0	0	0	0
166F	4	A581BF10	A581C010	A581C110	A581C210	0	0	0	0
1670	4	A581C310	A581C410	A581C510	A581C610	0	0	0	0
1671	4	A581C710	A581C810	A581C910	A581CA10	0	0	0	0
1672	4	A581CB10	A581CC10	A581CD10	A581CE10	0	0	0	0
1673	4	A581CF10	A581D010	A581D110	A581D210	0	0	0	0
1674	4	A581D310	A581D410	A581D510	A581D610	0	0	0	0
1675	4	A581D710	A581D810	A581D910	A581DA10	0	0	0	0
1676	4	A581DB10	A581DC10	A581DD10	A581DE10	0	0	0	0
1677	4	A581DF10	A581E010	A581E110	A581E210	0	0	0	0
1678	4	A581E310	A581E410	A581E510	A581E610	0	0	0	0
1679	4	A581E710	A581E810	A581E910	A581EA10	0	0	0	0
167A	4	A581EB10	A581EC10	A581ED10	A581EE10	0	0	0	0
167B	4	A581EF10	A581F010	A581F110	A581F210	0	0	0	0
167C	4	A581F310	A581F410	A581F510	A581F610	0	0	0	0
167D	4	A581F710	A581F810	A581F910	A581FA10	0	0	0	0
167E	4	A581FB10	A581FC10	A581FD10	A581FE10	0	0	0	0
167F	4	A5820110	A5820210	A5820310	A5820410	0	0	0	0
1680	4	A5820510	A5820610	A5820710	A5820810	0	0	0	0
1681	4	A5820910	A5820A10	A5820B10	A5820C10	0	0	0	0
1682	4	A5820D10	A5820E10	A5820F10	A5821010	0	0	0	0
1683	4	A5821110	A5821210	A5821310	A5821410	0	0	0	0
1684	4	A5821510	A5821610	A5821710	A5821810	0	0	0	0
1685	4	A5821910	A5821A10	A5821B10	A5821C10	0	0	0	0
1686	4	A5821D10	A5821E10	A5821F10	A5822010	0	0	0	0
1687	4	A5822110	A5822210	A5822310	A5822410	0	0	0	0
1688	4	A5822510	A5822610	A5822710	A5822810	0	0	0	0
1689	4	A5822910	A5822A10	A5822B10	A5822C10	0	0	0	0
168A	4	A5822D10	A5822E10	A5822F10	A5823010	0	0	0	0
168B	4	A5823110	A5823210	A5823310	A5823410	0	0	0	0
168C	4	A5823510	A5823610	A5823710	A5823810	0	0	0	0

Tab. 4-8: *Mode 405 RPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
168D	4	A5823910	A5823A10	A5823B10	A5823C10	0	0	0	0
168E	4	A5823D10	A5823E10	A5823F10	A5824010	0	0	0	0
168F	4	A5824110	A5824210	A5824310	A5824410	0	0	0	0
1690	4	A5824510	A5824610	A5824710	A5824810	0	0	0	0
1691	4	A5824910	A5824A10	A5824B10	A5824C10	0	0	0	0
1692	4	A5824D10	A5824E10	A5824F10	A5825010	0	0	0	0
1693	4	A5825110	A5825210	A5825310	A5825410	0	0	0	0
1694	4	A5825510	A5825610	A5825710	A5825810	0	0	0	0
1695	4	A5825910	A5825A10	A5825B10	A5825C10	0	0	0	0
1696	4	A5825D10	A5825E10	A5825F10	A5826010	0	0	0	0
1697	4	A5826110	A5826210	A5826310	A5826410	0	0	0	0
1698	4	A5826510	A5826610	A5826710	A5826810	0	0	0	0
1699	4	A5826910	A5826A10	A5826B10	A5826C10	0	0	0	0
169A	4	A5826D10	A5826E10	A5826F10	A5827010	0	0	0	0
169B	4	A5827110	A5827210	A5827310	A5827410	0	0	0	0
169C	4	A5827510	A5827610	A5827710	A5827810	0	0	0	0
169D	4	A5827910	A5827A10	A5827B10	A5827C10	0	0	0	0
169E	4	A5827D10	A5827E10	A5827F10	A5828010	0	0	0	0
169F	4	A5828110	A5828210	A5828310	A5828410	0	0	0	0
16A0	4	A5828510	A5828610	A5828710	A5828810	0	0	0	0
16A1	4	A5828910	A5828A10	A5828B10	A5828C10	0	0	0	0
16A2	4	A5828D10	A5828E10	A5828F10	A5829010	0	0	0	0
16A3	4	A5829110	A5829210	A5829310	A5829410	0	0	0	0
16A4	4	A5829510	A5829610	A5829710	A5829810	0	0	0	0
16A5	4	A5829910	A5829A10	A5829B10	A5829C10	0	0	0	0
16A6	4	A5829D10	A5829E10	A5829F10	A582A010	0	0	0	0
16A7	4	A582A110	A582A210	A582A310	A582A410	0	0	0	0
16A8	4	A582A510	A582A610	A582A710	A582A810	0	0	0	0
16A9	4	A582A910	A582AA10	A582AB10	A582AC10	0	0	0	0
16AA	4	A582AD10	A582AE10	A582AF10	A582B010	0	0	0	0
16AB	4	A582B110	A582B210	A582B310	A582B410	0	0	0	0
16AC	4	A582B510	A582B610	A582B710	A582B810	0	0	0	0
16AD	4	A582B910	A582BA10	A582BB10	A582BC10	0	0	0	0
16AE	4	A582BD10	A582BE10	A582BF10	A582C010	0	0	0	0
16AF	4	A582C110	A582C210	A582C310	A582C410	0	0	0	0
16B0	4	A582C510	A582C610	A582C710	A582C810	0	0	0	0
16B1	4	A582C910	A582CA10	A582CB10	A582CC10	0	0	0	0
16B2	4	A582CD10	A582CE10	A582CF10	A582D010	0	0	0	0
16B3	4	A582D110	A582D210	A582D310	A582D410	0	0	0	0
16B4	4	A582D510	A582D610	A582D710	A582D810	0	0	0	0
16B5	4	A582D910	A582DA10	A582DB10	A582DC10	0	0	0	0
16B6	4	A582DD10	A582DE10	A582DF10	A582E010	0	0	0	0
16B7	4	A582E110	A582E210	A582E310	A582E410	0	0	0	0
16B8	4	A582E510	A582E610	A582E710	A582E810	0	0	0	0
16B9	4	A582E910	A582EA10	A582EB10	A582EC10	0	0	0	0
16BA	4	A582ED10	A582EE10	A582EF10	A582F010	0	0	0	0
16BB	4	A582F110	A582F210	A582F310	A582F410	0	0	0	0
16BC	4	A582F510	A582F610	A582F710	A582F810	0	0	0	0
16BD	4	A582F910	A582FA10	A582FB10	A582FC10	0	0	0	0
16BE	4	A582FD10	A582FE10	A5830110	A5830210	0	0	0	0
16BF	4	A5830310	A5830410	A5830510	A5830610	0	0	0	0
16C0	4	A5830710	A5830810	A5830910	A5830A10	0	0	0	0
16C1	4	A5830B10	A5830C10	A5830D10	A5830E10	0	0	0	0

Tab. 4-8: *Mode 405 RPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
16C2	4	A5830F10	A5831010	A5831110	A5831210	0	0	0	0
16C3	4	A5831310	A5831410	A5831510	A5831610	0	0	0	0
16C4	4	A5831710	A5831810	A5831910	A5831A10	0	0	0	0
16C5	4	A5831B10	A5831C10	A5831D10	A5831E10	0	0	0	0
16C6	4	A5831F10	A5832010	A5832110	A5832210	0	0	0	0
16C7	4	A5832310	A5832410	A5832510	A5832610	0	0	0	0
16C8	4	A5832710	A5832810	A5832910	A5832A10	0	0	0	0
16C9	4	A5832B10	A5832C10	A5832D10	A5832E10	0	0	0	0
16CA	4	A5832F10	A5833010	A5833110	A5833210	0	0	0	0
16CB	4	A5833310	A5833410	A5833510	A5833610	0	0	0	0
16CC	4	A5833710	A5833810	A5833910	A5833A10	0	0	0	0
16CD	4	A5833B10	A5833C10	A5833D10	A5833E10	0	0	0	0
16CE	4	A5833F10	A5834010	A5834110	A5834210	0	0	0	0
16CF	4	A5834310	A5834410	A5834510	A5834610	0	0	0	0
16D0	4	A5834710	A5834810	A5834910	A5834A10	0	0	0	0
16D1	4	A5834B10	A5834C10	A5834D10	A5834E10	0	0	0	0
16D2	4	A5834F10	A5835010	A5835110	A5835210	0	0	0	0
16D3	4	A5835310	A5835410	A5835510	A5835610	0	0	0	0
16D4	4	A5835710	A5835810	A5835910	A5835A10	0	0	0	0
16D5	4	A5835B10	A5835C10	A5835D10	A5835E10	0	0	0	0
16D6	4	A5835F10	A5836010	A5836110	A5836210	0	0	0	0
16D7	4	A5836310	A5836410	A5836510	A5836610	0	0	0	0
16D8	4	A5836710	A5836810	A5836910	A5836A10	0	0	0	0
16D9	4	A5836B10	A5836C10	A5836D10	A5836E10	0	0	0	0
16DA	4	A5836F10	A5837010	A5837110	A5837210	0	0	0	0
16DB	4	A5837310	A5837410	A5837510	A5837610	0	0	0	0
16DC	4	A5837710	A5837810	A5837910	A5837A10	0	0	0	0
16DD	4	A5837B10	A5837C10	A5837D10	A5837E10	0	0	0	0
16DE	4	A5837F10	A5838010	A5838110	A5838210	0	0	0	0
16DF	4	A5838310	A5838410	A5838510	A5838610	0	0	0	0
16E0	4	A5838710	A5838810	A5838910	A5838A10	0	0	0	0
16E1	4	A5838B10	A5838C10	A5838D10	A5838E10	0	0	0	0
16E2	4	A5838F10	A5839010	A5839110	A5839210	0	0	0	0
16E3	4	A5839310	A5839410	A5839510	A5839610	0	0	0	0
16E4	4	A5839710	A5839810	A5839910	A5839A10	0	0	0	0
16E5	4	A5839B10	A5839C10	A5839D10	A5839E10	0	0	0	0
16E6	4	A5839F10	A583A010	A583A110	A583A210	0	0	0	0
16E7	4	A583A310	A583A410	A583A510	A583A610	0	0	0	0
16E8	4	A583A710	A583A810	A583A910	A583AA10	0	0	0	0
16E9	4	A583AB10	A583AC10	A583AD10	A583AE10	0	0	0	0
16EA	4	A583AF10	A583B010	A583B110	A583B210	0	0	0	0
16EB	4	A583B310	A583B410	A583B510	A583B610	0	0	0	0
16EC	4	A583B710	A583B810	A583B910	A583BA10	0	0	0	0
16ED	4	A583BB10	A583BC10	A583BD10	A583BE10	0	0	0	0
16EE	4	A583BF10	A583C010	A583C110	A583C210	0	0	0	0
16EF	4	A583C310	A583C410	A583C510	A583C610	0	0	0	0
16F0	4	A583C710	A583C810	A583C910	A583CA10	0	0	0	0
16F1	4	A583CB10	A583CC10	A583CD10	A583CE10	0	0	0	0
16F2	4	A583CF10	A583D010	A583D110	A583D210	0	0	0	0
16F3	4	A583D310	A583D410	A583D510	A583D610	0	0	0	0
16F4	4	A583D710	A583D810	A583D910	A583DA10	0	0	0	0
16F5	4	A583DB10	A583DC10	A583DD10	A583DE10	0	0	0	0
16F6	4	A583DF10	A583E010	A583E110	A583E210	0	0	0	0

Tab. 4-8: *Mode 405 RPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
16F7	4	A583E310	A583E410	A583E510	A583E610	0	0	0	0
16F8	4	A583E710	A583E810	A583E910	A583EA10	0	0	0	0
16F9	4	A583EB10	A583EC10	A583ED10	A583EE10	0	0	0	0
16FA	4	A583EF10	A583F010	A583F110	A583F210	0	0	0	0
16FB	4	A583F310	A583F410	A583F510	A583F610	0	0	0	0
16FC	4	A583F710	A583F810	A583F910	A583FA10	0	0	0	0
16FD	4	A583FB10	A583FC10	A583FD10	A583FE10	0	0	0	0
16FE	4	A5840110	A5840210	A5840310	A5840410	0	0	0	0
16FF	4	A5840510	A5840610	A5840710	A5840810	0	0	0	0

Tab. 4-8: *Mode 405 RPDO mapping parameter*

① R/W = Read/write access

Mode 405 TPDO communication parameter

Index (hex)	Default value of Sub-index (hex)					
	00H R ①	01H R/W ①②	02H R/W ①②	03H R/W ①②	04H —	05H R/W ①②
1800	5	4000 0180 + Node ID	FE	0	Reserved	0
1801	5	4000 0280 + Node ID	FE	0	Reserved	0
1802	5	4000 0380 + Node ID	FE	0	Reserved	0
1803	5	4000 0480 + Node ID	FE	0	Reserved	0
1804–18FF	5	C0000000	FE	0	Reserved	0

Tab. 4-9: *Mode 405 TPDO communication parameter*

① R = Read access
② W = Write access

Mode 405 TPDO mapping parameter

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1A00	4	A1000110	A1000210	A1000310	A1000410	0	0	0	0
1A01	4	A1000510	A1000610	A1000710	A1000810	0	0	0	0
1A02	4	A1000910	A1000A10	A1000B10	A1000C10	0	0	0	0
1A03	4	A1000D10	A1000E10	A1000F10	A1001010	0	0	0	0
1A04	4	A1001110	A1001210	A1001310	A1001410	0	0	0	0
1A05	4	A1001510	A1001610	A1001710	A1001810	0	0	0	0
1A06	4	A1001910	A1001A10	A1001B10	A1001C10	0	0	0	0
1A07	4	A1001D10	A1001E10	A1001F10	A1002010	0	0	0	0
1A08	4	A1002110	A1002210	A1002310	A1002410	0	0	0	0
1A09	4	A1002510	A1002610	A1002710	A1002810	0	0	0	0
1A0A	4	A1002910	A1002A10	A1002B10	A1002C10	0	0	0	0
1A0B	4	A1002D10	A1002E10	A1002F10	A1003010	0	0	0	0
1A0C	4	A1003110	A1003210	A1003310	A1003410	0	0	0	0
1A0D	4	A1003510	A1003610	A1003710	A1003810	0	0	0	0
1A0E	4	A1003910	A1003A10	A1003B10	A1003C10	0	0	0	0
1A0F	4	A1003D10	A1003E10	A1003F10	A1004010	0	0	0	0
1A10	4	A1004110	A1004210	A1004310	A1004410	0	0	0	0
1A11	4	A1004510	A1004610	A1004710	A1004810	0	0	0	0

Tab. 4-10: *Mode 405 TPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1A12	4	A1004910	A1004A10	A1004B10	A1004C10	0	0	0	0
1A13	4	A1004D10	A1004E10	A1004F10	A1005010	0	0	0	0
1A14	4	A1005110	A1005210	A1005310	A1005410	0	0	0	0
1A15	4	A1005510	A1005610	A1005710	A1005810	0	0	0	0
1A16	4	A1005910	A1005A10	A1005B10	A1005C10	0	0	0	0
1A17	4	A1005D10	A1005E10	A1005F10	A1006010	0	0	0	0
1A18	4	A1006110	A1006210	A1006310	A1006410	0	0	0	0
1A19	4	A1006510	A1006610	A1006710	A1006810	0	0	0	0
1A1A	4	A1006910	A1006A10	A1006B10	A1006C10	0	0	0	0
1A1B	4	A1006D10	A1006E10	A1006F10	A1007010	0	0	0	0
1A1C	4	A1007110	A1007210	A1007310	A1007410	0	0	0	0
1A1D	4	A1007510	A1007610	A1007710	A1007810	0	0	0	0
1A1E	4	A1007910	A1007A10	A1007B10	A1007C10	0	0	0	0
1A1F	4	A1007D10	A1007E10	A1007F10	A1008010	0	0	0	0
1A20	4	A1008110	A1008210	A1008310	A1008410	0	0	0	0
1A21	4	A1008510	A1008610	A1008710	A1008810	0	0	0	0
1A22	4	A1008910	A1008A10	A1008B10	A1008C10	0	0	0	0
1A23	4	A1008D10	A1008E10	A1008F10	A1009010	0	0	0	0
1A24	4	A1009110	A1009210	A1009310	A1009410	0	0	0	0
1A25	4	A1009510	A1009610	A1009710	A1009810	0	0	0	0
1A26	4	A1009910	A1009A10	A1009B10	A1009C10	0	0	0	0
1A27	4	A1009D10	A1009E10	A1009F10	A100A010	0	0	0	0
1A28	4	A100A110	A100A210	A100A310	A100A410	0	0	0	0
1A29	4	A100A510	A100A610	A100A710	A100A810	0	0	0	0
1A2A	4	A100A910	A100AA10	A100AB10	A100AC10	0	0	0	0
1A2B	4	A100AD10	A100AE10	A100AF10	A100B010	0	0	0	0
1A2C	4	A100B110	A100B210	A100B310	A100B410	0	0	0	0
1A2D	4	A100B510	A100B610	A100B710	A100B810	0	0	0	0
1A2E	4	A100B910	A100BA10	A100BB10	A100BC10	0	0	0	0
1A2F	4	A100BD10	A100BE10	A100BF10	A100C010	0	0	0	0
1A30	4	A100C110	A100C210	A100C310	A100C410	0	0	0	0
1A31	4	A100C510	A100C610	A100C710	A100C810	0	0	0	0
1A32	4	A100C910	A100CA10	A100CB10	A100CC10	0	0	0	0
1A33	4	A100CD10	A100CE10	A100CF10	A100D010	0	0	0	0
1A34	4	A100D110	A100D210	A100D310	A100D410	0	0	0	0
1A35	4	A100D510	A100D610	A100D710	A100D810	0	0	0	0
1A36	4	A100D910	A100DA10	A100DB10	A100DC10	0	0	0	0
1A37	4	A100DD10	A100DE10	A100DF10	A100E010	0	0	0	0
1A38	4	A100E110	A100E210	A100E310	A100E410	0	0	0	0
1A39	4	A100E510	A100E610	A100E710	A100E810	0	0	0	0
1A3A	4	A100E910	A100EA10	A100EB10	A100EC10	0	0	0	0
1A3B	4	A100ED10	A100EE10	A100EF10	A100F010	0	0	0	0
1A3C	4	A100F110	A100F210	A100F310	A100F410	0	0	0	0
1A3D	4	A100F510	A100F610	A100F710	A100F810	0	0	0	0
1A3E	4	A100F910	A100FA10	A100FB10	A100FC10	0	0	0	0
1A3F	4	A100FD10	A100FE10	A1010110	A1010210	0	0	0	0
1A40	4	A1010310	A1010410	A1010510	A1010610	0	0	0	0
1A41	4	A1010710	A1010810	A1010910	A1010A10	0	0	0	0
1A42	4	A1010B10	A1010C10	A1010D10	A1010E10	0	0	0	0
1A43	4	A1010F10	A1011010	A1011110	A1011210	0	0	0	0
1A44	4	A1011310	A1011410	A1011510	A1011610	0	0	0	0
1A45	4	A1011710	A1011810	A1011910	A1011A10	0	0	0	0
1A46	4	A1011B10	A1011C10	A1011D10	A1011E10	0	0	0	0

Tab. 4-10: *Mode 405 TPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1A47	4	A1011F10	A1012010	A1012110	A1012210	0	0	0	0
1A48	4	A1012310	A1012410	A1012510	A1012610	0	0	0	0
1A49	4	A1012710	A1012810	A1012910	A1012A10	0	0	0	0
1A4A	4	A1012B10	A1012C10	A1012D10	A1012E10	0	0	0	0
1A4B	4	A1012F10	A1013010	A1013110	A1013210	0	0	0	0
1A4C	4	A1013310	A1013410	A1013510	A1013610	0	0	0	0
1A4D	4	A1013710	A1013810	A1013910	A1013A10	0	0	0	0
1A4E	4	A1013B10	A1013C10	A1013D10	A1013E10	0	0	0	0
1A4F	4	A1013F10	A1014010	A1014110	A1014210	0	0	0	0
1A50	4	A1014310	A1014410	A1014510	A1014610	0	0	0	0
1A51	4	A1014710	A1014810	A1014910	A1014A10	0	0	0	0
1A52	4	A1014B10	A1014C10	A1014D10	A1014E10	0	0	0	0
1A53	4	A1014F10	A1015010	A1015110	A1015210	0	0	0	0
1A54	4	A1015310	A1015410	A1015510	A1015610	0	0	0	0
1A55	4	A1015710	A1015810	A1015910	A1015A10	0	0	0	0
1A56	4	A1015B10	A1015C10	A1015D10	A1015E10	0	0	0	0
1A57	4	A1015F10	A1016010	A1016110	A1016210	0	0	0	0
1A58	4	A1016310	A1016410	A1016510	A1016610	0	0	0	0
1A59	4	A1016710	A1016810	A1016910	A1016A10	0	0	0	0
1A5A	4	A1016B10	A1016C10	A1016D10	A1016E10	0	0	0	0
1A5B	4	A1016F10	A1017010	A1017110	A1017210	0	0	0	0
1A5C	4	A1017310	A1017410	A1017510	A1017610	0	0	0	0
1A5D	4	A1017710	A1017810	A1017910	A1017A10	0	0	0	0
1A5E	4	A1017B10	A1017C10	A1017D10	A1017E10	0	0	0	0
1A5F	4	A1017F10	A1018010	A1018110	A1018210	0	0	0	0
1A60	4	A1018310	A1018410	A1018510	A1018610	0	0	0	0
1A61	4	A1018710	A1018810	A1018910	A1018A10	0	0	0	0
1A62	4	A1018B10	A1018C10	A1018D10	A1018E10	0	0	0	0
1A63	4	A1018F10	A1019010	A1019110	A1019210	0	0	0	0
1A64	4	A1019310	A1019410	A1019510	A1019610	0	0	0	0
1A65	4	A1019710	A1019810	A1019910	A1019A10	0	0	0	0
1A66	4	A1019B10	A1019C10	A1019D10	A1019E10	0	0	0	0
1A67	4	A1019F10	A101A010	A101A110	A101A210	0	0	0	0
1A68	4	A101A310	A101A410	A101A510	A101A610	0	0	0	0
1A69	4	A101A710	A101A810	A101A910	A101AA10	0	0	0	0
1A6A	4	A101AB10	A101AC10	A101AD10	A101AE10	0	0	0	0
1A6B	4	A101AF10	A101B010	A101B110	A101B210	0	0	0	0
1A6C	4	A101B310	A101B410	A101B510	A101B610	0	0	0	0
1A6D	4	A101B710	A101B810	A101B910	A101BA10	0	0	0	0
1A6E	4	A101BB10	A101BC10	A101BD10	A101BE10	0	0	0	0
1A6F	4	A101BF10	A101C010	A101C110	A101C210	0	0	0	0
1A70	4	A101C310	A101C410	A101C510	A101C610	0	0	0	0
1A71	4	A101C710	A101C810	A101C910	A101CA10	0	0	0	0
1A72	4	A101CB10	A101CC10	A101CD10	A101CE10	0	0	0	0
1A73	4	A101CF10	A101D010	A101D110	A101D210	0	0	0	0
1A74	4	A101D310	A101D410	A101D510	A101D610	0	0	0	0
1A75	4	A101D710	A101D810	A101D910	A101DA10	0	0	0	0
1A76	4	A101DB10	A101DC10	A101DD10	A101DE10	0	0	0	0
1A77	4	A101DF10	A101E010	A101E110	A101E210	0	0	0	0
1A78	4	A101E310	A101E410	A101E510	A101E610	0	0	0	0
1A79	4	A101E710	A101E810	A101E910	A101EA10	0	0	0	0
1A7A	4	A101EB10	A101EC10	A101ED10	A101EE10	0	0	0	0
1A7B	4	A101EF10	A101F010	A101F110	A101F210	0	0	0	0

Tab. 4-10: *Mode 405 TPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1A7C	4	A101F310	A101F410	A101F510	A101F610	0	0	0	0
1A7D	4	A101F710	A101F810	A101F910	A101FA10	0	0	0	0
1A7E	4	A101FB10	A101FC10	A101FD10	A101FE10	0	0	0	0
1A7F	4	A1020110	A1020210	A1020310	A1020410	0	0	0	0
1A80	4	A1020510	A1020610	A1020710	A1020810	0	0	0	0
1A81	4	A1020910	A1020A10	A1020B10	A1020C10	0	0	0	0
1A82	4	A1020D10	A1020E10	A1020F10	A1021010	0	0	0	0
1A83	4	A1021110	A1021210	A1021310	A1021410	0	0	0	0
1A84	4	A1021510	A1021610	A1021710	A1021810	0	0	0	0
1A85	4	A1021910	A1021A10	A1021B10	A1021C10	0	0	0	0
1A86	4	A1021D10	A1021E10	A1021F10	A1022010	0	0	0	0
1A87	4	A1022110	A1022210	A1022310	A1022410	0	0	0	0
1A88	4	A1022510	A1022610	A1022710	A1022810	0	0	0	0
1A89	4	A1022910	A1022A10	A1022B10	A1022C10	0	0	0	0
1A8A	4	A1022D10	A1022E10	A1022F10	A1023010	0	0	0	0
1A8B	4	A1023110	A1023210	A1023310	A1023410	0	0	0	0
1A8C	4	A1023510	A1023610	A1023710	A1023810	0	0	0	0
1A8D	4	A1023910	A1023A10	A1023B10	A1023C10	0	0	0	0
1A8E	4	A1023D10	A1023E10	A1023F10	A1024010	0	0	0	0
1A8F	4	A1024110	A1024210	A1024310	A1024410	0	0	0	0
1A90	4	A1024510	A1024610	A1024710	A1024810	0	0	0	0
1A91	4	A1024910	A1024A10	A1024B10	A1024C10	0	0	0	0
1A92	4	A1024D10	A1024E10	A1024F10	A1025010	0	0	0	0
1A93	4	A1025110	A1025210	A1025310	A1025410	0	0	0	0
1A94	4	A1025510	A1025610	A1025710	A1025810	0	0	0	0
1A95	4	A1025910	A1025A10	A1025B10	A1025C10	0	0	0	0
1A96	4	A1025D10	A1025E10	A1025F10	A1026010	0	0	0	0
1A97	4	A1026110	A1026210	A1026310	A1026410	0	0	0	0
1A98	4	A1026510	A1026610	A1026710	A1026810	0	0	0	0
1A99	4	A1026910	A1026A10	A1026B10	A1026C10	0	0	0	0
1A9A	4	A1026D10	A1026E10	A1026F10	A1027010	0	0	0	0
1A9B	4	A1027110	A1027210	A1027310	A1027410	0	0	0	0
1A9C	4	A1027510	A1027610	A1027710	A1027810	0	0	0	0
1A9D	4	A1027910	A1027A10	A1027B10	A1027C10	0	0	0	0
1A9E	4	A1027D10	A1027E10	A1027F10	A1028010	0	0	0	0
1A9F	4	A1028110	A1028210	A1028310	A1028410	0	0	0	0
1AA0	4	A1028510	A1028610	A1028710	A1028810	0	0	0	0
1AA1	4	A1028910	A1028A10	A1028B10	A1028C10	0	0	0	0
1AA2	4	A1028D10	A1028E10	A1028F10	A1029010	0	0	0	0
1AA3	4	A1029110	A1029210	A1029310	A1029410	0	0	0	0
1AA4	4	A1029510	A1029610	A1029710	A1029810	0	0	0	0
1AA5	4	A1029910	A1029A10	A1029B10	A1029C10	0	0	0	0
1AA6	4	A1029D10	A1029E10	A1029F10	A102A010	0	0	0	0
1AA7	4	A102A110	A102A210	A102A310	A102A410	0	0	0	0
1AA8	4	A102A510	A102A610	A102A710	A102A810	0	0	0	0
1AA9	4	A102A910	A102AA10	A102AB10	A102AC10	0	0	0	0
1AAA	4	A102AD10	A102AE10	A102AF10	A102B010	0	0	0	0
1AAB	4	A102B110	A102B210	A102B310	A102B410	0	0	0	0
1AAC	4	A102B510	A102B610	A102B710	A102B810	0	0	0	0
1AAD	4	A102B910	A102BA10	A102BB10	A102BC10	0	0	0	0
1AAE	4	A102BD10	A102BE10	A102BF10	A102C010	0	0	0	0
1AAF	4	A102C110	A102C210	A102C310	A102C410	0	0	0	0
1AB0	4	A102C510	A102C610	A102C710	A102C810	0	0	0	0

Tab. 4-10: *Mode 405 TPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1AB1	4	A102C910	A102CA10	A102CB10	A102CC10	0	0	0	0
1AB2	4	A102CD10	A102CE10	A102CF10	A102D010	0	0	0	0
1AB3	4	A102D110	A102D210	A102D310	A102D410	0	0	0	0
1AB4	4	A102D510	A102D610	A102D710	A102D810	0	0	0	0
1AB5	4	A102D910	A102DA10	A102DB10	A102DC10	0	0	0	0
1AB6	4	A102DD10	A102DE10	A102DF10	A102E010	0	0	0	0
1AB7	4	A102E110	A102E210	A102E310	A102E410	0	0	0	0
1AB8	4	A102E510	A102E610	A102E710	A102E810	0	0	0	0
1AB9	4	A102E910	A102EA10	A102EB10	A102EC10	0	0	0	0
1ABA	4	A102ED10	A102EE10	A102EF10	A102F010	0	0	0	0
1ABB	4	A102F110	A102F210	A102F310	A102F410	0	0	0	0
1ABC	4	A102F510	A102F610	A102F710	A102F810	0	0	0	0
1ABD	4	A102F910	A102FA10	A102FB10	A102FC10	0	0	0	0
1ABE	4	A102FD10	A102FE10	A1030110	A1030210	0	0	0	0
1ABF	4	A1030310	A1030410	A1030510	A1030610	0	0	0	0
1AC0	4	A1030710	A1030810	A1030910	A1030A10	0	0	0	0
1AC1	4	A1030B10	A1030C10	A1030D10	A1030E10	0	0	0	0
1AC2	4	A1030F10	A1031010	A1031110	A1031210	0	0	0	0
1AC3	4	A1031310	A1031410	A1031510	A1031610	0	0	0	0
1AC4	4	A1031710	A1031810	A1031910	A1031A10	0	0	0	0
1AC5	4	A1031B10	A1031C10	A1031D10	A1031E10	0	0	0	0
1AC6	4	A1031F10	A1032010	A1032110	A1032210	0	0	0	0
1AC7	4	A1032310	A1032410	A1032510	A1032610	0	0	0	0
1AC8	4	A1032710	A1032810	A1032910	A1032A10	0	0	0	0
1AC9	4	A1032B10	A1032C10	A1032D10	A1032E10	0	0	0	0
1ACA	4	A1032F10	A1033010	A1033110	A1033210	0	0	0	0
1ACB	4	A1033310	A1033410	A1033510	A1033610	0	0	0	0
1ACC	4	A1033710	A1033810	A1033910	A1033A10	0	0	0	0
1ACD	4	A1033B10	A1033C10	A1033D10	A1033E10	0	0	0	0
1ACE	4	A1033F10	A1034010	A1034110	A1034210	0	0	0	0
1ACF	4	A1034310	A1034410	A1034510	A1034610	0	0	0	0
1AD0	4	A1034710	A1034810	A1034910	A1034A10	0	0	0	0
1AD1	4	A1034B10	A1034C10	A1034D10	A1034E10	0	0	0	0
1AD2	4	A1034F10	A1035010	A1035110	A1035210	0	0	0	0
1AD3	4	A1035310	A1035410	A1035510	A1035610	0	0	0	0
1AD4	4	A1035710	A1035810	A1035910	A1035A10	0	0	0	0
1AD5	4	A1035B10	A1035C10	A1035D10	A1035E10	0	0	0	0
1AD6	4	A1035F10	A1036010	A1036110	A1036210	0	0	0	0
1AD7	4	A1036310	A1036410	A1036510	A1036610	0	0	0	0
1AD8	4	A1036710	A1036810	A1036910	A1036A10	0	0	0	0
1AD9	4	A1036B10	A1036C10	A1036D10	A1036E10	0	0	0	0
1ADA	4	A1036F10	A1037010	A1037110	A1037210	0	0	0	0
1ADB	4	A1037310	A1037410	A1037510	A1037610	0	0	0	0
1ADC	4	A1037710	A1037810	A1037910	A1037A10	0	0	0	0
1ADD	4	A1037B10	A1037C10	A1037D10	A1037E10	0	0	0	0
1ADE	4	A1037F10	A1038010	A1038110	A1038210	0	0	0	0
1ADF	4	A1038310	A1038410	A1038510	A1038610	0	0	0	0
1AE0	4	A1038710	A1038810	A1038910	A1038A10	0	0	0	0
1AE1	4	A1038B10	A1038C10	A1038D10	A1038E10	0	0	0	0
1AE2	4	A1038F10	A1039010	A1039110	A1039210	0	0	0	0
1AE3	4	A1039310	A1039410	A1039510	A1039610	0	0	0	0
1AE4	4	A1039710	A1039810	A1039910	A1039A10	0	0	0	0
1AE5	4	A1039B10	A1039C10	A1039D10	A1039E10	0	0	0	0

Tab. 4-10: *Mode 405 TPDO mapping parameter*

Index (hex)	Default value of sub-index (hex)								
	00H R/W ①	01H R/W ①	02H R/W ①	03H R/W ①	04H R/W ①	05H R/W ①	06H R/W ①	07H R/W ①	08H R/W ①
1AE6	4	A1039F10	A103A010	A103A110	A103A210	0	0	0	0
1AE7	4	A103A310	A103A410	A103A510	A103A610	0	0	0	0
1AE8	4	A103A710	A103A810	A103A910	A103AA10	0	0	0	0
1AE9	4	A103AB10	A103AC10	A103AD10	A103AE10	0	0	0	0
1AEA	4	A103AF10	A103B010	A103B110	A103B210	0	0	0	0
1AEB	4	A103B310	A103B410	A103B510	A103B610	0	0	0	0
1AEC	4	A103B710	A103B810	A103B910	A103BA10	0	0	0	0
1AED	4	A103BB10	A103BC10	A103BD10	A103BE10	0	0	0	0
1AEE	4	A103BF10	A103C010	A103C110	A103C210	0	0	0	0
1AEF	4	A103C310	A103C410	A103C510	A103C610	0	0	0	0
1AF0	4	A103C710	A103C810	A103C910	A103CA10	0	0	0	0
1AF1	4	A103CB10	A103CC10	A103CD10	A103CE10	0	0	0	0
1AF2	4	A103CF10	A103D010	A103D110	A103D210	0	0	0	0
1AF3	4	A103D310	A103D410	A103D510	A103D610	0	0	0	0
1AF4	4	A103D710	A103D810	A103D910	A103DA10	0	0	0	0
1AF5	4	A103DB10	A103DC10	A103DD10	A103DE10	0	0	0	0
1AF6	4	A103DF10	A103E010	A103E110	A103E210	0	0	0	0
1AF7	4	A103E310	A103E410	A103E510	A103E610	0	0	0	0
1AF8	4	A103E710	A103E810	A103E910	A103EA10	0	0	0	0
1AF9	4	A103EB10	A103EC10	A103ED10	A103EE10	0	0	0	0
1AFA	4	A103EF10	A103F010	A103F110	A103F210	0	0	0	0
1AFB	4	A103F310	A103F410	A103F510	A103F610	0	0	0	0
1AFC	4	A103F710	A103F810	A103F910	A103FA10	0	0	0	0
1AFD	4	A103FB10	A103FC10	A103FD10	A103FE10	0	0	0	0
1AFE	4	A1040110	A1040210	A1040310	A1040410	0	0	0	0
1AFF	4	A1040510	A1040610	A1040710	A1040810	0	0	0	0

Tab. 4-10: *Mode 405 TPDO mapping parameter*

① R/W = Read/write access

4.6.1 CAN-ID / COB-ID

Each message type on each device has a unique 11-bit identifier for bus arbitration and identification on the CAN bus. The lowest CAN-ID wins the bus arbitration. CAN-IDs with lower priority (higher CAN-ID) will wait until the bus is free.

For easier configuration, one CAN-ID scheme exists for all CANopen® devices. By default four TPDO and four RPDO are reserved for every Node-ID. To use more PDO for one node, it is necessary to use CAN-IDs of other nodes.

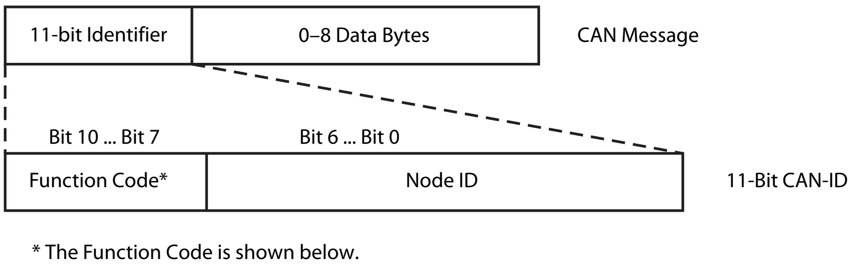


Fig. 4-1: *Structure of a CAN message*

Broadcast objects (Node ID = 0)

COB	Function Code (binary)	Resulting CAN-ID
NMT	0000b	0H
SYNC	0001b	80H
TIME	0010b	100H

Tab. 4-11: *Broadcast objects (Node ID = 0) and resulting CAN-ID*

Peer-to-peer objects (Node ID = 1–127)

COB	Function Code (binary)	Resulting CAN-ID
EMCY	0001b	81H–FFH
TPDO1	0011b	181–1FFH
RPDO1	0100b	201–27FH
TPDO2	0101b	281–2FFH
RPDO2	0110b	301–37FH
TPDO3	0111b	381–3FFH
RPDO3	1000b	401–47FH
TPDO4	1001b	481–4FFH
RPDO4	1010b	501–57FH
TSDO	1011b	581–5FFH
RSDO	1100b	601–67FH
NMT error control	1110b	701–77FH

Tab. 4-12: *Peer-to-peer objects (Node ID = 1–127) and resulting CAN-ID*

Restricted CAN-IDs

In a self-defined CAN-ID scheme, use of the following CAN-IDs are restricted and shall not be used as a CAN-ID by any configurable communication object.

CAN-ID (hex)	Used by COB
0	NMT
1–7F	Reserved
101–180	Reserved
581–5FF	Default TSDO
601–67F	Default RSDO
6E0–6FF	Reserved
701–77F	NMT Error Control
780–7FF	Reserved

Tab. 4-13: *Restricted CAN-IDs*

4.6.2 Error Register

The object 1001H provides error information. The CANopen® device maps internal errors into this object. It is a part of an emergency object.

7	6	5	4	3	2	1	0
Manufacturer specific*	0H	Device profile specific	Communication error (overrun, error state)*	Temperature	Voltage	Current	Generic error*

* Used by the ME3CAN1-Q firmware.

Fig. 4-2: *Structure of the error register*

The Generic error bit will be set as long the EMCY error code is bigger than 00FFH (refer to section 4.6.12).

The Error Register can be cleared by clearing the pre-defined error field in object 1003H. (Refer to next section 4.6.3).

All of these bits can be set by the emergency message transmission command in the Command Interface. (Refer to section 5.2.)

4.6.3 Pre-defined error field

This object provides the errors that occurred on the module and were signaled via the emergency object.

- Sub-index 00H: Number of errors

  The sub-index 00H displays the number of errors that are recorded. The entire history will be deleted by writing 0H to this sub-index. Values other than 0H are not allowed.

- Sub-index 01H–0FH: Standard error fields

  List of the last 15 EMCY errors sent by ME3CAN1-Q. Sub-index 01H contains the newest message and sub-index 0FH contains the oldest message. Refer to section 8.2.1 for error code description.

4.6.4 SDO

A Service Data Object (SDO) provides a direct access to the object entries of a CANopen® device's Object Dictionary. These object entries may contain data of any size and data type. SDO is used to transfer multiple data sets from a client to a server and vice versa. The client controls which data set is to be transferred via a multiplexer (index and sub-index of the Object Dictionary). By using the Command Interface (CIF), it is possible to make an SDO access to other CANopen® devices or to the ME3CAN1-Q itself. No configuration is needed in the Object Dictionary.

For details of the Command Interface, please refer to chapter 5.

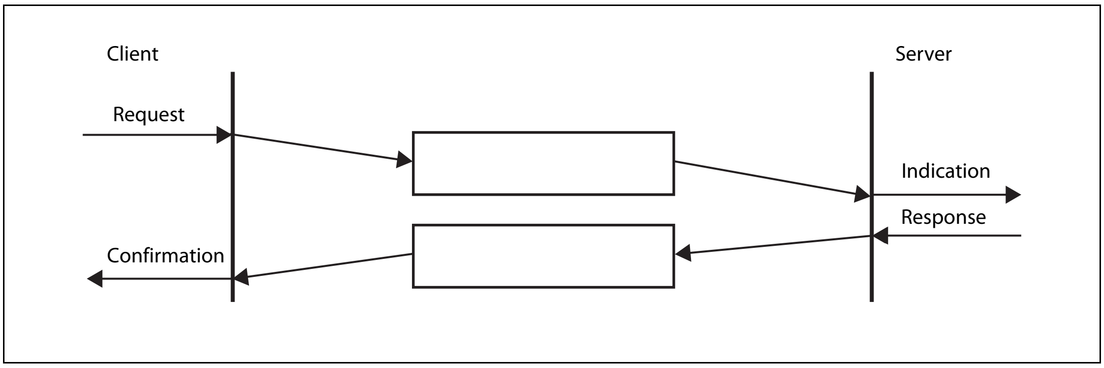


Fig. 4-3: *Data transfer using SDOs*

4.6.5 RPDO / TPDO

Real-time data transfer is performed by the Process Data Objects (PDO). The transfer is performed with no protocol overhead.

PDOs correspond to objects in the Object Dictionary and provide the interface to the application objects. Data type and mapping of application objects into a PDO is determined by a corresponding default PDO mapping structure within the Object Dictionary. The variable mapping of PDO and the mapping of application objects into a PDO may be transmitted to a CANopen® device during the configuration process by applying the SDO services to the corresponding objects of the Object Dictionary.

The PDO communication parameter describes the communication capabilities of the PDO.

The PDO mapping parameter contains information about the contents of the PDO.

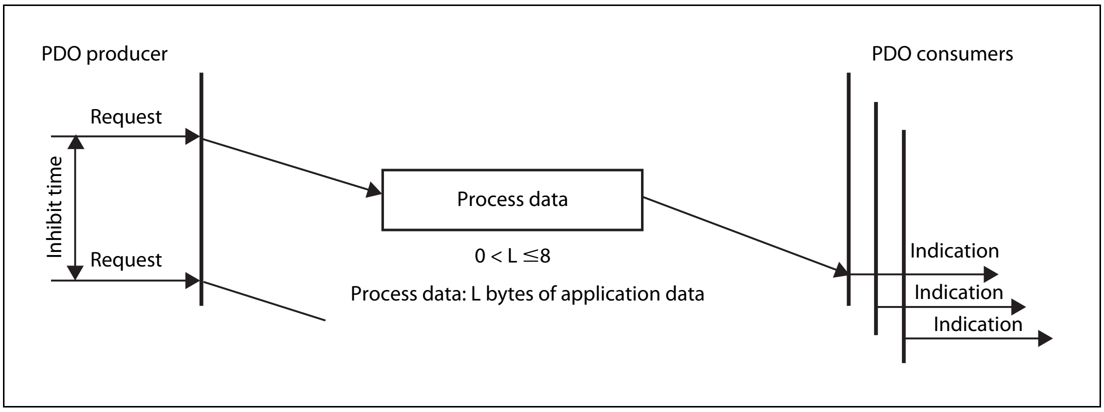


Fig. 4-4: *Transfer of PDOs*

With the Parameter "transmission type", two transmission modes are configurable:

– Synchronous transmission
– Event-driven transmission

Use the following way to change the PDO communication or mapping parameter:

- Set the PDO to not valid (communication parameter sub-index 01H bit 31).
- Set the communication parameters.
- Set the mapping parameters.
  – Set 00H to the sub-index.
  – Modify the mapping at sub-indexes 01H to 08H.
  – Enable the mapping by setting the number of mapped objects to the sub-index 00H.
- Set the PDO to valid (communication parameter sub-index 01H bit 31).

For unneeded data in an RPDO, a dummy mapping entry can be made to the data type definition Indexes to make the RPDO length fit the length of the TPDO accordingly.

For data type definitions indexes, refer to section 4.5.

Object 1400H to 14FFH

- Sub-index 01H: RPDO COB-ID

Bit 31	Bit 30 ... Bit 11	Bit 10 ... Bit 0
Valid	0H	11-bit CAN-ID

Fig. 4-5:
Bit allocation for sub-index 01H: RPDO COB-ID

Bit/Item	Description
Valid	Bit = 0: Valid Bit = 1: Invalid
11-bit CAN-ID	11-bit CAN-ID of the CAN base frame. Refer to section 4.6.1.

Tab. 4-14:
Description for sub-index 01H: RPDO COB-ID

- Sub-index 02H: RPDO transmission type

Value (hex)	Description
00–F0	Synchronous Received PDO data will be processed after the next SYNC message, independent from the transmission rate specified by the transmission type.
F1–FD	Reserved
FE	Event-driven (Function Mode 405)

Tab. 4-15: *Description for sub-index 02H: RPDO transmission type*

Object 1600H to 17FFH

- Sub-index 01H–08H: RPDO mapping parameter

  The default mapping is for unsigned integer 16 bit objects (Refer to section 3.5.19).

Bit 31 ... Bit 16	Bit 15 ... Bit 8	Bit 7 ... Bit 0
Index	Sub-index	Length

Fig. 4-6: *Bit allocation for sub-index 01H–08H: RPDO mapping parameter*

Bit/Item	Description
Index	Index of the mapped object
Sub-index	Sub-index of the mapped object
Length	Length of the mapped object (unit: bit)

Tab. 4-16: *Description for sub-index 01H–08H: RPDO mapping parameter*

Example ▽ To map the first unsigned 16-bit data of RPDO1 to Un\G10000, set Index 1600H Sub-index 01H to A5800110H.

This stands for Object Dictionary Index A580H, Sub-index 01H and a data size of 16 bit.

△

Object 1800H to 18FFH

- Sub-index 01H: TPDO COB-ID

Bit 31	Bit 30	Bit 29 ... Bit 11	Bit 10 ... Bit 0
Valid	RTR	0H	11-bit CAN-ID

Fig. 4-7: *Bit allocation for sub-index 01H: TPDO COB-ID*

Bit/Item	Description
Valid	Bit = 0: Valid Bit = 1: Invalid
RTR	Bit = 0: Remote transmission Request (RTR) allowed Bit = 1: Remote transmission Request (RTR) not allowed This bit is constantly set to "1" in the ME3CAN1-Q.
11-bit CAN-ID	11-bit CAN-ID of the CAN base frame. Refer to section 4.6.1.

Tab. 4-17: *Description for sub-index 01H: TPDO COB-ID*

- Sub-index 02H: TPDO transmission type

Value (hex)	Description
00	Synchronous (acyclic) The PDO will be transmitted after occurrence of the SYNC but acyclic (not periodically), only if an event occurred before the SYNC.
01	Synchronous (cyclic every SYNC)
02	Synchronous (cyclic every 2nd SYNC)
03	Synchronous (cyclic every 3rd SYNC)
: :	: :
F0	Synchronous (cyclic every 240th SYNC)
F1–FD	Reserved
FE	Event-driven (function mode 405)

Tab. 4-18: *Description for sub-index 02H: TPDO transmission type*

- Sub-index 03H: TPDO inhibit time

  This object configures the minimum time between two PDO transmissions. This is used only for the event-driven transmission. PDO transmission request by Yn1 will be dismissed during this time. Unit of this value is 100 µs (ME3CAN1-Q counting resolution: 1 ms). Set this to 0 to disable the inhibit time.

- Sub-index 05H: TPDO event timer

  If the event timer elapses and no event-driven transmission is sent during that time, a message with the current value of the Object Dictionary will be sent. Unit of this value is ms. Set this to 0 to disable the event timer.

NOTE If the inhibit time is active, no PDO will be transmitted. Refer to fig. 4-12 and fig. 4-13.

Object 1A00H to 1BFFH

- Sub-index 01H–08H: TPDO mapping parameter

  The default mapping is for unsigned integer 16 bit objects (Refer to section 3.5.19).

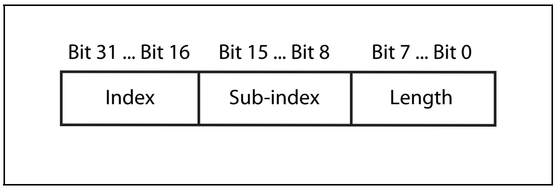


Fig. 4-8:
Bit allocation for sub-index 01H–08H: RPDO mapping parameter

Bit/Item	Description
Index	Index of the mapped object
Sub-index	Sub-index of the mapped object
Length	Length of the mapped object (unit: bit)

Tab. 4-19:
Description for sub-index 01H–08H: RPDO mapping parameter

Example ▽ To map unsigned 16-bit data of Un\G10000 to the first 16 bit of TPDO 1, set index 1A00H sub-index 01H to A1000110H.

This stands for Object Dictionary index A100H, sub-index 01H and a data size of 16-bit.

△

Relation between buffer memory, data exchange control, inhibit time and event timer

The following cases show the relation between buffer memory data of the Transmit Process Data, data exchange control (Yn1), PDO inhibit time, PDO event timer and CAN bus data in NMT state Operational for event-driven PDO's.

NOTE The event and inhibit timer are started every time when PDO transmission is started.

- Case 1: Inhibit time = 0, Event time = 0

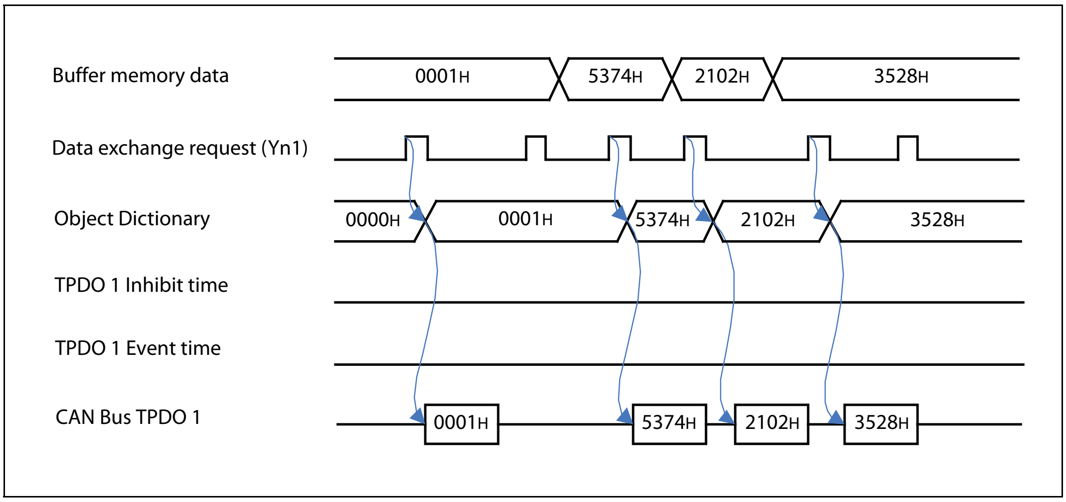


Fig. 4-9: *Relationships for inhibit time and event time = 0*

If the data exchange request is triggered by Yn1 and the data in the buffer memory is different to the data in the Object Dictionary, the buffer memory data will be copied to the Object Dictionary. Then a PDO will be created and sent to the CAN bus.

If the data are the same, no PDO will be sent even if the data exchange is triggered by Yn1.

- Case 2: Inhibit time > 0, Event time = 0

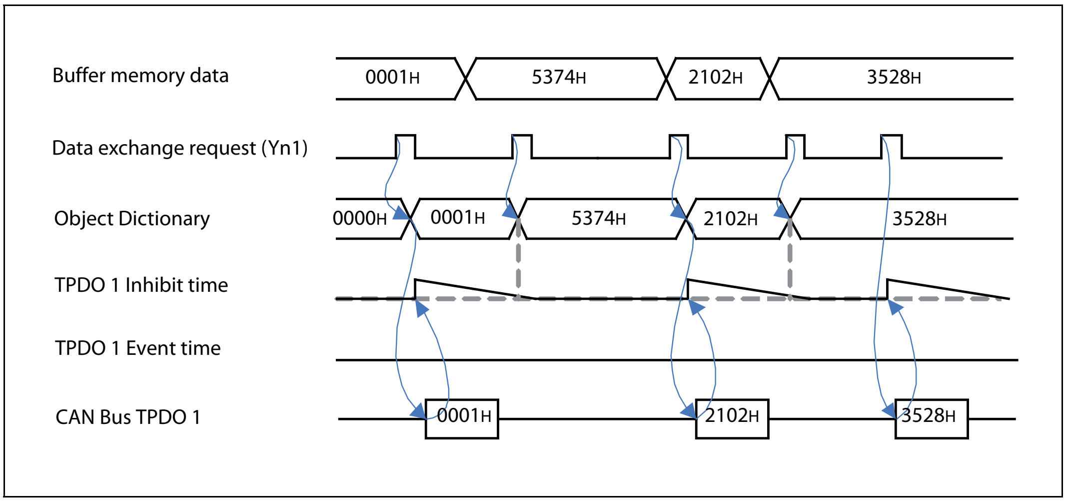


Fig. 4-10: *Relationships for inhibit time > 0 and event time = 0*

The behavior is the same as for case 1, but with the following condition added:

– A PDO will only be sent if the inhibit time is not active and the data exchange is requested.

- Case 3: Inhibit time = 0, Event time > 0

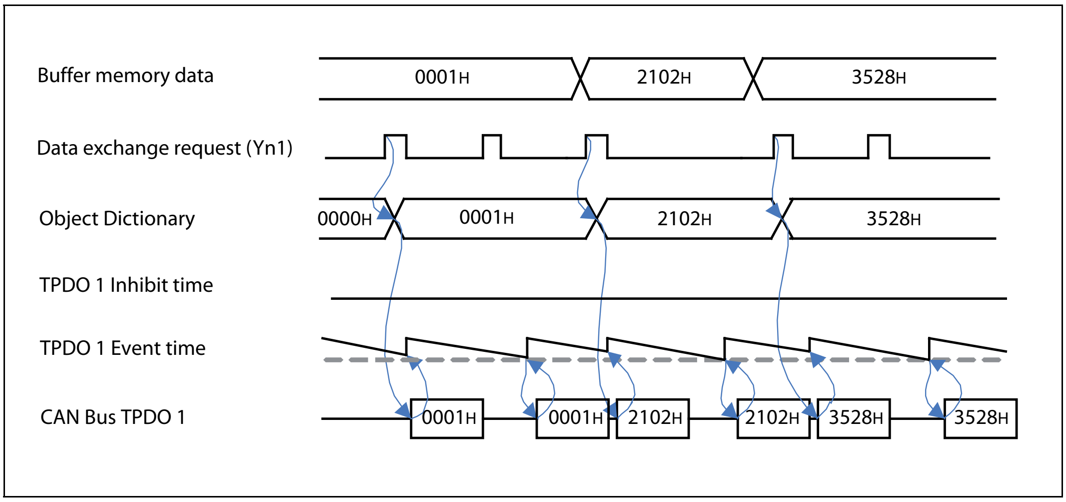


Fig. 4-11: *Relationships for inhibit time = 0 and event time > 0*

The behavior is the same as for case 1, but with the following condition added:

– A PDO will also be sent whenever the event timer elapses, even if the data is the same.

- Case 4: Inhibit time > 0, Event time > 0, Inhibit time < Event time

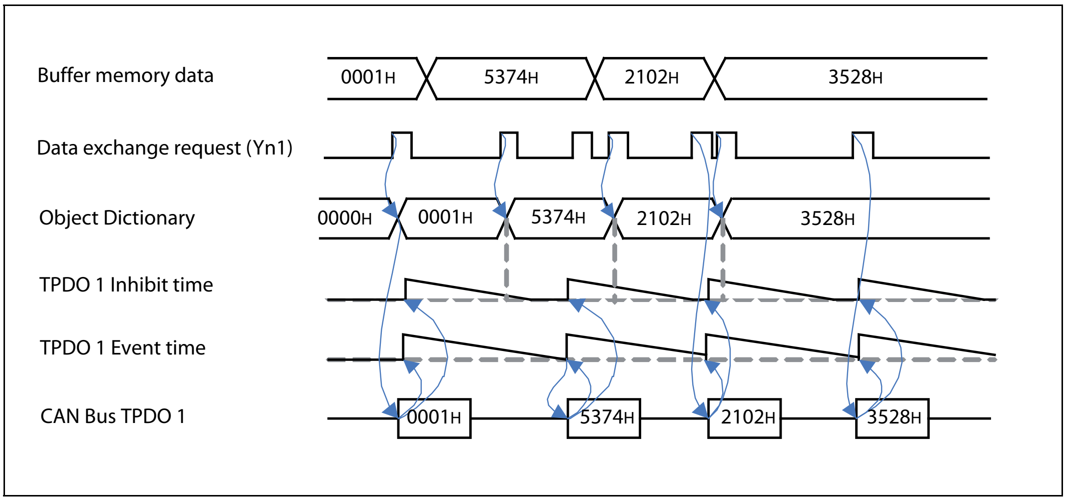


Fig. 4-12: *Relationships for inhibit time > 0, event time > 0 and inhibit time < event time*

The behavior is the same as for case 1, but with the following conditions added:

– A PDO will only be sent if the inhibit time is not active and the data exchange is requested.

– A PDO will also be sent whenever the event timer elapses.

- Case 5: Inhibit time > 0, Event time > 0, Inhibit time > Event time

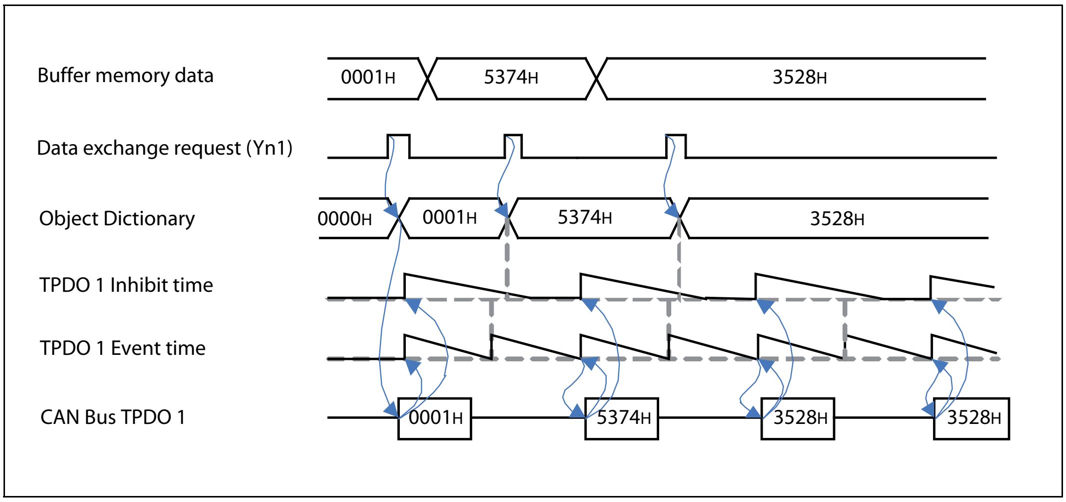


Fig. 4-13: *Relationships for inhibit time > 0, event time > 0 and inhibit time > event time*

The behavior is the same as for case 4. This case is to illustrate how the timing will be if the inhibit time is longer than the event time.

4.6.6 SYNC

The SYNC producer broadcasts the synchronization object periodically. The SYNC message provides the basic network synchronization mechanism. The time period between SYNC messages is specified by the standard parameter communication cycle period. There may be a time jitter in transmission by the SYNC producer corresponding approximately to the latency from some other message being transmitted just before the SYNC.

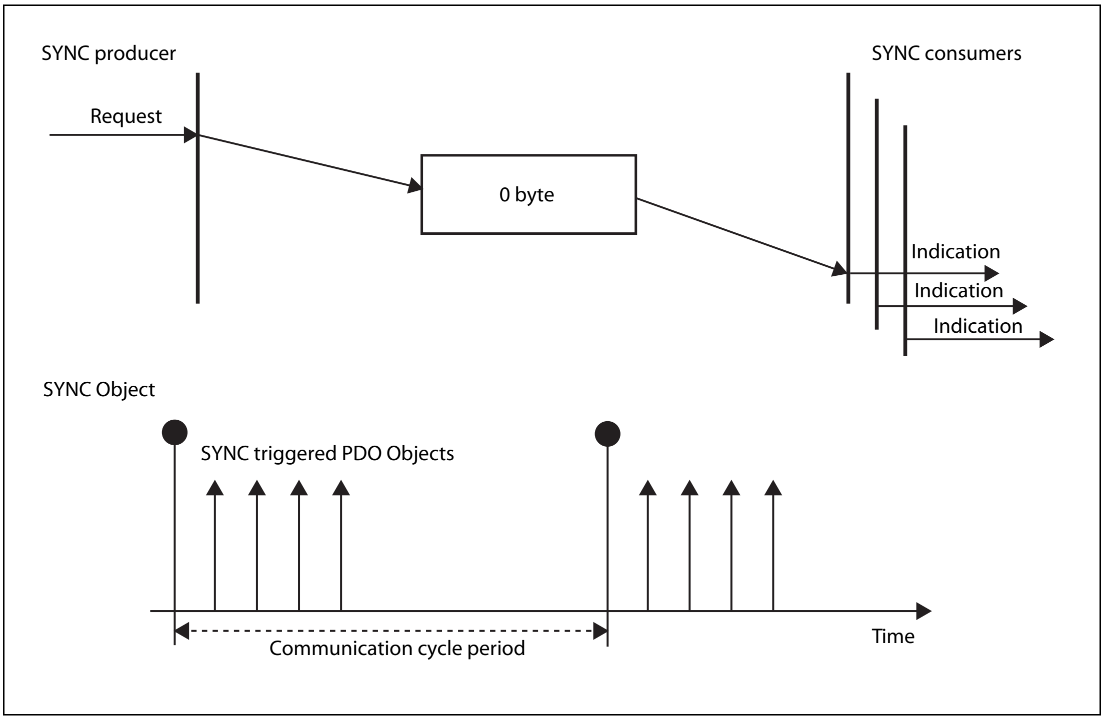


Fig. 4-14: *Transfer of a SYNC message*

Object 1005H: COB-ID SYNC message

In order to guarantee timely access to the network, the SYNC is given a very high priority CAN-ID.

Bit 31	Bit 30	Bit 29 ... Bit 11	Bit 10 ... Bit 0
X	gen.	0H	11-bit CAN-ID

Fig. 4-15: *Bit allocation for object 1005H: COB-ID SYNC message*

Bit/Item	Description
X	Do not care
gen.	Bit = 0: Don't generate SYNC message Bit = 1: Generate SYNC message **NOTES:** • The device needs to be active NMT master to produce SYNC messages. • Before activating SYNC generation, the communication cycle period has to be set up.
11-bit CAN-ID	11-bit CAN-ID of the CAN base frame. Refer to section 4.6.1.

Tab. 4-20: *Description for object 1005H: COB-ID SYNC message*

Object 1006H: Communication cycle period

The object 1006H provides the communication cycle period. This period defines the SYNC interval. The 32 bit value is given in µs units. The ME3CAN1-Q counting resolution is 1 ms, values smaller than 1 ms will set internally to 1 ms, values starting from 1 ms will be divided by 1000. The value 0 disables the SYNC producing. The module needs to be active NMT Master to produce SYNC messages.

Setting range: 0 to 4, 294, 967, 295

For details about NMT master refer to section 4.8.5.

4.6.7 Node guarding

This protocol is used to detect remote errors in the network. Each NMT slave serves one response message for the node guarding protocol.

The NMT master polls each NMT guarding slave at regular time intervals. This time-interval is called the guard time and may be different for each NMT slave. The response of the NMT slave contains the NMT state of that NMT slave. The node lifetime is given by guard time multiplied by lifetime factor. The node lifetime may be different for each NMT slave. If the NMT slave has not been polled during its lifetime, a remote node error is indicated through the NMT service life guarding event. A remote node error is indicated through the NMT service node guarding event if:

– the NMT master does not receive the confirmation after the RTR within the node life time,

– the response of the NMT guarding slave state does not match the expected state,

– the NMT guarding slave did not receive the NMT master RTR polling for time set in 100CH and 100DH.

If a remote error occurred previously but the errors in the guarding protocol have disappeared, it will be indicated that the remote error has been resolved through the NMT service node guarding event and the NMT service life guarding event.

If Heartbeat is activated, the Node guarding settings will be ignored.

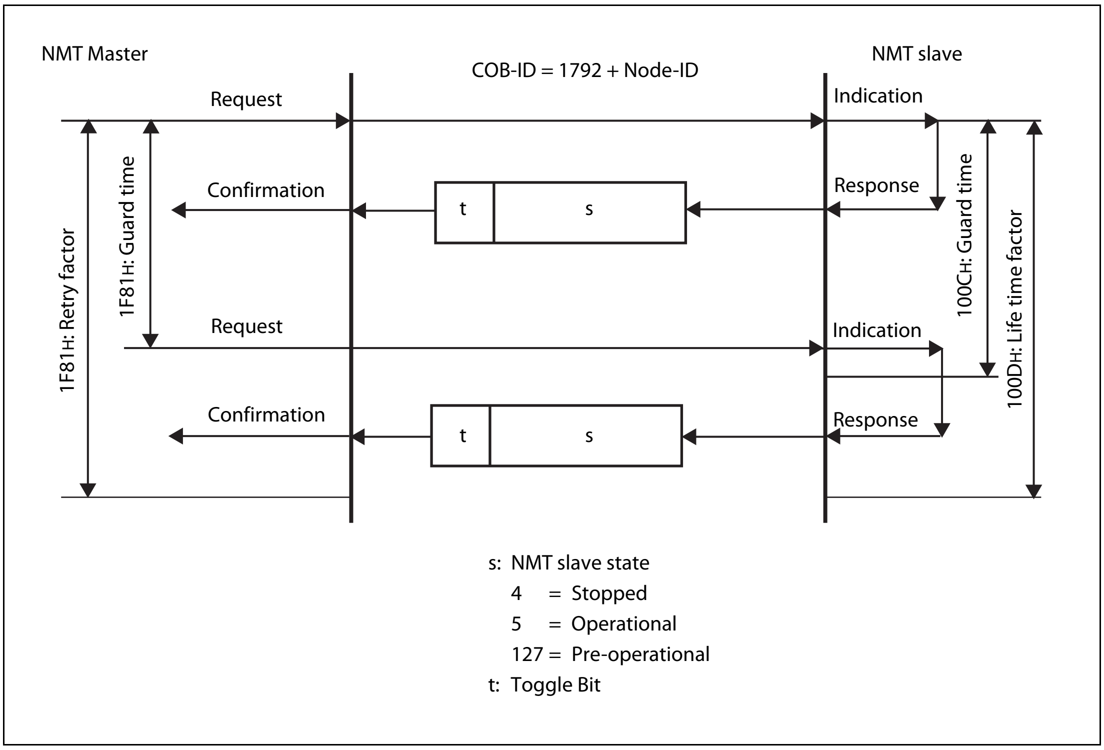


Fig. 4-16: *Node guarding*

NOTE Node guarding produces a high bus load. It is recommended to use heartbeat instead.

Object 100CH: guard time (slave setting)

The 16 bit guard time in units of ms is the time limit for which the response must be sent. The value 0 disables life guarding.

Object 100DH: life time factor (slave setting)

The 8 bit life time factor value multiplied by the guard time gives the life time for which the NMT Master has to send the guarding request. The value 0 disables life guarding.

Both Objects have to be set to activate Node guarding. The order in which Guard time and Life time factor are set does not matter.

Object 1F81H: NMT slave assignment (master setting)

For the NMT slave assignment, please refer to section 4.8.6.

4.6.8 Heartbeat

The heartbeat protocol defines an error control service without a request. A heartbeat producer transmits a heartbeat message cyclically. One or more heartbeat consumer receives the indication. The relationship between producer and consumer is configurable via the Object Dictionary. The heartbeat consumer guards the reception of the heartbeat within the heartbeat consumer time. If the heartbeat is not received within the heartbeat consumer time a heartbeat event will be generated.

If the ME3CAN1-Q is configured as Flying Master, the heartbeat producing and consuming is automatically activated (refer to section 4.8.10).

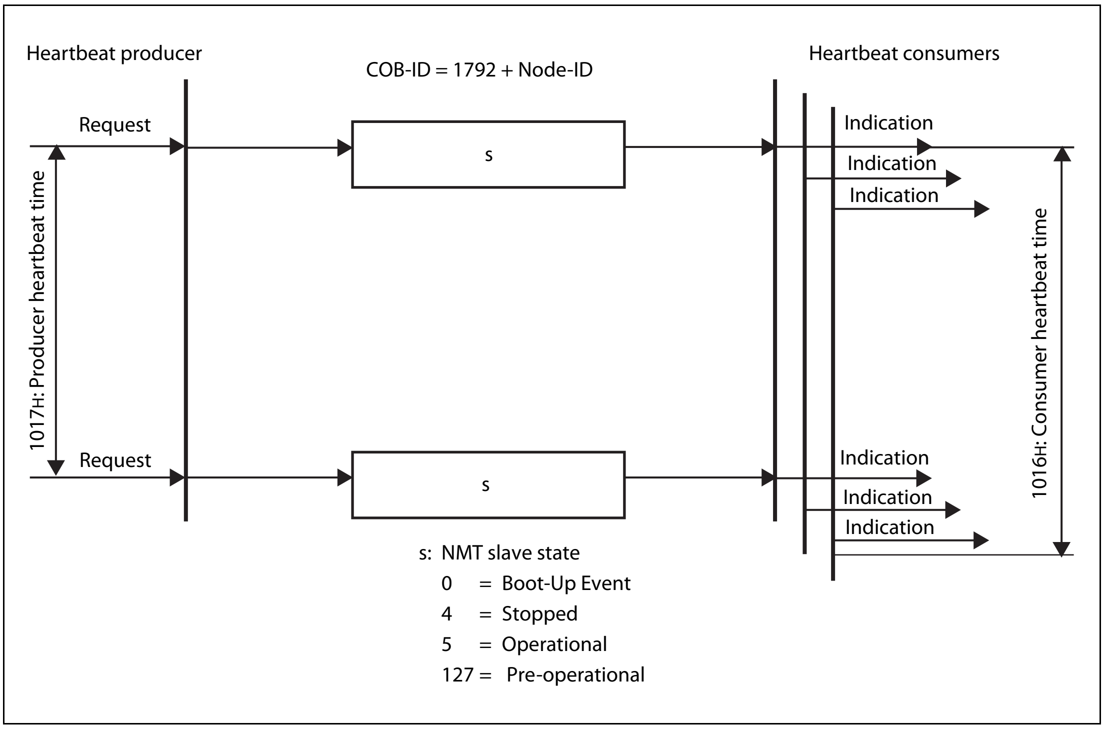


Fig. 4-17: *Heartbeat*

NOTE Heartbeat produces a high bus load, but only half that of node guarding.

Object 1016H, Sub-index 01H–7FH: Consumer heartbeat time

The consumer heartbeat time object indicates the expected heartbeat cycle times. Monitoring of the heartbeat producer starts after reception of the first heartbeat. The consumer heartbeat time should be higher than the corresponding producer heartbeat time. Before reception of the first heartbeat, the status of the heartbeat producer is unknown.

Bit 31 ... Bit 24	Bit 23 ... Bit 16	Bit 15 ... Bit 0
0H	Node-ID	Heartbeat time

Fig. 4-18: *Bit allocation for sub-index 01H–0FH: Consumer heartbeat time*

If the heartbeat time is 0 or the node-ID is 0 or greater than 127, the corresponding object entry is not used.

The unit of heartbeat time is ms.

Object 1017H: Producer heartbeat time

The unit of 16 bit producer heartbeat time is ms. The value 0 disables the producer heartbeat.

4.6.9 TIME

The TIME producer broadcasts the time stamp object. This TIME provides the simple network clock. The time stamp contains the time of day, which is represented by a 48 bit sequence. These sequences represent the time in milliseconds after midnight (28 bits) and the number of days since 1984-01-01 (16 bits). Only one time stamp producer is allowed in the Network.

The time and the date have to be configured by setting Un\G51 to Un\G57 (clock data).

In order to guarantee timely access to the network, the TIME is given a very high priority CAN-ID. CANopen® devices that operate a local clock may use the TIME object to adjust their own time base to that of the time stamp object producer.

The consuming and producing setting can be directly changed at Un\G50 (refer to section 3.5.11).

In case of time overflow (time later than 31st December 2079 23:59.59), the time returns to 1st January 2000 00:00:00. Buffer memory display for year will be 00 to 99 in all cases.

NOTE

For TIME consuming, a received time stamp before 1st January 2000 0:00.00 is set to 1st January 2000 00:00:00.

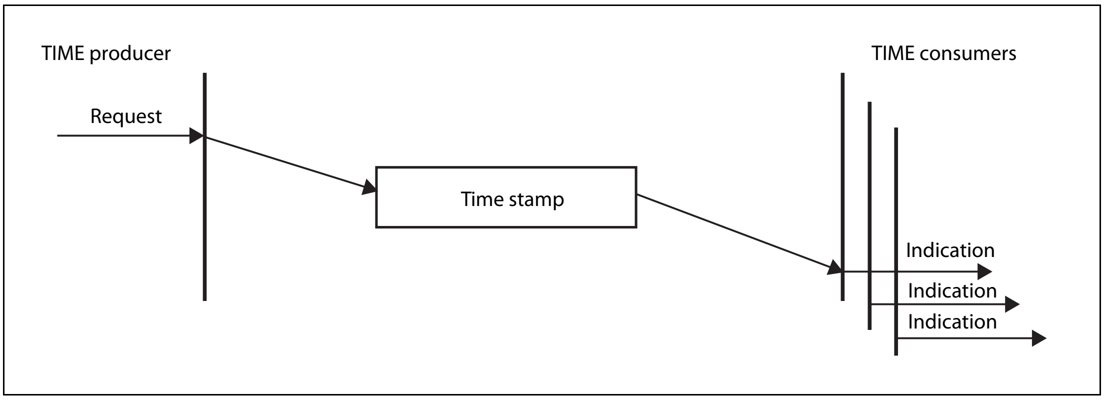


Fig. 4-19: *Time stamping*

Object 1012H: COB-ID time stamp object

Bit 31	Bit 30	Bit 29 ... Bit 11	Bit 10 ... Bit 0
consume	produce	0H	11-bit CAN-ID

Fig. 4-20: *Bit allocation for object 1012H: COB-ID time stamp object*

Bit/Item	Description
consume	Bit = 0: Do not consume TIME messages Bit = 1: Consume TIME messages
produce	Bit = 0: Do not produce TIME messages Bit = 1: Produce TIME messages **NOTE:** • The device needs to be active NMT master to produce TIME messages.
11-bit CAN-ID	11-bit CAN-ID of the CAN base frame. (Refer to section 4.6.1)

Tab. 4-21: *Description for object 1012H: COB-ID time stamp object*

4.6.10 Store parameters

To store all parameters to the non-volatile memory, write SDO 65766173H (ISO8859 string code: "save") to Object Index 1010H, sub-index 01H or use the store command in the CIF (refer to section 3.5.18). After each power-up or restart, the saved parameters will be valid.

NOTE The *store parameter* command is not necessary for CDCF files stored on Object 1F22H.

On read access, the ME3CAN1-Q gives back information about its storage functionality:

Bit	Description
0	Constant 1: Device does save parameter on command.
1	Constant 0: Device does not save parameter without user request.
2–31	Reserved

Tab. 4-22: *Storage functionality information*

4.6.11 Restore default parameters

To restore factory default parameters, write SDO 64616F6CH (ISO8859 code: daol ("load")) to Object Index 1011H, sub-index 01H. The stored parameters are then overwritten to factory default settings.

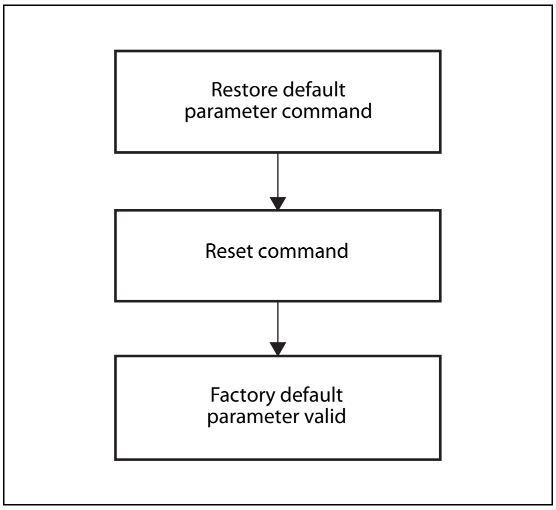


Fig. 4-21:
Restore procedure

NOTES Do not make a store parameter command before executing the restart command. Otherwise the factory default parameters will be overwritten with the previous settings.

CDCF files stored on Object 1F22H will be also cleared and will be cleared directly before the restart command.

On read access, the ME3CAN1-Q gives back information about its restoring functionality:

Bit	Description
0	Constant 1: Device does restore factory default parameters on command.
1–31	Reserved

Tab. 4-23: *Restoring functionality information*

4.6.12 EMCY

Emergency objects are triggered by the occurrence of a CANopen® device internal error. An emergency object is transmitted only once per "error event." No further emergency objects are transmitted as long as no new errors occur on a CANopen® device. Zero or more emergency consumers may receive the emergency object.

The received EMCY Messages will be displayed in Un\G750 to Un\G859 (refer to section 3.5.17). A transmission of EMCY Messages is possible over the CIF (refer to section 3.5.18).

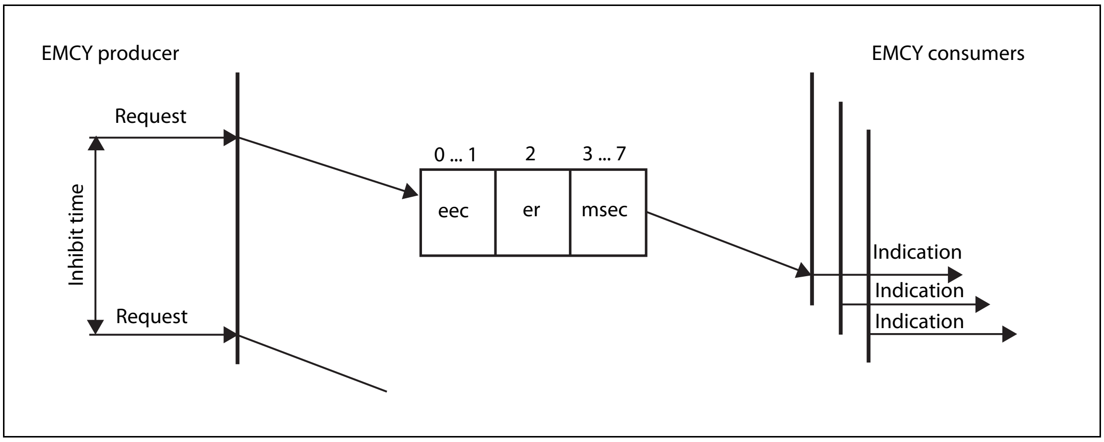


Fig. 4-22: *EMCY Message*

eec: Emergency error code (2 Byte) (Refer to section 3.5.17)

er: Error register (1 Byte) (refer to object 1001H in section 4.6.2)

msec: Manufacturer-specific error code (5 Byte)

Object 1014H: COB-ID EMCY

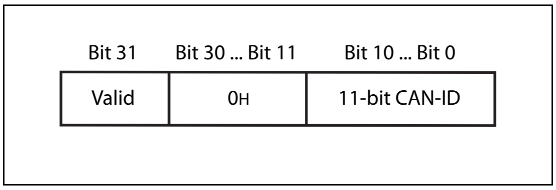


Fig. 4-23:
Bit allocation for object 1014H: COB-ID EMCY

Bit/Item	Description
Valid	Bit = 0: EMCY producing is valid Bit = 1: EMCY producing is invalid
11-bit CAN-ID	11-bit CAN-ID of the CAN base frame. Refer to section 4.6.1.

Tab. 4-24:
Description for object 1014H: COB-ID EMCY

For the resulting COB-ID, refer to section 4.6.1.

NOTE

The setting is fixed in the ME3CAN1-Q and cannot be changed.

Object 1015H: Inhibit time EMCY

This object configures the minimum time between two EMCY messages. The unit of the 16 bit value is 100 µs. The value 0 disables the inhibit time.

The ME3CAN1-Q counting resolution is 1ms, values smaller than 1 ms will set internally to 1ms, values starting from 1ms will be divided by 1000.

Object 1028H, Sub-index 01H–7FH: Emergency consumer object

This object configures the COB-IDs for the EMCY objects that the module is consuming. The sub-index refers to the related node-ID.

Bit 31	Bit 30 ... Bit 11	Bit 10 ... Bit 0
Valid	0H	11-bit CAN-ID

Fig. 4-24:
Bit allocation for object 1028H, sub-index 01H–7FH

Bit/Item	Description
Valid	Bit = 0: EMCY consuming of remote Node is valid Bit = 1: EMCY consuming of remote Node is not valid
11-bit CAN-ID	11-bit CAN-ID of the CAN base frame. Refer to section 4.6.1.

Tab. 4-25:
Description for object 1028H, sub-index 01H–7FH

For the resulting COB-ID, refer to section 4.6.1.

4.7 Error Behavior

If a serious CANopen® device failure is detected in NMT state Operational, the CANopen® device automatically shifts to the NMT state *Pre-operational* by default. Alternatively, the CANopen® device can be configured to change to NMT state *Stopped* or remain in the current NMT state.

CANopen® device failures include the following communication errors:

- Bus-OFF conditions of the CAN interface
- Only as NMT Slave:
  - Life guarding event with the state 'occurred' and the reason 'time out'
  - Heartbeat event with state 'occurred' and the reason 'time out'
- PLC RUN → STOP: If the setting value is 01H, the ME3CAN1-Q will change into *Pre-operational* but can be set again to *Operational* when the PLC is in STOP.

  With the setting value 00H or 02H, the ME3CAN1-Q cannot set into *Operational* as long as the PLC is in STOP.

Severe CANopen® device errors also may be caused by CANopen® device internal failures.

Object 1029H, Sub-index 01H: Error behavior object

Value (hex)	Description
00	Change to NMT state *Pre-operational* (only if currently in NMT state *Operational*)
01	No change of the NMT state ①
02	Change to NMT state *Stopped*
03–FE	Not used

Tab. 4-26: *Error class values*

① PLC RUN → STOP: In case setting value 01H the ME3CAN1-Q will change into *Pre-operational* but can be set again to *Operational* also when the PLC is in STOP.

4.8 Network Management

The NMT provides services for controlling the network behavior of CANopen® devices. All CANopen® devices of a network referred to as NMT slaves are controlled by services provided by an NMT master.

The NMT master is usually but not necessarily the application master.

The ME3CAN1-Q supports the following master functions:

- NMT start-up master
- Flying master
- Configuration manager
- SYNC producer
- TIME producer
- LSS master

4.8.1 CANopen® boot-up procedure and NMT states

CANopen® devices shift to the NMT state *Pre-operational* directly after finishing device initialization. In this NMT state, CANopen® device parameterization and CAN-ID-allocation via SDO (e.g. using a configuration tool) is possible. Then the CANopen® devices may be switched directly or by the NMT start-up master into the NMT state *Operational*.

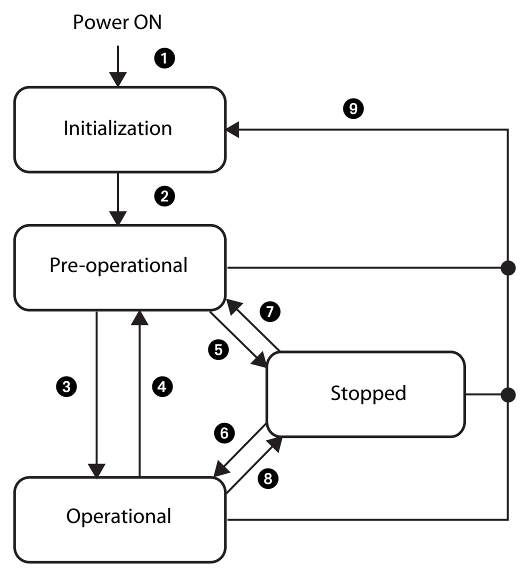


Fig. 4-25: *NMT states*

State change	Description
❶	Shift to the NMT state *Initialization* automatically at power on.
❷	Shift to the NMT state *Pre-operational* automatically after the initialization finishes, and send a Boot-Up message (refer to section 4.8.2)
❸	NMT service start remote node indication
❹ ❼	NMT service enter *Pre-operational* indication
❺ ❽	NMT service stop remote node indication
❻	NMT service start remote node indication
❾	NMT service reset node indication or reset communication indication

Tab. 4-27: *Description of fig. 4-25*

NMT state *Pre-operational*

In the NMT state *Pre-operational*, communication via SDO is possible. PDO communication is not allowed. Configuration of PDO, parameters and also the allocation of application objects (PDO mapping) may be performed by a configuration application. The CANopen® device may be switched into the NMT state *Operational* directly by sending the NMT service start remote node.

NMT state *Operational*

In the NMT state *Operational*, all communication objects are active.

NMT state *Stopped*

By switching a CANopen® device into the NMT state *Stopped*, it is forced to stop the communication (except NMT node control and NMT error control). Furthermore, this NMT state may be used to achieve certain application behavior.

NMT states and communication object relation

The relation between NMT states and communication objects is shown in the following table. Services in the listed communication objects may only be executed if the CANopen® devices involved in the communication are in the appropriate NMT states.

In case of trying to send a communication object which is not allowed in the specific NMT state, no error information will be displayed.

Communication Object	NMT state		
	Pre-operational	Operational	Stopped
PDO	○	●	○
SDO	●	●	○
SYNC	●	●	○
EMCY	●	●	○
TIME	●	●	○
Node control and error control	●	●	●

Tab. 4-28: *Relation between communication objects and NMT states*

●: Applicable, ○: Not applicable

4.8.2 Boot-Up protocol

The boot-up protocol is used to signal that a NMT slave has switched to the NMT state *Pre-operational* after the NMT state *Initialization*. The protocol uses the same CAN-ID as the error control protocols.

One data byte is transmitted with value 0.

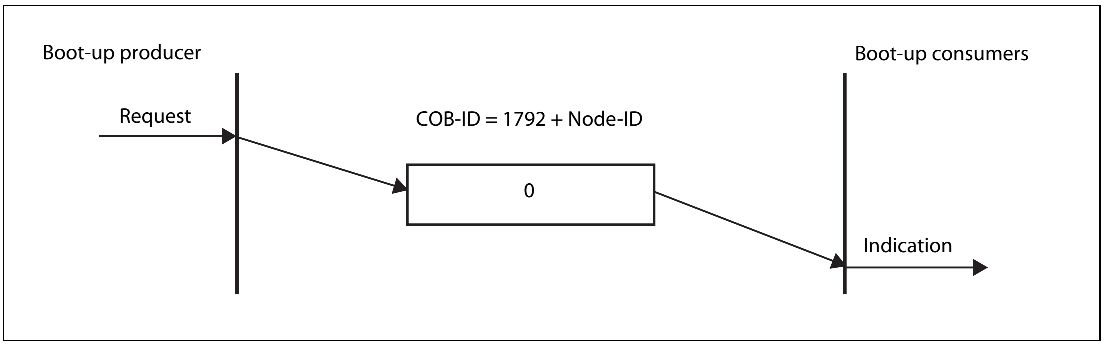


Fig. 4-26: *Protocol Boot-Up*

4.8.3 NMT protocol (node control)

The NMT protocol is used by the NMT Master to control the NMT state of remote nodes. Only the NMT Master is allowed to produce this protocol.

The active NMT master ignores NMT messages with the Node ID 0 (all nodes).

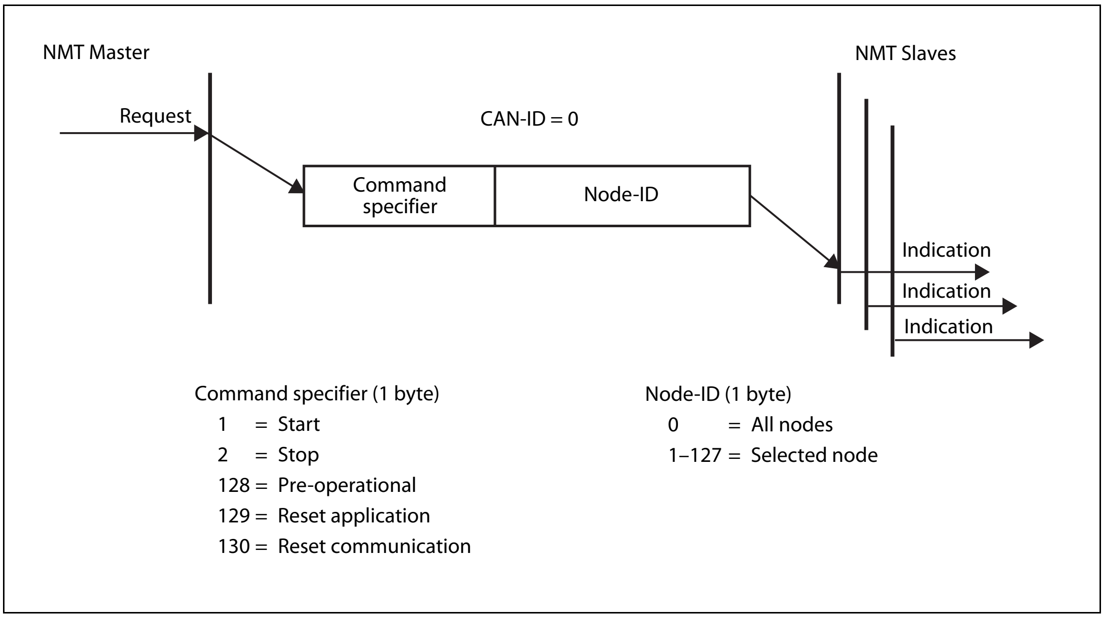


Fig. 4-27: *Node control*

4.8.4 NMT slave identification

The NMT start-up master and the LSS master are using the NMT slave identification data to identify the NMT slave before configuring the NMT slave. If the configured identification data on the NMT master and the response from the NMT slave are different, the NMT start-up master service will stop the start-up of this NMT slave.

The sub-index corresponds to the NMT slave Node ID. The default value 0 means "not- configured" and the NMT master will skip this entry. For the LSS Master, all NMT slave identification data need to be configured. For the NMT Startup Master the NMT slave identification entries are optional.

Object 1F84H, Sub-index 01H to 7FH: Device Type

The sub-index corresponds to the node ID.

The value refers to the object 1000H sub-index 00H of the corresponding node ID.

Object 1F85H, Sub-index 01H to 7FH: Vendor identification

The sub-index corresponds to the node ID.

The value refers to the object 1018H sub-index 01H of the corresponding node ID.

Object 1F86H, Sub-index 01H to 7FH: Product code

The sub-index corresponds to the node ID.

The value refers to the object 1018H sub-index 02H of the corresponding node ID.

Object 1F87H, Sub-index 01H to 7FH: Revision number

The sub-index corresponds to the node ID.

The value refers to the object 1018H sub-index 03H of the corresponding node ID.

Object 1F88H, Sub-index 01H to 7FH: Serial number

The sub-index corresponds to the node ID.

The value refers to the object 1018H sub-index 04H of the corresponding node ID.

4.8.5 NMT master start-up

The NMT master start-up behaves according to the NMT slave state machine as defined in section 4.8.1. Before the NMT master shifts from NMT state *Pre-operational* to NMT state *Operational*, all assigned NMT slaves shall be booted.

The main flow chart for the NMT master start-up is shown in fig. 4-28.

Figure 4-29 shows a simple start-up overview to show the influence of the Un\G70 setting. It is recommended not to use the simple start-up since it cannot been guaranteed that every NMT slave will be set into *Operational* state. Instead, set the NMT slave start-up values for every connected NMT slave in the NMT master (refer to section 4.8.6).

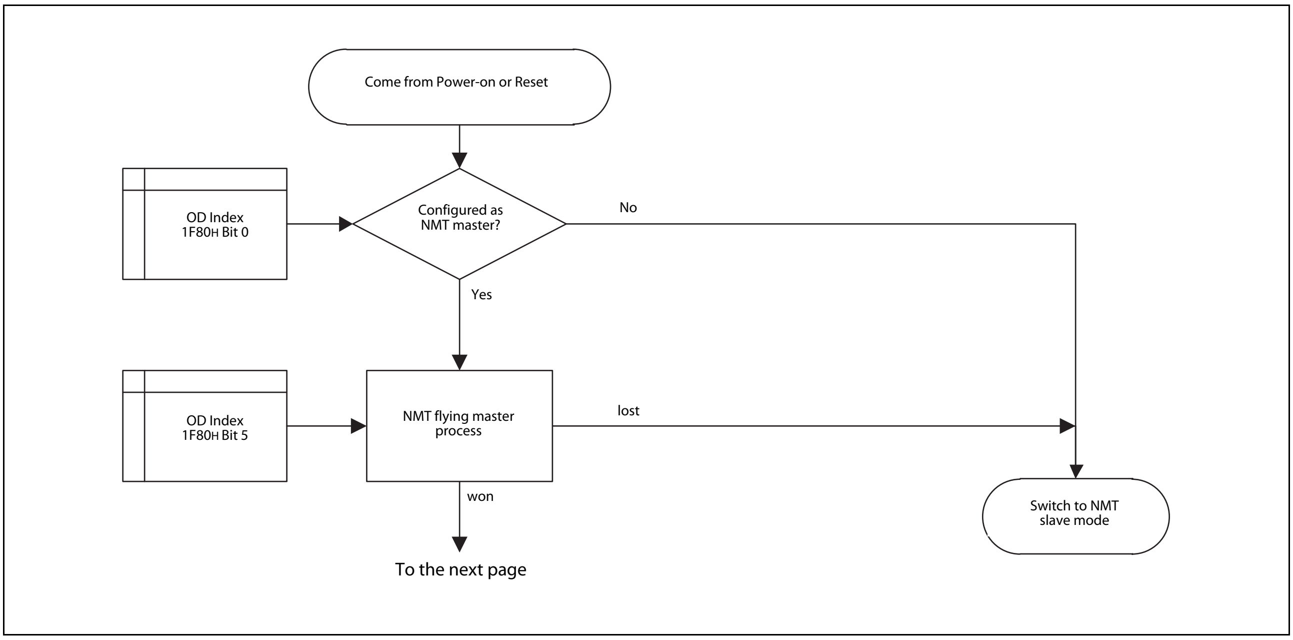


Fig. 4-28: *NMT Master startup process (1)*

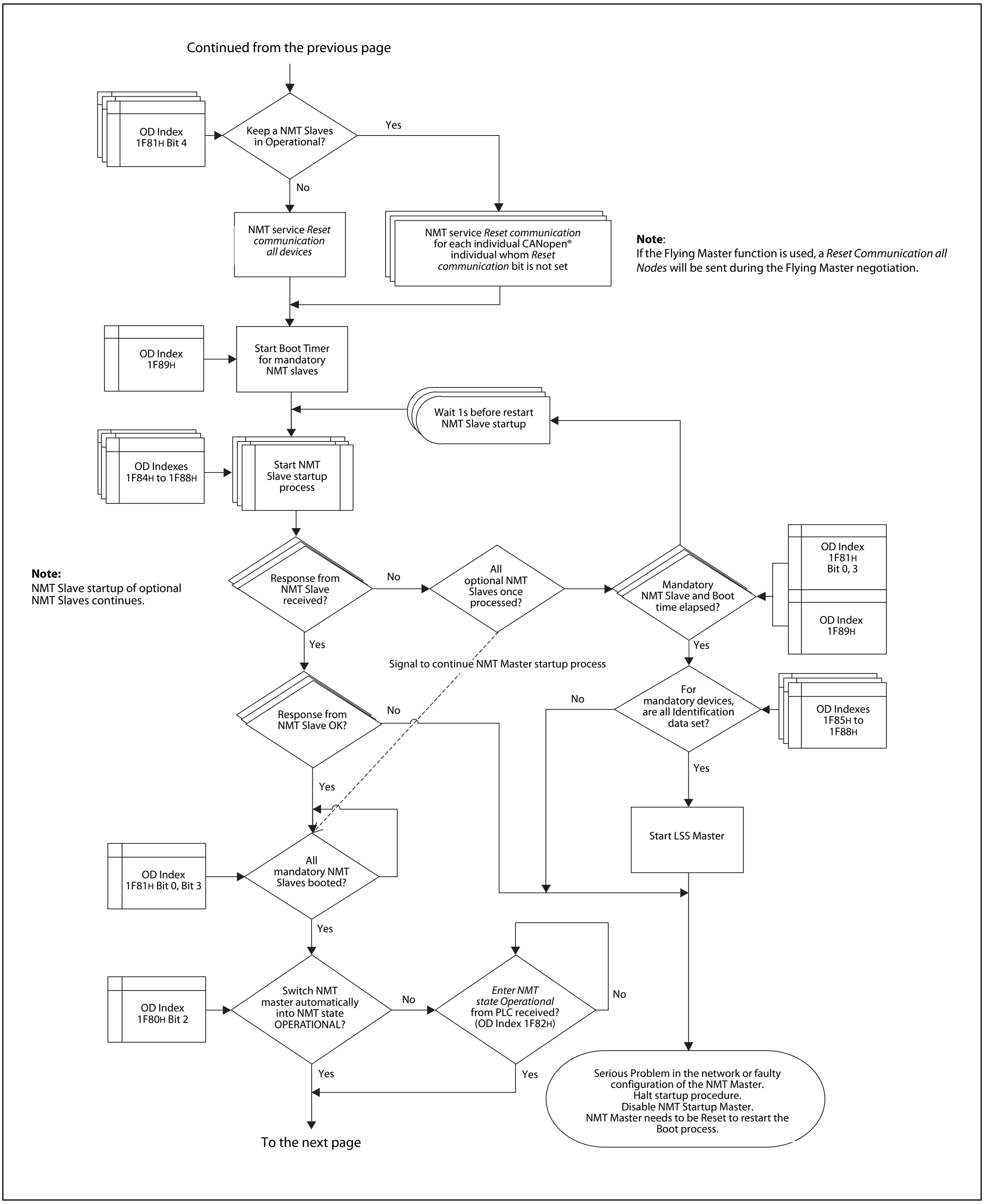


Fig. 4-28: *NMT Master startup process (2)*

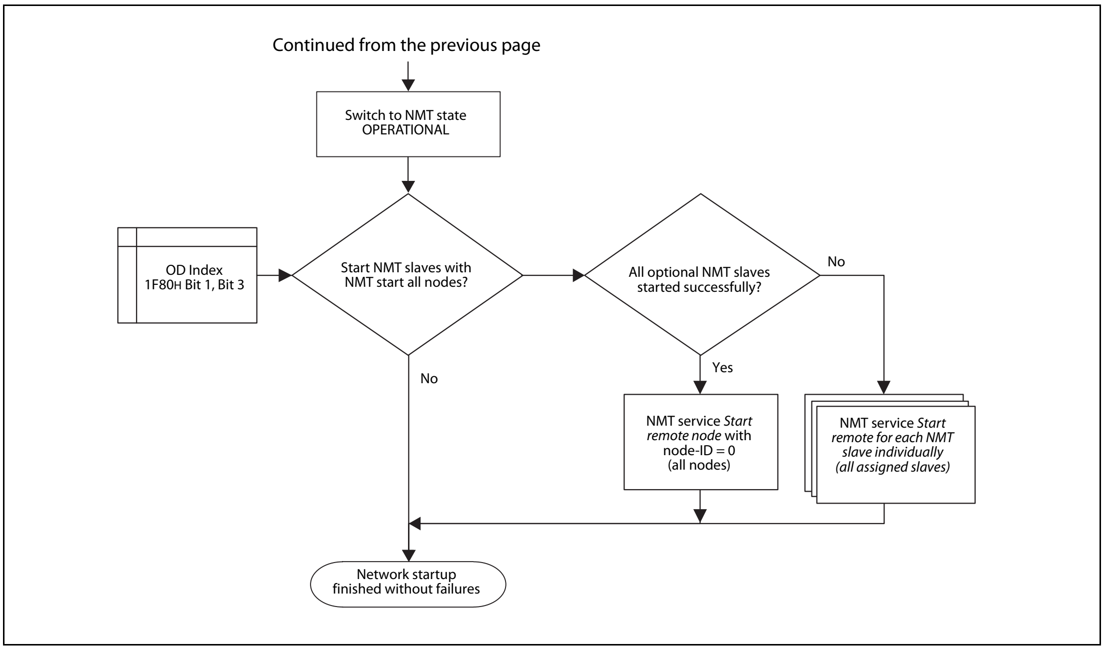


Fig. 4-28: *NMT Master startup process (3)*

NMT Master simple startup

The following figure shows a more simple overview of the total NMT master startup without any NMT Slave setting in Object Dictionary Index 1F81H. Refer to fig. 4-28 to see the whole process.

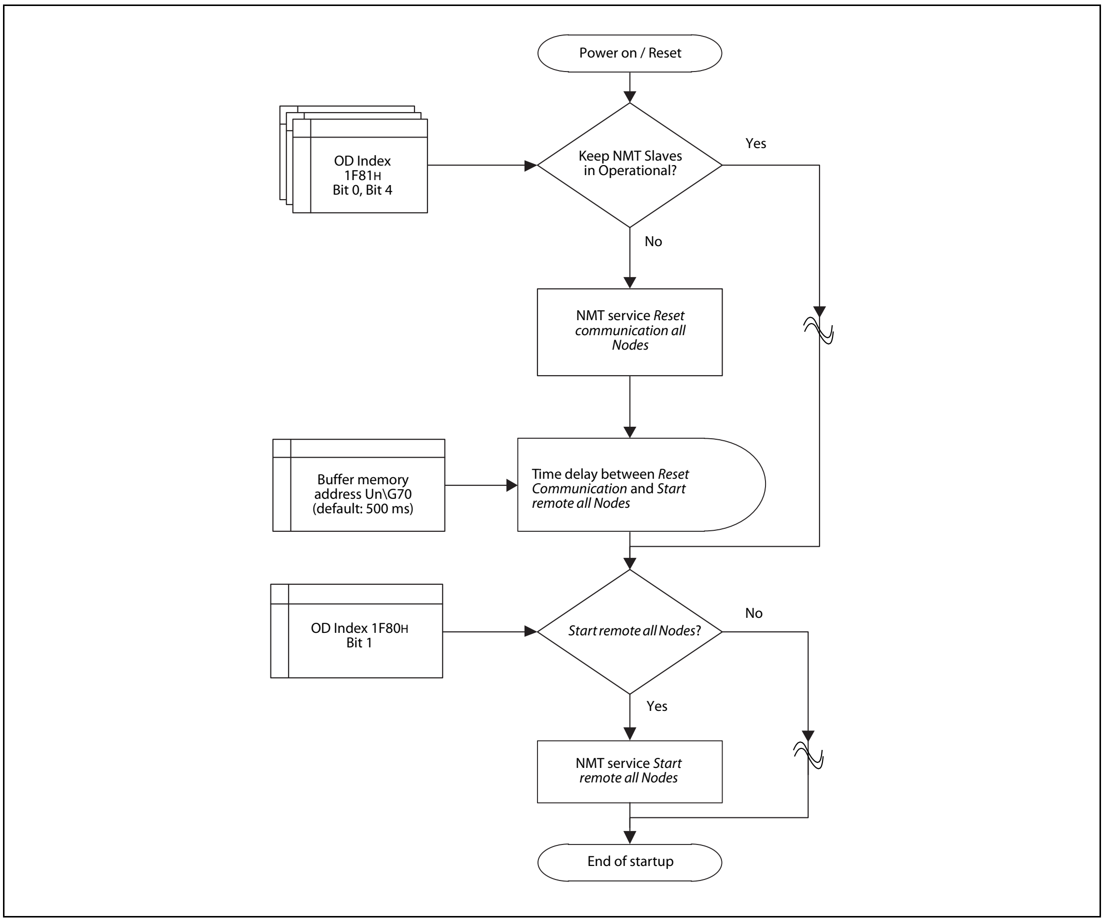


Fig. 4-29: *NMT Master simple startup*

Object 1F80H: NMT start-up

By using a SDO access, this object configures the start-up behavior of a CANopen® device. If the node is set as master without flying master capability, the node starts as NMT master and ignores "all nodes" NMT commands from the network. After the ME3CAN1-Q has been configured as the NMT master, the parameter values have to be stored (refer to section 4.6.10) and the module has to be restarted by Yn2 or by NMT request Reset Node (refer to sections 3.3.2 and 4.8.8.).

Bit 31 ... Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0H	Stop all nodes	Flying master	Reset all nodes	Start node	NMT master start	Start all nodes	NMT master

Fig. 4-30: *Bit allocation for object 1F80H: NMT start-up*

Bit/Item	Description	Remark
NMT master	Setting of module: Bit = 0: NMT slave Bit = 1: NMT master	• If this bit is set to 0, all settings of object 1F80H and 1F81H are ignored. • Only one (active) NMT master is allowed in a CANopen® network.
Start all nodes	How to start the NMT slaves by sending NMT service: Bit = 0: Send NMT service *Start remote node* for each NMT slave. Bit = 1: Send NMT service *Start all remote nodes.*	If this bit is set to 1: • Consider fig. 4-29 (NMT Master simple startup) • Don't use this setting to start remote nodes which are not assigned to the master via index 1F81H (refer to section 4.8.6).
NMT master start	How to shift to NMT state *Operational*: Bit = 0: Shift automatically Bit = 1: Do not shift automatically	If this bit is set to 1: • The NMT Master has to be shifted manually into NMT state *Operational*. This can be done by using the SDO write command for object 1F82H. The start-up process will be suspended as long the device is not in NMT State *Operational*. Refer to section 4.8.8 and section 3.5.18.
Start node	How to start the NMT slaves: Bit = 0: The NMT master shall start the NMT slaves. Bit = 1: Not the NMT master but the PLC application shall start the NMT slaves.	If this bit is set to 1: • Consider the result behavior shown in fig. 4-29 and fig. 4-31.
Reset all nodes	Describes which NMT service shall be executed if an error control event occurs in an assigned mandatory NMT slave (refer to section 4.8.6). Bit = 0: NMT service *Reset communication* for the erroneous CANopen® device. Bit = 1: NMT service *Reset communication all nodes*	• For optional NMT Slaves, NMT service reset communication for this device must be executed. • If bit 6 (stop all nodes) is set to 1, this bit setting will be ignored by the mandatory NMT slaves.
Flying master	Bit = 0: Do not use flying master service. Bit = 1: Use flying master service.	• If the device is lost at the flying master negotiation, the device works as NMT slave. • When using flying master service, all NMT master in the network needs to be set as flying master. • When using flying master service, additional settings need to be considered (refer to section 4.8.10).
Stop all nodes	How to stop nodes if an error control event occurs in an assigned mandatory NMT slave: Bit = 0: Do not stop all nodes. Bit = 1: Stop all nodes	• If this setting is set to 1, the bit 4 setting is ignored. • To restart the network, the NMT master has to be reset manually by Yn2 or by executing the SDO write command for the object 1F82H to execute the NMT service *Reset communication* or *Reset node for all nodes*. (Refer to sections 3.3.2, 4.8.8 and 3.5.18.

Tab. 4-29: *Description of object 1F80H: NMT start-up*

4.8.6 NMT slave start-up

This setting is optional.

Depending on the setting, the NMT master shall start-up the NMT slave. In this case the NMT start-up master uses the indexes 1F84H to 1F88H (refer to section 4.8.4) to identify the NMT slaves during boot-up.

To check whether the NMT slave is available in the network, the NMT start-up master will request the index 1000H of the NMT slave. If there is no response to this request, the NMT master will retry the request after 1 s until the NMT slave responds to the request or until the boot time for mandatory slave elapses without a response (refer to fig. 4-28).

The index 1F89H Boot time (refer to page 4–45) shall be set to a value higher than the maximum NMT start-up time of the slowest mandatory slave. This time is measured from power-on/restart of the NMT master until the point where the last mandatory slave gets to the NMT state *Operational*.

If identification data of NMT slaves doesn't match to the setting in the NMT Master, the whole NMT startup process will be stopped and the NMT start-up master will be disabled.

If the identification is successful, the configuration manager configures the NMT Slave at the time when configuration data are stored in the NMT Master. (Refer to section 4.8.12)

Depending on the setting, the NMT master then sets the NMT slave into the NMT state *Operational*.

NOTE To get the CANopen® network work properly, it is recommended to assign all CANopen® devices which are NMT slave to the NMT master.

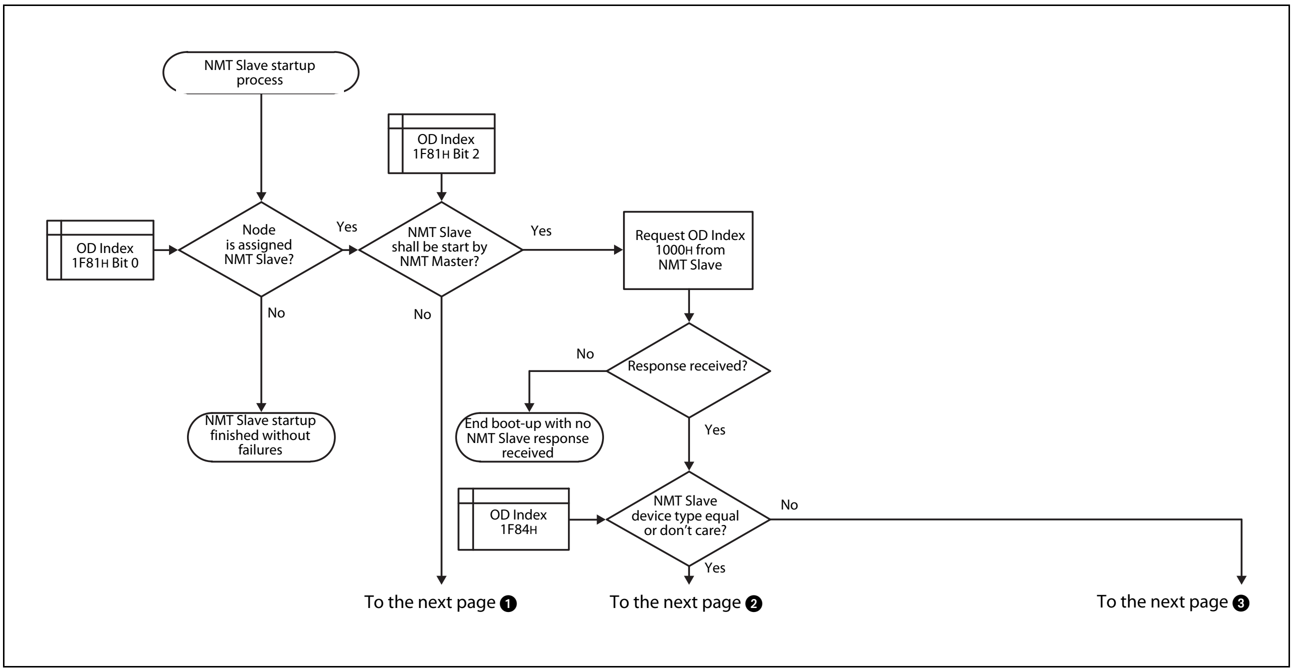


Fig. 4-31: *NMT Slave startup process (1)*

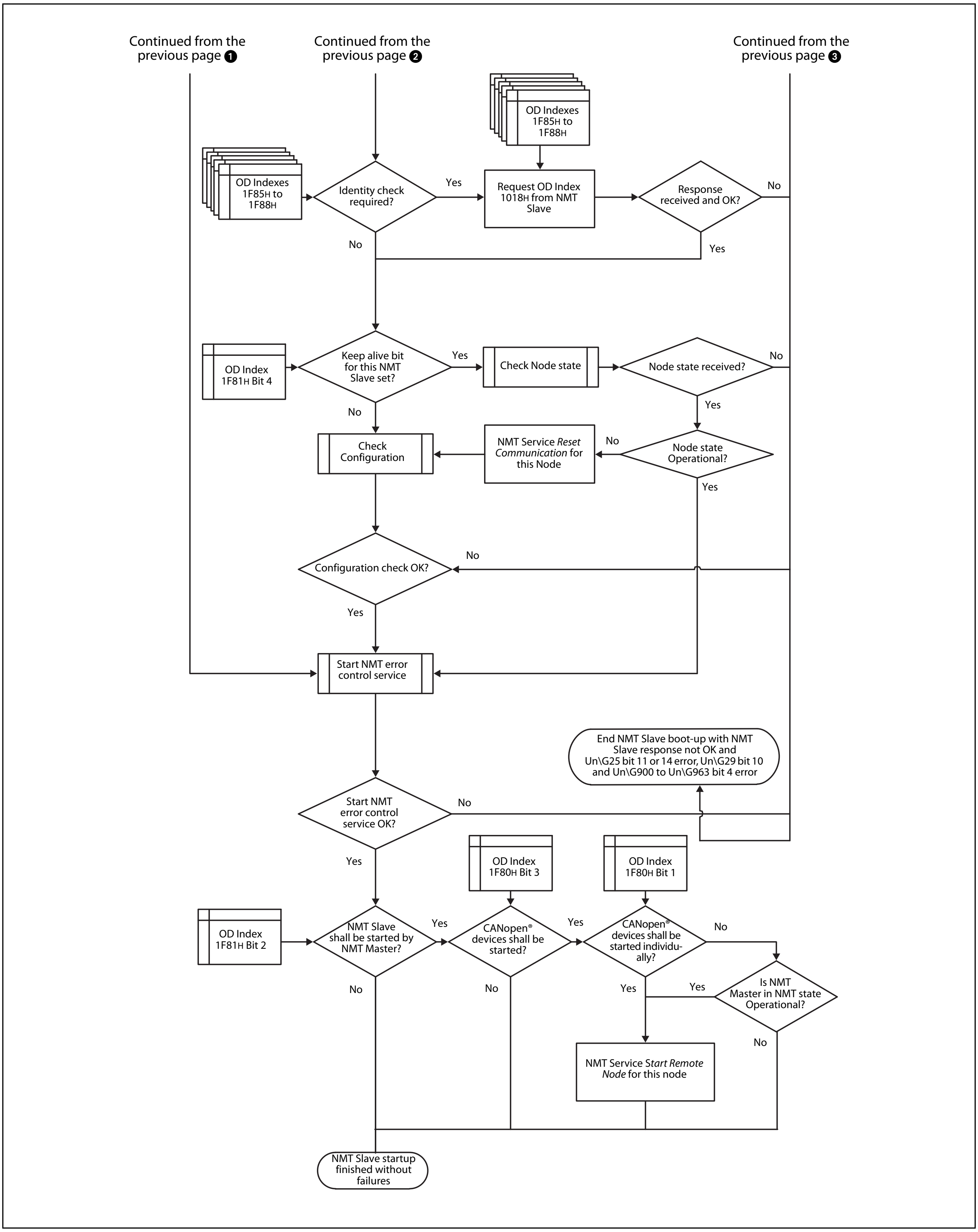


Fig. 4-31: NMT Slave startup process (2)

Object $1F81_H$, Sub-index 01_H to $7F_H$: NMT slave assignment

This object configures on the NMT Master for each node-ID (corresponding to the sub-index) the node guarding values and the NMT Slave configuration. Each sub-index of this object corresponds to the node-ID of a CANopen® device in the network. The sub-index which corresponds to the node-ID of the NMT Master is ignored.

To enable node guarding the configuration (bit 0), the guard time and the retry factor need to be set.

Bit 31 ... Bit 16	Bit 15 ... Bit 8	Bit 7 ... Bit 0
Guard time	Retry factor	Configuration

Fig. 4-32:
Bit allocation for NMT slave assignment

- Guard time
  - The value for the guard time indicates the cycle time for the node guarding of the CANopen® device. The value is in units of ms. The value 0 disables the node guarding of the CANopen® device. If the heartbeat consumer object is configured to a value ≠ 0, then the heartbeat mechanism will have priority over node guarding.
  - Setting range: K0 to K65535
- Retry factor
  - The value for the retry factor indicates the number of retries the NMT master issues in case of a node guarding event. The value 0 disables the node guarding of the CANopen® device.
  - Setting range: K0 to K255
- Configuration

Bit 7 ... Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Reserved	Reset communication	Mandatory	NMT boot slave	Reserved	NMT slave

Fig. 4-33: *Bit allocation for the configuration field of NMT slave assignment*

Bit/Item	Description	Remark
NMT slave	Bit = 0: Remote node is NMT master or not assigned Bit = 1: Remote node is NMT slave and assigned to this NMT master	• If the NMT master shall start-up the NMT slave and/or execute node-guarding to the NMT slave, it's mandatory to set this bit. • When using flying master service, please consider that if flying masters are not the active NMT master and need to be started up by the active NMT master, these flying master shall switch to NMT slave mode. (Refer to section 4.8.10)
NMT boot slave	Shall configuration and NMT service *Start remote node* be allowed in case of error control event or NMT service *Boot-up*? Bit = 0: Shall not be allowed. Bit = 1: Shall be performed	• Refer to sections 4.8.1, 4.8.2 and 4.8.12.

Tab. 4-30: *Description of the configuration field*

Bit/Item	Description	Remark
Mandatory	How shall the CANopen® device be present prior to network start-up? Bit = 0: May be present (CANopen® device is optional). Bit = 1: Shall be present (CANopen® device is mandatory).	• For mandatory slaves, please consider the bit 4 and 6 of the object 1F80H. (Refer to section 4.8.5). • For LSS slave, this bit must be set to 1 to enable the LSS service for this NMT slave. (Refer to section 4.8.11)
Reset communication	How shall the NMT service *Reset communication* be executed for the CANopen® device? Bit = 0: May be executed at any time. Bit = 1: Shall not be executed when the CANopen® device is in NMT state *Operational*.	• When using flying master service, all node reset communication command will be executed during the flying master negotiation. • If heartbeat consumption is not configured for this node, the NMT start-up master will start with node guarding, which must be answered within 100ms. • If heartbeat is not used or not supported, please confirm that the NMT slave supports node guarding. • If the NMT slave is configured for life guarding of the NMT master, take care that also the NMT Master is configured for node guarding. Otherwise the NMT slave will go into the NMT error state. • If no heartbeat or no node guarding confirmation is received within the Heartbeat consuming time after the Node Guarding RTR message, the NMT slave start-up ends with an error.
Reserved	Set to 0, otherwise SDO access error 06090030H will occur.	—

Tab. 4-30: *Description of the configuration field*

Object 1F89H: Boot time

The boot time defines the time out in ms for the NMT slave boot-up. The time is measured from the start of the NMT slave boot process until the signaling of successful boot of all mandatory NMT slaves. If the boot time elapses before all mandatory slaves are started, the NMT start-up will be stopped and the NMT start-up master will be disabled.

The value 0 disables the timer.

Setting range: K0 to K4, 294, 967, 295.

Object 102AH: NMT inhibit time

This object configures the minimum time between two NMT messages. The 16 bit value is given in multiples of 100 µs (lowest counting resolution of ME3CAN1-Q: 1ms).

The value 0 disables the inhibit time.

Setting range: In the ME3CAN1-Q, the value is fixed to 0.

4.8.7 NMT boot-up / Error event handling

When the consumer heartbeat time elapses, node guarding fails or the NMT Slave responds with an unexpected node state, the NMT master handles the NMT Slave as shown in the following figure.

If the NMT master receives a boot-up message from an assigned NMT Slave, the NMT slave will be started up by the NMT start-up master (refer to section 4.8.2). If the NMT master is in NMT state stopped, the NMT start-up master will not be able to start the NMT slave.

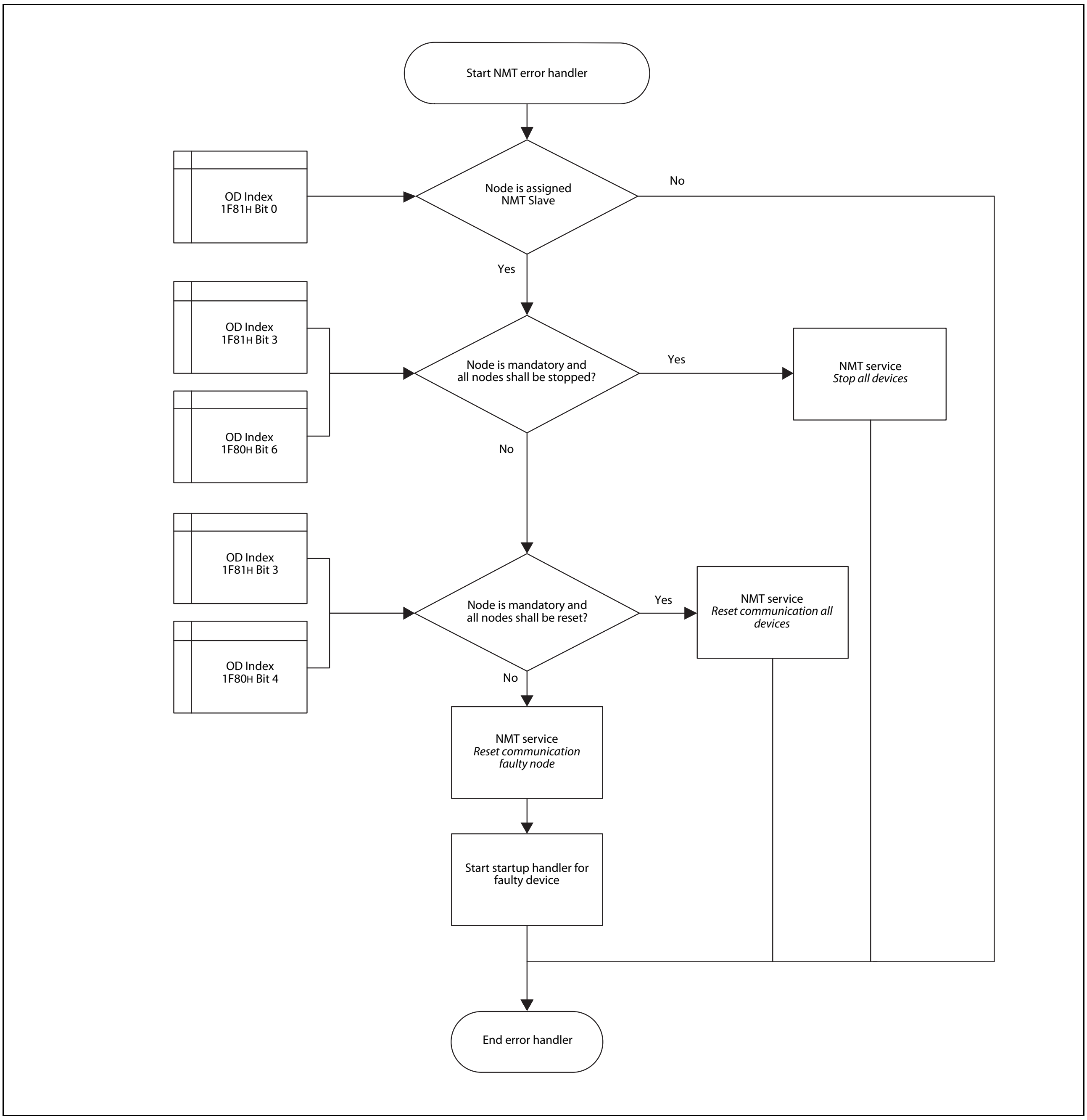


Fig. 4-34: *NMT error handler*

4.8.8 Request NMT

This object indicates at the NMT Master the current NMT state of a unique CANopen® device in the network. The sub-index corresponds to the node-ID of the CANopen® devices in the network. The sub-index 80H represents all nodes. Only the NMT Master is allowed to send NMT node control messages.

A NMT message can be requested by using the SDO write access in the NMT master. Please consider to use this carefully, because if the request is a *Stop* or *Pre-Operational* request, the NMT start-up master will not set the target node back to *Operational* automatically until the next restart.

NOTE If a node for heartbeat consuming is activated and a boot-up message is received from this node, the NMT state *Pre-operational* will be displayed for this node until the next heartbeat is received for this node.
A read access is possible by using the buffer memory (refer to section 3.5.16).

Object 1F82H, Sub-index 01H to 80H: Request NMT

Value (hex)	Description	
	Read	Write
00	NMT state unknown	Reserved
01	CANopen® device missing	Reserved
02–03	Reserved	
04	NMT state *Stopped*	NMT service *Stop remote node*
05	NMT state *Operational*	NMT service *Start remote node*
06	Reserved	NMT service *Reset node*
07	• Remote Node: Reserved • Local Node: NMT state *Reset communication*	NMT service *Reset communication*
08–7E	Reserved	
7F	NMT state *Pre-operational*	NMT service *Enter pre-operational*
80–83	Reserved	
84	Reserved	NMT service *Stop remote node excluding NMT master* NMT Slave will be set into the NMT state *Stopped*, but the NMT Master will stay in its current NMT state.
85	Reserved	NMT service *Start remote node excluding NMT master* NMT Slave will be set into the NMT state *Operational*, but the NMT Master will stay in its current NMT state.
86	Reserved	NMT service *Reset node excluding NMT master* NMT Slave will be set into the NMT state *Reset node*, but the NMT Master will stay in its current NMT state.
87	Reserved	NMT service *Reset communication excluding NMT master* NMT Slave will be set into the NMT state *Reset communication*, but the NMT Master will stay in its current NMT state.
88–8E	Reserved	
8F	Reserved	NMT service *enter Pre-operational excluding NMT master* NMT Slave will be set into the NMT state *Pre-operational*, but the NMT Master will stay in its current NMT state.
90–FE	Reserved	

Tab. 4-31: *Description for object 1F82H*

4.8.9 Request node guarding

This object indicates the node guarding state for a unique CANopen® device in the network. The sub-index corresponds to the node-ID of the CANopen® devices in the network. The sub-index 80H represents all nodes.

NOTE

If node guarding is not set, the node guarding will not start.

Object 1F83H, Sub-index 01H–80H: Request node guarding

Value (hex)	Description	
	Read	Write
00	Node guarding stopped	Stop node guarding
01	Node guarding started	Start node guarding
02–FE	Reserved	

Tab. 4-32: *Description for object 1F83H*

4.8.10 Flying master

The Flying Master mechanism provides services for a hot stand-by NMT master within a CANopen® network. All flying masters shall monitor the heartbeat of all masters in the network. A new negotiation is automatically started if the active master fails. The master with the highest priority and the lowest node ID wins the negotiation. A new negotiation is started when a new NMT master with a higher priority than the active NMT master joins the network.

The flying NMT master priority is defined by node ID * NMT master priority, and the lower value has the higher priority.

In Un\G25 bit 15 indicates whether the module is the current NMT master (refer to section 3.5.5).

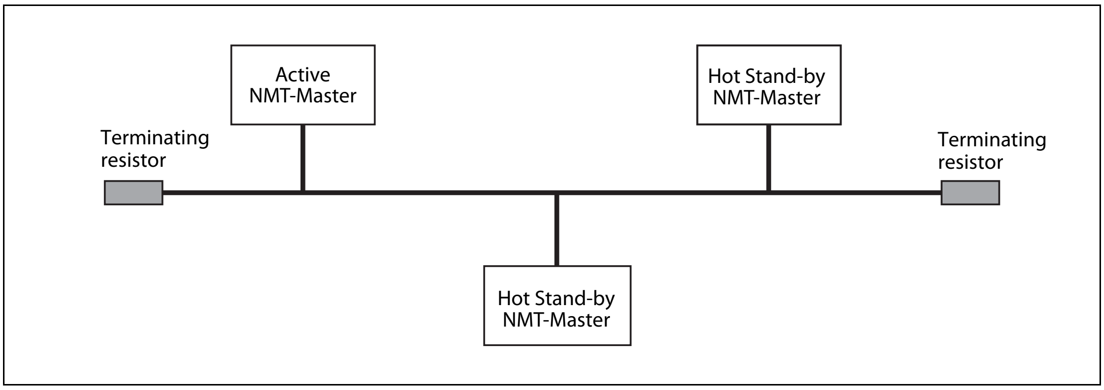


Fig. 4-35: *CANopen® network with flying masters*

NOTES

If flying master is enabled in the module and no heartbeat producing is set, the heartbeat producing is automatically set to 1000 ms.

If the module lose the negotiation and no heartbeat consuming is set for the active NMT master, the heartbeat consuming is set automatically to (1500 + 10 × node ID) ms.

If the heartbeat producing and consuming is set manually, please set a different consuming time for each NMT master (active and hot stand-by). This is necessary so that when the active NMT master is timed-out, that only one hot stand-by NMT master initiates the flying master negotiation.

NOTES

If a flying master which is not a ME3CAN1-Q is in the network, please ensure that heartbeat producing is enabled in this node, otherwise the ME3CAN1-Q with activated flying master will send endless NMT messages *reset communication*.

All flying masters should have the same configuration for the slaves.

Configure the negotiation response wait time of all flying master so, that when there is a request for flying master negotiation, the flying master with the higher priority responses before the lower one. Otherwise, the flying master negotiation will be endless.
Flying Master negotiation response wait time = NMT master priority × priority time slot +
node ID × node time slot

During the flying master negotiation process, a NMT service *reset communication* message will be sent to all nodes.

When using the flying master function please consider the following points:

- The network communication will be reset after the active NMT master fails which will interrupt the system application.
- Application data will be not synchronized by the flying master mechanisms. This has to be handled by a proper CANopen® configuration and CANopen® system planning.
- Be careful with the setting of the NMT flying master timing parameters. An inappropriate setting will result in a malfunction of the flying master negotiation. Test the system configuration before going into productive state.

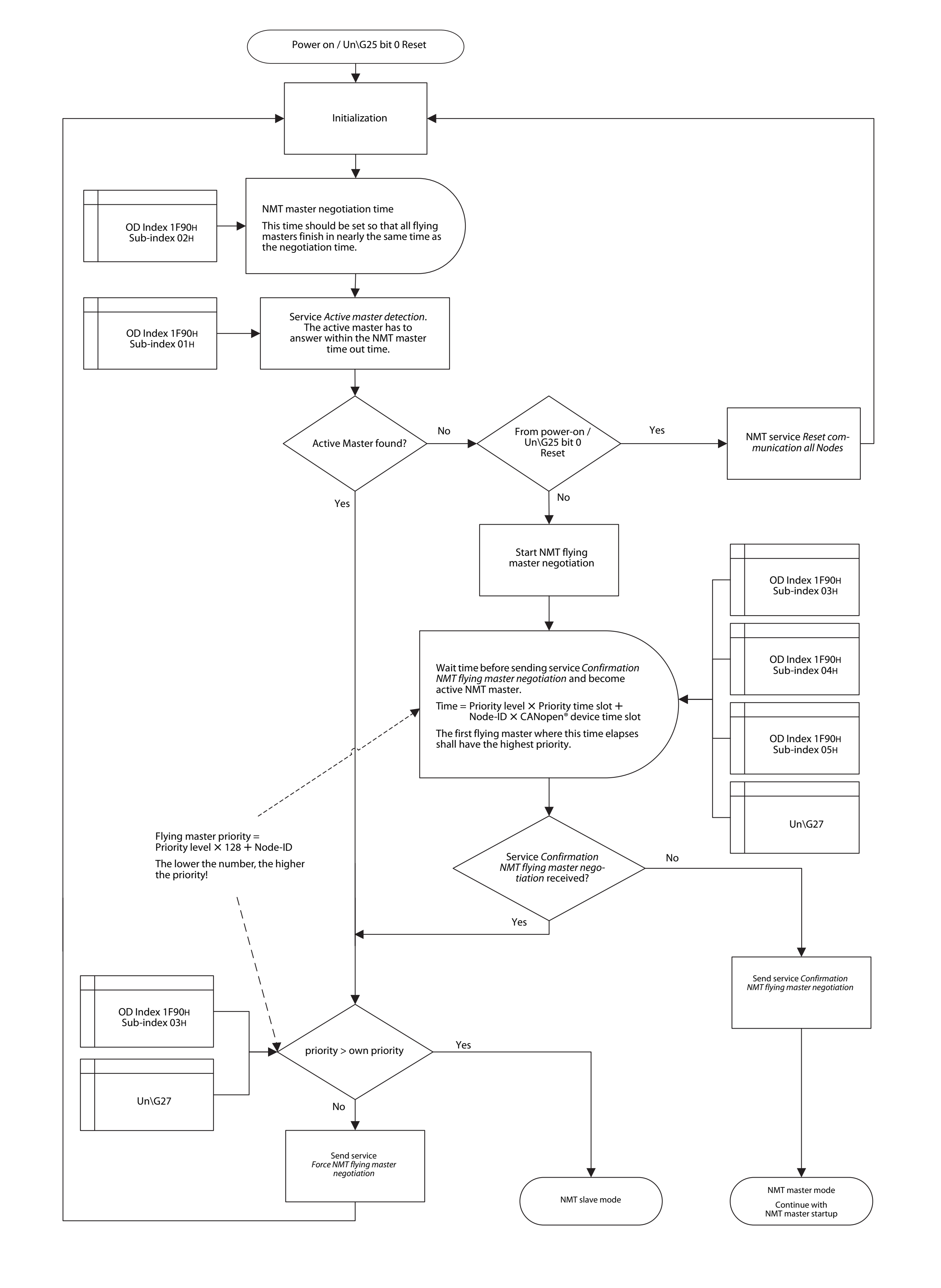


Fig. 4-36: NMT flying master process

Object 1F80H: NMT start-up

Set bit 5 to ON to participate in the NMT flying master negotiation. Refer to section 4.8.5.

Object 1F90H: NMT flying master timing parameter

This object defines the parameters for the NMT flying master negotiation process.

- Sub-index 01H: NMT master timeout

  The value is in units of ms.

- Sub-index 02H: NMT master negotiation time delay

  The value is in units of ms.

- Sub-index 03H: NMT master priority

Bit 15 ... Bit 8	Bit 7 ... Bit 0
Reserved	NMT master priority level

Fig. 4-37:
Bit allocation for sub-index 03H: NMT master priority

Value (hex)	Description	
00	Priority	High
01		Medium
02		Low
03–FF	Reserved	

Tab. 4-33:
The NMT master priority is set with the value of the bits 7–0

- Sub-index H04: Priority time slot

  The value is in units of ms.

  – Formula for the priority time slot:

    Priority time slot > 127 × CANopen® device time slot (sub-index 05H)

- Sub-index 05H: CANopen® device time slot

  The value is in units of ms.

- Sub-index 06H: Multiple NMT master detect cycle time

  The value is in units of ms.

4.8.11 LSS

There are devices available that are sealed against harsh environments and therefore do not have any hardware components, like DIP-switches, for the node-ID or bit timing parameters setting. For these kinds of devices, the ME3CAN1-Q uses the layer setting services and protocols to configure the baud rate and node address via the CANopen® network.

Only one LSS-Master is allowed within a CANopen® network. For the LSS master mode the ME3CAN1-Q has to be the active NMT Master.

To activate the LSS master, the following needs to be configured in the object dictionary:

- Index 1F89H (boot time out)

  The time shall be longer than the boot time of the NMT client, which needs the longest time for boot-up (power on until boot-up message).

- Indexes 1F84H to 1F88H, the sub-index for the node ID which shall be set at the LSS client

  The identification information which is available at the object dictionary indexes 1000H and 1018H at the LSS client. (Refer to section 4.8.4)

- Index 1F81H, the sub-index for the node ID which shall be set at the LSS client

  Set bit 0 NMT slave, bit 2 NMT boot slave and bit 3 mandatory device.

If the LSS slave is not found at the configured baud rate, the ME3CAN1-Q changes the baud rate automatically in order to find the LSS slave. Due to communication with a different baud rate, other devices in the network may get into a bus off condition. If the device does not support automatic recovering from bus off or needs too much time for recovering, it's not possible to configure the LSS client.

It is recommended to establish a point-to-point connection for the configuration and to delete the serial number entry (index 1F88H) after configuration to prevent an unwanted start of the LSS master.

NOTE

Check if the LSS client activates an internal bus termination. If necessary, deactivate the bus termination first to prevent unwanted behavior of the connected nodes on the bus.

4.8.12 Configuration manager

The configuration manager provides mechanisms to configure the CANopen® devices in a CANopen® network. For saving and requesting the CANopen® device configuration, the following objects are used.

The sub-indexes are according to node ID. The configuration manager can only be used on the active NMT master.

NOTE

If a failure occurs during the configuration upload to the NMT slave, the configuration will be stopped, except SDO access failures, when reading only indexes and sub-indexes.

Object 1020H: Verify configuration

This object indicates the downloaded configuration date and time in the NMT Slave. A configuration manager uses this object to verify the configuration after a restart to check if a reconfiguration is necessary. If the object dictionary configuration is changed in a NMT slave, the sub-indexes 01H and 02H values will be set to 0.

During NMT slave boot-up, the configuration manager compares the corresponding entries of 1020H of the slave with its own setting in the indexes 1F26H and 1F27H (see below) and decides if a reconfiguration is necessary or not. This mechanism reduces the NMT Slave boot-up time.

- Sub-index 01H: Configuration date; contains the number of days since 1984-01-01.
- Sub-index 02H: Configuration time; contains the number of ms after midnight.

Object 1F22H, Sub-index 01H–7FH: Concise DCF

Configuration files are stored in these objects in the Concise DCF format: The sub-index indicates the corresponding node ID. A CANopen® configuration software and a CAN-Bus PC interface is necessary to generate the CANopen® configuration and to save it via the CAN Bus.

Up to 60 Concise DCFs can be stored on the ME3CAN1-Q. The maximum size for each entry is 65531 bytes.

NOTES

To delete a sub-index entry, write 0 to this sub-index. During this time, it is not possible to write a new file. If the flash ROM is busy, a SDO write access error 06060000H will occur.

If the ME3CAN1-Q responds to a SDO write access to a sub-index with an SDO Error 06010002H, this sub-index already had been used. Delete the sub-index entry before by using the method described above.

If the ME3CAN1-Q responds to a SDO write access to a sub-index with an SDO access Error 06070010H, the CDCF File is bigger than 65531 bytes, or this sub-index has already been used. Check the file size and delete the sub-index entry before by using the method described above.

If the CANopen® configuration software has a problem with the automatic transfer of the Concise DCF, flash ROM busy errors will occur. In this case, please use the selective file download if supported.

All 1F22H sub-indexes can also be deleted by the restore default parameter command (refer to section 4.6.11).

The self-configuration by configuring the sub-index of the self-node ID is not supported.

The Concise DCF data will be directly stored in the flash ROM. A store parameter command by using the object dictionary index 1010H is not necessary (refer to section 4.6.10).

Object 1F25H, Sub-index 01H–80H: Configuration request

To initiate a configuration request for a CANopen® node, use the SDO write command in the CIF (refer to section 5.1.3) and write 666E6F63} (ISO8859 string code: "conf") to the corresponding sub-index of the ME3CAN1-Q. The sub-index 80H initiates a configuration request for all CANopen® devices in the network for which Concise DCF data are stored. A configuration request to the self-node ID will be ignored and no error will be generated.

If no data are stored for the Node ID in sub-index 01H to 7FH, a SDO error 08000024H will be generated.

A configuration request to the self-node ID will be ignored.

Object 1F26H, Sub-index 01H–7FH: Expected configuration date

This object is used by CANopen® configuration software to verify the configuration date of the CANopen® devices in the network. The value contains the number of days since 1984-01-01.

Object 1F27H, Sub-index 01H–7FH: Expected configuration time

This object is used by CANopen® configuration software to verify the configuration time of the CANopen® devices in the network. The value contains the number of ms after midnight.

4.9 Device Profile CiA®-405 V2.0 for IEC 61131-3 Programmable Devices

This section describes the standardized CANopen® interface and device profile for IEC 61131-3 programmable devices, e.g. PLCs. The supported objects for data read/write support signed 8 bit, unsigned 8 bit, signed 16 bit, unsigned 16 bit, signed 32 bit, unsigned 32 bit and float 32 bit. The corresponding objects in the object dictionary can be directly accessed via the buffer memory from the PLC.

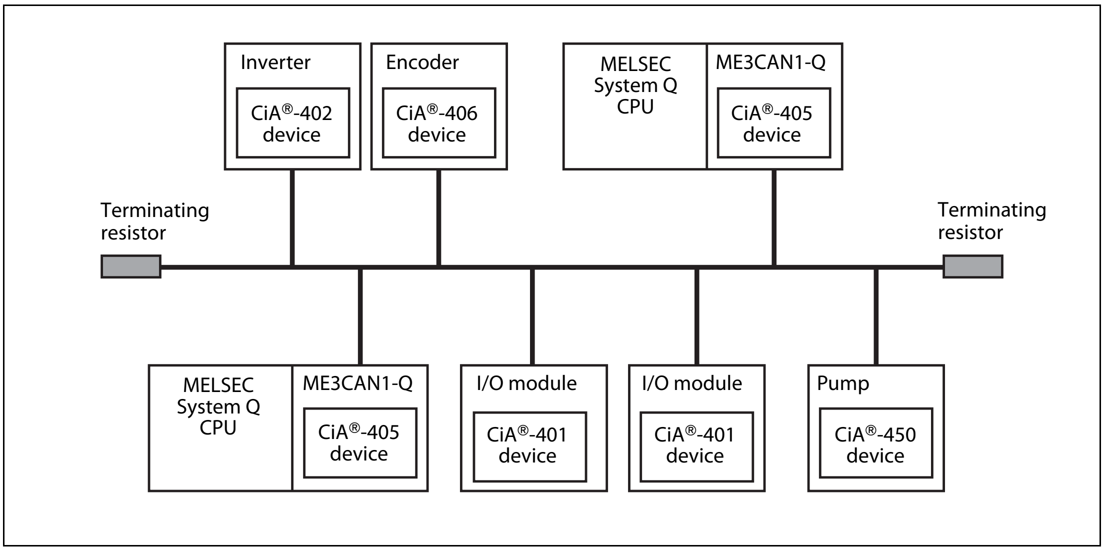


Fig. 4-38: *CANopen® network with PLCs*

Input network variables

The table below provides a brief description and reference information for the ME3CAN1-Q CANopen® object dictionary for input network variables.

Index (hex)	Sub-index (hex)	Description	Data type	Initial value ①	R/W ②
A000–A007	00	Highest sub-index	U8	FEH	R
	01–FE	Signed integer 8 bit	I8	0	R
A008	00	Highest sub-index	U8	10H	R
	01–10	Signed integer 8 bit	I8	0	R
A040–A047	00	Highest sub-index	U8	FEH	R
	01–FE	Unsigned integer 8 bit	U8	0	R
A048	00	Highest sub-index	U8	10H	R
	01–10	Unsigned integer 8 bit	U8	0	R
A0C0–A0C3	00	Highest sub-index	U8	FEH	R
	01–FE	Signed integer 16 bit	I16	0	R
A0C4	00	Highest sub-index	U8	08H	R
	01–08	Signed integer 16 bit	I16	0	R
A100–A103	00	Highest sub-index	U8	FEH	R
	01–FE	Unsigned integer 16 bit	U16	0	R
A104	00	Highest sub-index	U8	08H	R
	01–08	Unsigned integer 16 bit	U16	0	R
A1C0–A1C1	00	Highest sub-index	U8	FEH	R
	01–FE	Signed integer 32 bit	I32	0	R
A1C2	00	Highest sub-index	U8	04H	R
	01–04	Signed integer 32 bit	I32	0	R

Tab. 4-34: *Input network variables*

Index (hex)	Sub-index (hex)	Description	Data type	Initial value ①	R/W ②
A200–A201	00	Highest sub-index	U8	FEH	R
	01–FE	Unsigned integer 32 bit	U32	0	R
A202	00	Highest sub-index	U8	04H	R
	01–04	Unsigned integer 32 bit	U32	0	R
A240–A241	00	Highest sub-index	U8	FEH	R
	01–FE	Float 32 bit	Real32	0	R
A242	00	Highest sub-index	U8	04H	R
	01–04	Float 32 bit	Real32	0	R

Tab. 4-34: *Input network variables*

① The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

② Indicates whether reading from and writing to CAN bus are enabled.
R: Read enabled
W: Write enabled

Output network variables

The table below provides a brief description and reference information for the ME3CAN1-Q CANopen® object dictionary for output network variables.

Index (hex)	Sub-index (hex)	Description	Data type	Initial value ①	R/W ②
A480–A487	00	Highest sub-index	U8	FEH	R
	01–FE	Signed integer 8 bit	I8	0	R/W
A488	00	Highest sub-index	U8	10H	R
	01–10	Signed integer 8 bit	I8	0	R/W
A4C0–A4C7	00	Highest sub-index	U8	FEH	R
	01–FE	Unsigned integer 8 bit	U8	0	R/W
A4C8	00	Highest sub-index	U8	10H	R
	01–10	Unsigned integer 8 bit	U8	0	R/W
A540–A543	00	Highest sub-index	U8	FEH	R
	01–FE	Signed integer 16 bit	I16	0	R/W
A544	00	Highest sub-index	U8	08H	R
	01–08	Signed integer 16 bit	I16	0	R/W
A580–A583	00	Highest sub-index	U8	FEH	R
	01–FE	Unsigned integer 16 bit	U16	0	R/W
A584	00	Highest sub-index	U8	08H	R
	01–08	Unsigned integer 16 bit	U16	0	R/W
A640–A641	00	Highest sub-index	U8	FEH	R
	01–FE	Signed integer 32 bit	I32	0	R/W
A642	00	Highest sub-index	U8	04H	R
	01–04	Signed integer 32 bit	I32	0	R/W
A680–A681	00	Highest sub-index	U8	FEH	R
	01–FE	Unsigned integer 32 bit	U32	0	R/W
A682	00	Highest sub-index	U8	04H	R
	01–04	Unsigned integer 32 bit	U32	0	R/W
A6C0–A6C1	00	Highest sub-index	U8	FEH	R
	01–FE	Float 32 bit	Real32	0	R/W
A6C2	00	Highest sub-index	U8	04H	R
	01–04	Float 32 bit	Real32	0	R/W

Tab. 4-35: *Output network variables*

① The "Default" value is the initial value set after the power is turned ON or the PLC CPU is reset.

② Indicates whether reading from and writing to CAN bus are enabled.
R: Read enabled
W: Write enabled

5 Command Interface

This chapter describes the Command Interface supported by the ME3CAN1-Q. For the command interface, the buffer memory addresses Un\G1000–Un\G1066 are used (section 3.5.18).

The following commands are supported:

Command Interface	Reference (Section)
SDO read ①	5.1.1
SDO multi read ①	5.1.2
SDO write ①	5.1.3
SDO multi write ①	5.1.4
Send an Emergency Message	5.2
Display current parameter	5.3
Clear/Reset the "CIF was busy" error	5.4.3

Tab. 5-1:
Commands

① This command uses SDO communication. If the NMT Startup Master is active it can happen that the NMT Startup Master has already occupied the SDO connection to the remote Node.

During the first initial network startup the NMT Startup Master occupies up to 126 SDO connections at the same time. If an NMT Slave fails after the initial Network Startup the NMT Startup Master occupies the SDO connection to the specific NMT Slave. If the NMT Startup master is active for one or more NMT slaves, bit 14 in Un\G25 is ON (Refer to section 3.5.5).

5.1 SDO Request

Please consider that the NMT Master startup process is using SDO's which can be result in an error of the CIF command if the NMT Startup Master accesses the remote Node at the same time.

5.1.1 CIF SDO read access

Execution procedure: CIF SDO read access

- Write the command code 0004H for SDO read access to Un\G1000.
- Write the Node number and the Index / Sub-index of the target Object Dictionary to Un\G1001 to Un\G1003.
- After writing all the necessary parameters turn ON Y(n+1)7 in order to trigger the command execution. If the command execution is finished, X(n+1)7 will be turned ON.
- If the access has been successful, Un\G1000 will contain "5" and Un\G1001 to Un\G1003 will contain the node number, index and sub index for verification purposes. The length of the read data (in byte) will be stored in Un\G1004. Un\G1005 to Un\G1066 will contain up to 124 data bytes.

Buffer memory allocation

Address (Decimal)	Description	
	Transmit message	Receive message
1000	Command 0004H: SDO read	• 0005H: SDO read success • 000FH: Error (Refer to section 5.4) • FFFFH: CIF Busy
1001	Node number ①	Node number ① (read back)
1002	Index	Index (read back)
1003	• Low byte: Sub index • High byte: Reserved	Sub index (read back)
1004	Unused	Data length (read back)
1005–1066	Unused	Result data

Tab. 5-2: *Buffer memory allocation for CIF SDO read access*

① Node number 0 is accessing the local ME3CAN1-Q modules Object Dictionary, regardless of its real node address. This is useful as the configuration of the local node can be programmed independently from the node address.

Result data structure in Un\G1005 to Un\G1066

Address (Decimal)	Description	
	High Byte	Low Byte
1005	2nd data byte	1st data byte
1006	4th data byte	3rd data byte
1007	6th data byte	5th data byte
1008	8th data byte	7th data byte
:	:	:
1065	122nd data byte	121st data byte
1066	124th data byte	123rd data byte

Tab. 5-3: *Result data structure*

5.1.2 CIF Multi SDO read access

With the multi SDO read access command, up to 8 SDO read accesses can be made within one command. The maximum data length for each access is 8 bytes.

Execution procedure: CIF Multi SDO read access

- At first write the Command code 8H, the node number (0, 1–127), the Object Dictionary Index and the Sub index to the buffer memory.
- After writing all the necessary parameters turn ON Y(n+1)7 in order to trigger the command execution. If the command execution is finished, X(n+1)7 will be turned ON.
- If the access has been successful Un\G1000 will display "9" and Un\G1001 to Un\G1064 will contain the node number, index and sub index for verification purposes.

Buffer memory allocation

Address (Decimal)	Description	
	Transmit message	**Receive message**
1000	Command 0008H: SDO Multi read	• 0009H: SDO read success • 000FH: Error (Refer to section 5.4) • 00F9H: Error (refer to Node number and Result data for details) • FFFFH: CIF Busy
1001	Node number ①	• Success: Node number ① (read back) • Error: – High Byte: 0FH – Low Byte: Node number ① (read back)
1002	Index	Index (read back)
1003	• Low byte: Sub index • High byte: Reserved	Sub index (read back)
1004	Unused	• Success: Data length • Error: 0H
1005	Unused	• Success: Result data • Error: SDO access error code
1006		
1007		
1008		
: :	: :	: :
1057	Node number ①②	• Success: Node number ① (read back) • Error: – High Byte: 0FH – Low Byte: Node number ① (read back)
1058	Index	Index (read back)
1059	• Low byte: Sub index • High byte: reserved	Sub index (read back)
1060	Unused	• Success: Data length • Error: 0H
1061	Unused	• Success: Result data • Error: SDO access error code
1062		
1063		
1064		
1065–1066	Unused	Unused

Tab. 5-4: *Buffer memory allocation for CIF Multi SDO read access*

① Node number 0 is accessing the local ME3CAN1-Q modules Object Dictionary, regardless of its real node address. This is useful as the configuration of the local node can be programmed independently from the node address.

② If the final setting is located before Un\G1057 write FFFFH in the last buffer memory address (Node number).

5.1.3 CIF SDO write access

Execution procedure: CIF SDO write access

- Write the command code 0002H for SDO write access to Un\G1000.
- Write the Node number and the Index/Sub-index of the target Object Dictionary to Un\G1001 to Un\G1003.
- Write the data length (in bytes) to be written, to Un\G1004, and the data to be written, to Un\G1005 and Un\G1066.
- After writing all the necessary parameters turn ON Y(n+1)7 in order to trigger the command execution. If the command execution is finished, the X(n+1)7 will be turned ON.
- If the access has been successful, Un\G1000 will display "3" and Un\G1001 to Un\G1003 will contain the node number, index and sub index for verification purposes.

Buffer memory allocation

Address (Decimal)	Description	
	Transmit message	Receive message
1000	Command 0002H: SDO write	• 0003H: SDO write success • 000FH: Error (Refer to section 5.4) • FFFFH: CIF Busy
1001	Node number ①	Node number ① (read back)
1002	Index	Index (read back)
1003	• Low byte: Sub index • High byte: Reserved	Sub index (read back)
1004	Data length (in byte)	Unused
1005–1066	Command parameter data	Unused

Tab. 5-5: *Buffer memory allocation for CIF SDO write access*

① Node number 0 is accessing the local ME3CAN1-Q modules Object Dictionary, regardless of its real node address. This is useful as the configuration of the local node can be programmed independently from the node address.

Command parameter data structure in Un\G1005 to Un\G1066

Address (Decimal)	Description	
	High Byte	Low Byte
1005	2nd data byte	1st data byte
1006	4th data byte	3rd data byte
1007	6th data byte	5th data byte
1008	8th data byte	7th data byte
: :	: :	: :
1065	122nd data byte	121st data byte
1066	124th data byte	123rd data byte

Tab. 5-6:
Command parameter data structure

Example Setting:
Changing the NMT state of the whole network to state *Operational**

* The module needs to be active NMT Master)

Address (Decimal)	Description	
	Transmit message	Receive message
1000	Command 0002H: SDO write	• 0003H: SDO write success or • 000FH: Error (Refer to section 5.4)
1001	Node number (The ME3CAN1-Q itself): 0H	Node number (read back): 0H (the ME3CAN1-Q)
1002	Index (Request NMT): 1F82H	Index (read back): 1F82H (Request NMT)
1003	Sub index (all nodes): 80H	Sub index (read back): 80H (all nodes)
1004	Data length (1 byte): 1	Unused
1005	Command parameter data (NMT service Start remote node): 05H	Unused
1006–1066	Unused	Unused

Tab. 5-7: *Example setting for changing the NMT state of the whole network to state Operational*

5.1.4 CIF Multi SDO write access

With the multi SDO write access command, up to 8 SDO write accesses can be made within one command. The maximum data length for each access is 8 bytes.

Execution procedure: CIF Multi SDO write access

- Write the command code 0006H for multi SDO write access to Un\G1000.
- Write the node number (0, 1–127), the Object Dictionary Index, the Sub-index, the data length (in byte) and the data to be sent to the buffer memory.
- After writing all the necessary parameters turn ON Y(n+1)7 in order to trigger the command execution. If the command execution is finished, X(n+1)7 will be turned ON.
- If the access has been successful, Un\G1000 will display "7" and the following buffer memory addresses will contain the node number, index and sub index for verification purposes number.

Buffer memory allocation

Address (Decimal)	Description	
	Transmit message	**Receive message**
1000	Command 0006H: SDO Multi write	• 0007H: SDO write success • 000FH: Error (Refer to section 5.4) • 00F7H: Error (refer to Node number and Result data for details) • FFFFH: CIF Busy
1001	Node number ①	• Success: Node number ① (read back) • Error: – High Byte: 0FH – Low Byte: Node number ① (read back)
1002	Index	Index (read back)
1003	• Low byte: Sub index • High byte: Reserved	Sub index (read back)
1004	Data length (in byte)	Unused
1005	Command parameter data (1 to 8 byte)	• Success: Unused • Error: SDO access error code
1006		
1007		
1008		
: :	: :	: :
1057	Node number ①②	• Success: Node number ① (read back) • Error: – High Byte: 0FH – Low Byte: Node number ① (read back)
1058	Index	Index (read back)
1059	• Low byte: Sub index • High byte: reserved	Sub index (read back)
1060	Data length (in byte)	Unused
1061	Command parameter data (1 to 8 byte)	• Success: Unused • Error: SDO access error code
1062		
1063		
1064		
1065–1066	Unused	Unused

Tab. 5-8: *Buffer memory allocation for CIF Multi SDO write access*

① Node number 0 is accessing the local ME3CAN1-Q modules Object Dictionary, regardless of its real node address. This is useful as the configuration of the local node can be programmed independently from the node address.

② If the final setting is located before Un\G1057 write FFFFH in the last buffer memory address (Node number).

5.2 Send an Emergency Message

This command can be used to send an emergency message by the PLC to the CANopen® network.

Execution procedure: Send an emergency message

- Write the command code 000AH to Un\G1000.
- Write the Emergency error code①, Error register and Manufacturer-specific error code that will be sent as the Emergency Message to Un\G1001 to Un\G1004.

  Unused emergency data bytes **have to be** filled with "00H".
- After writing the necessary command parameters, turn ON Y(n+1)7 to execute the command. If the command execution is finished, X(n+1)7 will be turned ON.

Buffer memory allocation

Address (Decimal)	Description	
	Transmit message	**Receive message**
1000	Command 000AH: Send emergency message	• 000BH: Command success • 000CH: Communication error • 000FH: Error (Refer to section 5.4) • FFFFH: CIF Busy
1001	Emergency error code ①	• 0000H: No Error • 0001H: EMCY Inhibit time not elapsed • 0002H: Device is not in CANopen® State *Operational* or *Pre-Operational*
1002	• Low Byte: Error register (Refer to section 4.6.2 and section 4.6.12) • High Byte: Byte 0 of Manufacturer-specific error code (msef) (Refer to section 4.6.12)	Unused
1003	• Low Byte: Byte 1 of msef • High Byte: Byte 2 of msef	Unused
1004	• Low Byte: Byte 3 of msef • High Byte: Byte 4 of msef	Unused
1005–1066	Unused	Unused

Tab. 5-9: *Buffer memory allocation when sending an emergency message*

① For Emergency error codes please refer to section 8.2.1.

5.3 Display Current Parameter

The command "Display Current Parameter" can be used to display the parameter of the last issued CIF command in Un\G1001 to Un\G1066.

If a command caused an error, this function allows the parameter which caused the error to be displayed and to make the necessary adjustments to the parameter set and PLC program.

Execution procedure: Display current parameter

- Write the command code 0000H to Un\G1000.
- Turn ON Y(n+1)7 in order to trigger the command execution. If the command execution is finished, X(n+1)7 will be turned ON.
- When the parameter value of the last executed CIF command has been restored to Un\G1001 to #1066, 0000H is displayed to Un\G1000.

Buffer memory allocation

Address (Decimal)	Description	
	Transmit message	Receive message
1000	Command 0H	0H
1001–1066	Unused	Parameter of last issued CIF command

Tab. 5-10: *Buffer memory allocation when displaying current parameter*

5.4 Error Messages

If an error occurs during the execution of a command, 000FH is written to Un\G1000, and the error class and additional data are stored to Un\G1000 to Un\G1066.

Address (Decimal)	Description
1000	000FH (Error)
1001	Error Class
1002–1066	Additional data, error class dependent

Tab. 5-11:
Storing of error messages in the buffer memory addresses Un\G1000 to Un\G1066

5.4.1 Unknown command used

The command written to Un\G1000 is unknown.

NOTE This error will also occur when a command is not supported in this function mode.

Address (Decimal)	Description
1000	000FH (Error)
1001	Error Class: 0064H
1002–1066	Unused

Tab. 5-12:
Error message when an unknown command is used

5.4.2 Command or parameter change while CIF was busy

After the command interface (CIF) has received a new command in Un\G1000, it will start to execute this command with the parameters given in Un\G1001 to Un\G1066.

After the command has been written to Un\G1000, the result Un\G1000 will display "CIF busy" (FFFFH). After the command written to Un\G1000 has been processed, the result Un\G1000 will be set to the corresponding success/failure code and will not contain the value FFFFH.

If any buffer memory from Un\G1000 to Un\G1066 is accessed by a write access while the CIF is busy, the data is not written to the buffer memory area and the "Command or parameter change while CIF was busy" error is displayed in the result buffer memory. This error status must be acknowledged/ reset by a special command to make the CIF available again (refer to the next section 5.4.3 below).

Address (Decimal)	Description
1000	000FH (Error)
1001	Error Class: FFFFH
1002–1066	Unused

Tab. 5-13:
Error message when a command or parameter change was attempted while CIF was busy

5.4.3 Clear/Reset the "CIF was busy" error

To reset the CIF after a "Command or parameter change while CIF was busy" error (refer to section 5.4.3 above), FFFFH must be written to Un\G1000. Then Y(n+1)7 must be turned ON in order to trigger the command execution. If the command execution is finished, X(n+1)7 will be turned ON.

The CIF is available again if Un\G1000 contains 0000H.

5.4.4 SDO Error

Node-ID of an error and an error code are stored in Un\G1002 to Un\G1004.

Address (Decimal)	Description
1000	000FH (Error)
1001	Error Class: 0003H
1002	Node-ID
1003	Low word of error code
1004	High word of error code
1005–1066	Unused

Tab. 5-14:
SDO error message

NOTE For SDO error codes please refer to section 8.2.3.

5.4.5 Bus OFF

The ME3CAN1-Q is in Bus OFF state and cannot send CAN messages.

Address (Decimal)	Description
1000	000FH (Error)
1001	Error Class: B0FFH
1002–1066	Unused

Tab. 5-15:
Error message when the ME3CAN1-Q is in Bus OFF state

5.4.6 Device in wrong state

The ME3CAN1-Q is in wrong device state for the command.

Address (Decimal)	Description
1000	000FH (Error)
1001	Error Class: 0F0FH
1002–1066	Unused

Tab. 5-16:
Error message when the ME3CAN1-Q is in wrong state

6 Setup and Procedures before Operation

6.1 Handling Precautions

- Do not drop the module or subject it to heavy impact.
- Do not remove the PCB of the module from its case. Doing so may cause the module to fail.
- Prevent foreign matter such as dust or wire chips from entering the module. Such foreign matter can cause a fire, failure, or malfunction.
- Before handling the module, touch a grounded metal object to discharge the static electricity from the human body.

  Failure to do so may cause the module to fail or malfunction.
- Tighten the module fixing screw within the following range. A loose screw may cause short circuits, failures, or malfunctions.

Screw location	Tightening torque range
Module fixing screw (M3 screw, optional)	0.36 to 0.48 Nm

Tab. 6-1: *Tightening torque*

- To mount the module on the base unit, fully insert the module fixing latch into the fixing hole in the base unit and press the module using the hole as a fulcrum.

  Improper installation may result in a module malfunction, or may cause the module to fall off.

6.2 Procedures before Operation

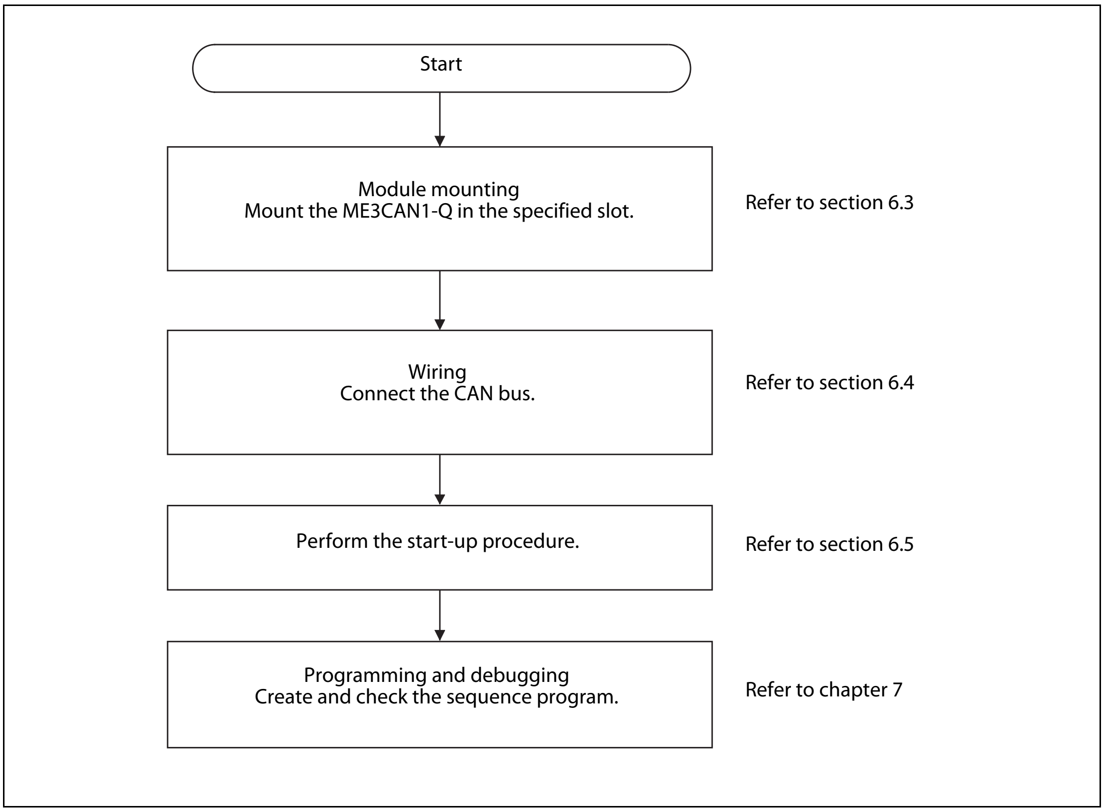


Fig. 6-1: *Function chart for the setup of the CANopen® module*

6.3 Installation of the Module

The ME3CAN1-Q can be combined with a CPU module or, when mounted to a remote I/O station, with a master module for MELSECNET/H (refer to section 2.2).

WARNING:

- ***Cut off all phases of the power source externally before starting the installation or wiring work.***
- ***Always insert the module fixing latch of the module into the module fixing hole of the base unit. Forcing the hook into the hole will damage the module connector and module.***
- ***Do not touch the conductive parts of the module directly.***

① After switching of the power supply, insert the module fixing latch into the module fixing hole of the base unit.

② Push the module in the direction of the arrow to load it into the base unit.

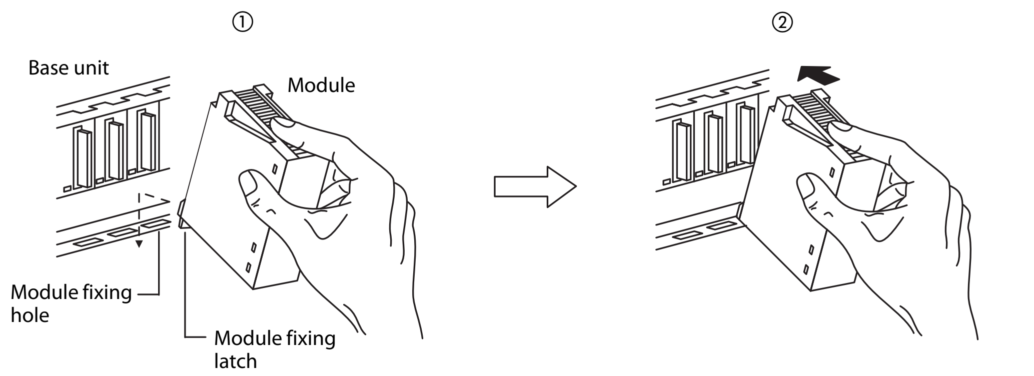


Fig. 6-2: *Module installation*

③ Secure the module with an additional screw (M3×12) to the base unit if large vibration is expected. This screw is not supplied with the module.

6.4 Wiring

6.4.1 Wiring Precautions

Please observe the following precautions for external wiring:

- Perform class D grounding (grounding resistance: 100 Ω or less) to the shield of the twisted shield cable (refer to section 6.4.2). Do not use common grounding with heavy electrical systems.
- Always confirm the connector layout before connecting the CAN bus to the ME3CAN1-Q.

  (For the signal layout of the connector please refer to section 3.1.2)
- Make sure to properly wire to the CAN bus connector in accordance with the following precautions. Failure to do so may cause electric shock, equipment failures, a short-circuit, wire breakage, malfunctions, or damage to the product.
  - The size of the cable end should follow the dimensions described in the manual.
  - Tightening torque should follow the specifications in the manual.
  - Twist the end of strand wire and make sure that there are no loose wires.
  - Do not solder-plate the electric wire ends.
  - Do not connect more than the specified number of wires or electric wires of unspecified size.
  - Affix the electric wires so that neither the connector nor the connected parts are directly stressed.
- Make sure that foreign matter such as cutting chips and wire scraps does not enter the ME3CAN1-Q. Failure to observe this could lead to fires, faults or malfunctioning.
- A protective label is attached on the top of the ME3CAN1-Q to avoid foreign matter such as wire scraps from entering inside during wiring process. Do not remove the label until the wiring is completed. Before starting the system, however, be sure to remove the label to ensure heat radiation.
- Make sure to affix the CAN bus connector with fixing screws.

  Tightening torque should be within 0.20 to 0.28 Nm. Loose connections may cause malfunctions.
- Do not disconnect the CAN bus cable connected to the ME3CAN1-Q by pulling the cable section. Be sure to hold the connector connected to the ME3CAN1-Q. Pulling the cable while it is connected to the ME3CAN1-Q may lead to malfunctioning or damage of the ME3CAN1-Q or cable.
- Make sure to observe the following precautions in order to prevent any damage to the machinery or accidents due to abnormal data written to the PLC under the influence of noise:
  - Do not bundle or adjacently lay the communication cable connected to the ME3CAN1-Q with the main circuit line, power line, or the load line other than that for the PLC. Separate these by 100 mm as a guide. Failure to observe this could lead to malfunctioning caused by noise, surge, or induction.
  - Ground the shield wire or shield of a shielded cable. Do not use common grounding with heavy electrical systems.
- Place the communication cable in grounded metallic ducts or conduits both inside and outside of the control panel whenever possible.

6.4.2 CAN bus wiring

Applicable connector

Use a female D-sub 9-pin connector. For the signal layout of the connector please refer to section 3.1.2)

Applicable cable

Use a CAN bus cable that meets the following specifications.

Item	Transmission line
Cable Type	Shielded twisted pair cable
No. of Pairs	2
Conformance Standard	ISO 11898/1993
Cross-sectional area	0.3 mm^2 to 0.82 mm^2 or more (AWG22 to AWG18)
Impedance	120 Ω

Tab. 6-2: *Specifications of the CAN bus cable*

The following table shows the relation between bus length and cable cross section:

Bus length [m]	Cable cross section (mm^2)	Length-related resistance (mΩ/m)
0 to 40	0.3 to 0.34	70
40 to 300	0.34 to 0.60	<60
300 to 600	0.50 to 0.60	<40
600 to 1000	0.75 to 0.80	<26

Tab. 6-3: *Relation between bus length and cable cross section*

Grounding of the twisted pair cable

For electromagnetic compatibility (EMC) it is recommended to ground the cable shield at both ends.

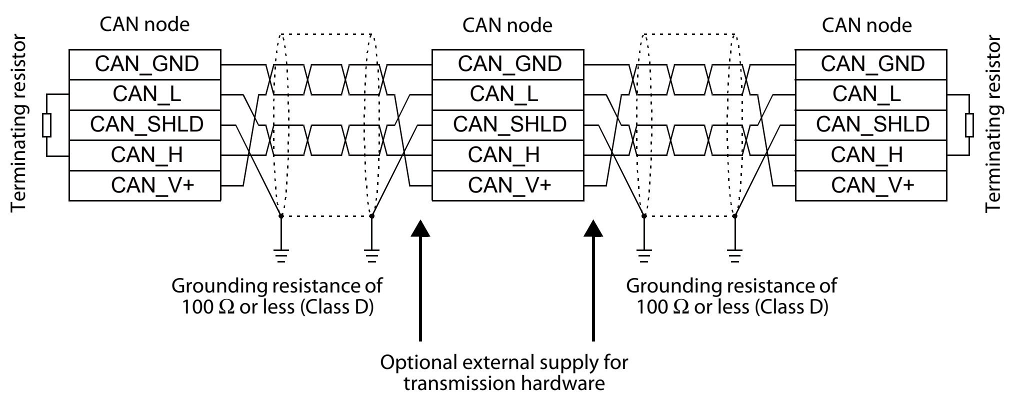


Fig. 6-3: *Connection of the CAN bus cable.*

WARNING:
For safety, always check the potential differences between the grounding points. If potential differences are found, proper measures must be taken to avoid damages.

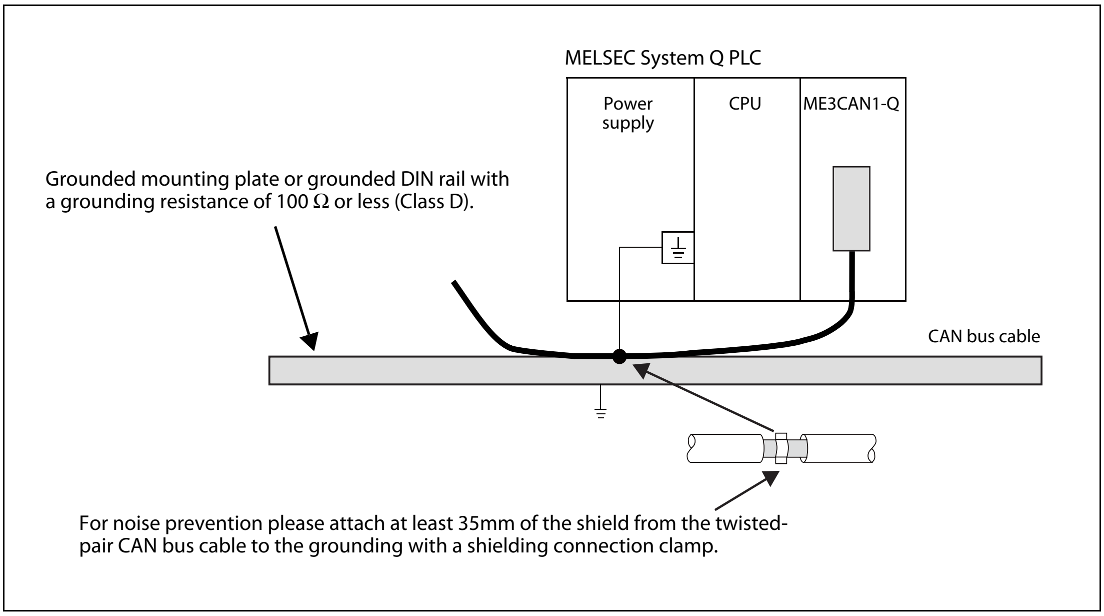


Fig. 6-4: *Grounding of the CAN bus cable*

Ground the communication cable as follows:

- The grounding resistance should be 100 Ω or less.
- The grounding point should be close to the ME3CAN1-Q. Keep the grounding wires as short as possible.
- Independent grounding should be performed for best results. When independent grounding is not performed, perform "shared grounding" of the following figure.

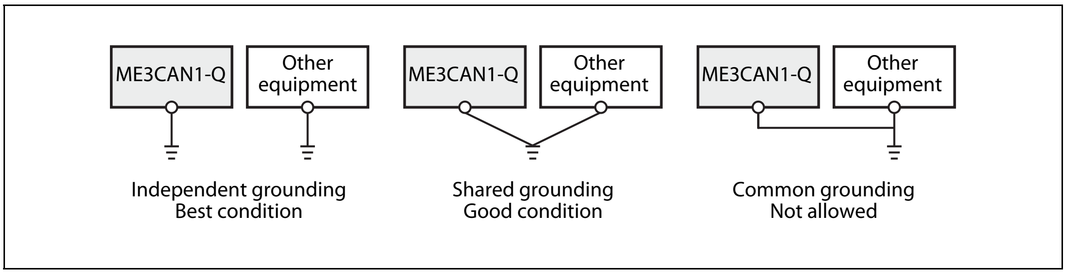


Fig. 4-5: *Grounding of the ME3CAN1-Q*

Termination

The CAN network must be terminated at both ends by a 120 Ω termination resistor between the wires CAN_L and CAN_H. It is recommended to use a CAN bus connector with built-in bus terminator.

6.5 Start-up Procedure

6.5.1 CANopen® 405 mode

Step	Action		Reference (Section)
1	Set the function mode (Un\G21)		3.5.2
2	Store the buffer memory configuration (set Un\G22 then turn Y(n+1)F ON)		3.5.3 3.3.2
3	Restart the ME3CAN1-Q (turn Yn2 ON)		3.3.2
4	Set the baud rate (Un\G24)		3.5.4
5	Set the Node Address (Un\G27)		3.5.6
6	Store the buffer memory configuration (set Un\G22 then turn Y(n+1)F ON)		3.5.3 3.3.2
7	Restart the ME3CAN1-Q (turn Yn2 ON)		3.3.2
8	CANopen® NMT Master:	Configure OD Index 1F80H and if necessary the OD Index 1F90H	—
		Store the OD configuration (OD Index 1010H)	—
		Restart the ME3CAN1-Q (turn Yn2 ON)	3.3.2
9	Setup Heartbeat producing/consuming		4.6.8
10	Setup RPDO communication and mapping parameter		4.6.5
11	Setup TPDO communication and mapping parameter		
12	On the NMT Master:	Setup NMT Slave assignment (OD Index 1F81H)	4.8.6
		Setup NMT Slave Identification data (OD Indexes 1F84H to 1F88H), the OD Index 1F84H is in most cases sufficient.	4.8.4
		Setup the Boot time (OD Index 1F89H)	4.8.6
13	Store the OD configuration (OD Index 1010H)		4.6.10

Tab. 6-4: *Start-up procedure for CANopen® 405 mode*

6.5.2 11 bit/29 bit CAN-ID Layer 2 Mode

Step	Action	Reference (Section)
1	Set the function mode (Un\G21)	3.5.2
2	Store the buffer memory configuration (set Un\G22 then turn Y(n+1)F ON)	3.5.3 3.3.2
3	Restart the ME3CAN1-Q (turn Yn2 ON)	3.3.2
4	Set the baud rate (Un\G24)	3.5.4
5	Store the buffer memory configuration (set Un\G22 then turn Y(n+1)F ON)	3.5.3 3.3.2
6	Restart the ME3CAN1-Q (turn Yn2 ON)	3.3.2
7	Setup Pre-defined Layer 2 message configuration	3.6.2
8	Setup buffer memory location of the Receive / Transmit Process Data	3.6.6
9	Setup PLC RUN>STOP and power down messages	3.6.5
10	Store the buffer memory configuration (set Un\G22 then turn Y(n+1)F ON)	3.5.3 3.3.2

Tab. 6-5: *Start-up procedure for 11 bit/29 bit CAN-ID Layer 2 Mode*

7 Programming

This chapter describes the programming of the CANopen® module ME3CAN1-Q.

The program shown below is an example of how to set local parameters, set up a CANopen® network, and exchange data over the CANopen® bus with the ME3CAN1-Q.

Large networks can be configured more quickly and easily by using a CANopen® configuration tool instead.

WARNING:
When applying the program example or parts of the program example introduced in this chapter to the actual system, verify the applicability and confirm that no problems will occur in the system control.

NOTES

This program example together with the function blocks can be downloaded from http://eu3a.mitsubishielectric.com/fa/en/ in the MyMitsubishi section (free registration necessary).

In the sample ladder program labels are used. (For label setting operation on GX Works2, refer to the GX Works2 Operating Manual (Simple Project).)

7.1 System Configuration

The sample program sets up the initial buffer memory and Object dictionary settings and starts PDO communication.

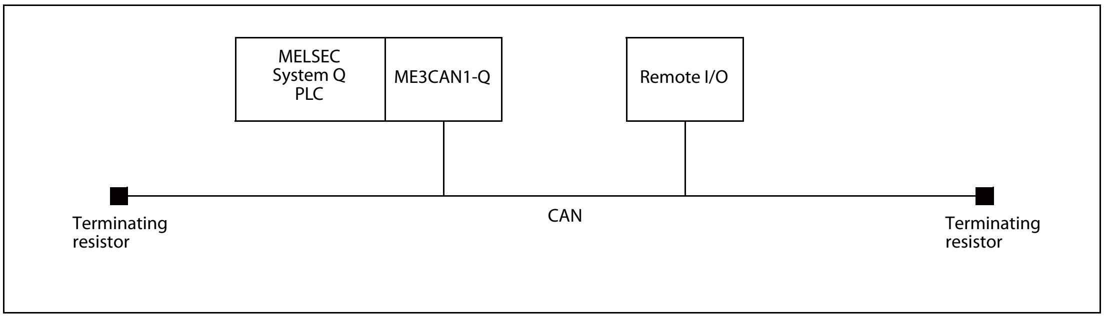


Fig. 7-1: *System configuration for this example*

7.2 Local Label Setting

No.	Class	Label Name	Data Type
1	VAR	CANID	Word[Unsigned]/Bit String[16-bit]
2	VAR	CommandSequence	Word[Signed]
3	VAR	NMTMasterSetError	Bit
4	VAR	NMTMasterSetErrorCount	Word[Signed]
5	VAR	NMTMasterSetCompleted	Bit
6	VAR	NMTMasterSetOkCount	Word[Signed]
7	VAR	ConsumedNodeAddress	Word[Signed](0..32)
8	VAR	ConsumerHeartbeatTime	Word[Signed](0..32)
9	VAR	ConsumerSetupError	Bit
10	VAR	ConsumerSetupErrorCounter	Word[Signed]
11	VAR	ConsumerSetupCompleted	Bit
12	VAR	ConsumerSetupOkCounter	Word[Signed]
13	VAR	ConsumingNodeID	Word[Signed]
14	VAR	ErrorReset	Bit
15	VAR	ErrorStatus	Word[Unsigned]/Bit String[16-bit]
16	VAR	ExecuteMapping	Bit
17	VAR	FillData	Word[Unsigned]/Bit String[16-bit]
18	VAR	FirstPDOProcessing	Bit
19	VAR	FourthPDOProcessing	Bit
20	VAR	ME3CAN1QInit	CANopen®Init
21	VAR	ME3CAN1QMasterSetup	NMTMasterSettings
22	VAR	GuardedTime	Word[Signed](0..15)
23	VAR	HeartbeatConsumer	HeartbeatConsumerSetup
24	VAR	HeartbeatConsumingSetting	Bit
25	VAR	HeartbeatProducer	HeartbeatProducerSetup
26	VAR	HeartbeatProducerSetting	Bit
27	VAR	Master	Bit
28	VAR	MasterNodeAddress	Word[Signed]
29	VAR	NodeAddress	Word[Signed]
30	VAR	NodeHeartbeatStatus	Word[Unsigned]/Bit String[16-bit](0..126)
31	VAR	NodeNMTStatus	Word[Unsigned]/Bit String[16-bit](0..2)
32	VAR	NoOfConsumedNodes	Word[Signed]
33	VAR	NoOfEntries	Word[Signed]
34	VAR	NoOfProducingNodes	Word[Signed]
35	VAR	NumberOfSlaveNodes	Word[Signed]
36	VAR	ObjectIndex	Word[Unsigned]/Bit String[16-bit](1..8)
37	VAR	ObjectLength	Word[Unsigned]/Bit String[16-bit](1..8)
38	VAR	ObjectSubindex	Word[Unsigned]/Bit String[16-bit](1..8)
39	VAR	Operational	Bit
40	VAR	PDOnumber	Word[Signed]
41	VAR	PdoRead	PDORead
42	VAR	PDOReadData	Word[Unsigned]/Bit String[16-bit](0..3)
43	VAR	PDOSetupError	Bit
44	VAR	PDOSetupErrCounter	Word[Signed]
45	VAR	PDOSetupOkCounter	Word[Signed]
46	VAR	PDOSetupProcessing	Bit
47	VAR	PdoWrite	PDOWrite
48	VAR	PDOWriteData	Word[Unsigned]/Bit String[16-bit](0..3)

Tab. 7-1: *Local label for this program example*

No.	Class	Label Name	Data Type
49	VAR	PreOperational	Bit
50	VAR	ProducerHeartbeatTime	Word[Signed](0..32)
51	VAR	ProducerNodeID	Word[Signed](0..32)
52	VAR	ProducerSetupError	Bit
53	VAR	ProducerSetupErrorCounter	Word[Signed]
54	VAR	ProducerSetupCompleted	Bit
55	VAR	ProducerSetupOkCounter	Word[Signed]
56	VAR	SDOReadCompleted	Bit
57	VAR	ReadData	Word[Unsigned]/Bit String[16-bit](0..61)
58	VAR	ReadDataLength	Word[Signed]
59	VAR	SDOReadErrorCode	Double Word[Unsigned]/Bit String[32-bit]
60	VAR	SDOReadError	Bit
61	VAR	SDOReadErrorCounter	Word[Signed]
62	VAR	ReadIndex	Word[Unsigned]/Bit String[16-bit]
63	VAR	ReadNodeAddress	Word[Signed]
64	VAR	ReadSubIndex	Word[Unsigned]/Bit String[16-bit]
65	VAR	ReceiveOrTransmit	Bit
66	VAR	ReleaseAnalogInputdata	Bit
67	VAR	RemoteNodeID	Word[Unsigned]/Bit String[16-bit]
68	VAR	NMTRequestCompleted	Bit
69	VAR	RequestData	Word[Unsigned]/Bit String[16-bit]
70	VAR	NMTRequestError	Bit
71	VAR	NMTRequestErrorCounter	Word[Signed]
72	VAR	RetryFactor	Word[Signed](0..15)
73	VAR	RPDOnumber	Word[Signed]
74	VAR	SDOREadCommand	SDORead
75	VAR	SDOReadRequest	Bit
76	VAR	SDOwriteCommand	SDOWrite
77	VAR	SecondPDOProcessing	Bit
78	VAR	ExecNMTMasterConfig	Bit
79	VAR	SetupPDOs	PDOSetup
80	VAR	SlaveConfiguration	Word[Signed](0..15)
81	VAR	NMTSlaveSetup	NMTSlaveSettings
82	VAR	NMTSlaveSetupError	Bit
83	VAR	NMTSlaveSetupErrorCounter	Word[Signed]
84	VAR	NMTSlaveSetCompleted	Bit
85	VAR	NMTSlaveSetupOkCounter	Word[Signed]
86	VAR	StartAllNodes	Bit
87	VAR	StartCANOpenNodes	NMTRequestWrite
88	VAR	StartConsumerSetup	Bit
89	VAR	StartPDOCommunication	Bit
90	VAR	StartPDORead	Bit
91	VAR	StartPDOSetup	Bit
92	VAR	StartPDOWrite	Bit
93	VAR	StartProducerSetup	Bit
94	VAR	StartNMTRequest	Bit
95	VAR	StartSDORead	Bit
96	VAR	StartSDOWrite	Bit
97	VAR	StartNMTSlaveSetup	Bit
98	VAR	StartupConfigurationValue	Word[Unsigned]/Bit String[16-bit]
99	VAR	TargetSlaveNumber	Word[Signed](0..15)

Tab. 7-1: *Local label for this program example*

No.	Class	Label Name	Data Type
100	VAR	ThirdPDOProcessing	Bit
101	VAR	TPDOnumber	Word[Signed]
102	VAR	TransmissionType	Word[Unsigned]/Bit String[16-bit]
103	VAR	STliteHeartbeatActive	Bit
104	VAR	STlitePreOperational	Bit
105	VAR	SDOWriteCompleted	Bit
106	VAR	WriteData	Word[Unsigned]/Bit String[16-bit](0..61)
107	VAR	WriteDataLength	Word[Signed]
108	VAR	SDOWriteErrorCode	Double Word[Unsigned]/Bit String[32-bit]
109	VAR	SDOWriteError	Bit
110	VAR	SDOWriteErrorCounter	Word[Signed]
111	VAR	WriteIndex	Word[Unsigned]/Bit String[16-bit]
112	VAR	WriteNodeAddress	Word[Signed]
113	VAR	WriteSubIndex	Word[Unsigned]/Bit String[16-bit]
114	VAR	SDOWriteOkCounter	Word[Signed]
115	VAR	PDOSetupCompleted	Bit
116	VAR	NMTRequestOkCounter	Word[Signed]
117	VAR	SDOReadOKCounter	Word[Signed]
118	VAR	InitComplete	Bit
119	VAR	StartCommunication	Bit
120	VAR	SlaveSettingsSetup	Bit
121	VAR	StartNode	Word[Signed]
122	VAR	NumberOfNodes	Word[Signed]
123	VAR	STliteOperational	Bit
124	VAR	NMTStatusRead	NMTStatus
125	VAR	CheckNMTStatus	Bit
126	VAR	HeartbeatStatusRead	HeartbeatStatus
127	VAR	CheckHeartbeatStatus	Bit
128	VAR	Stopped	Bit
129	VAR	WriteOK	Bit
130	VAR	ReadOK	Bit
131	VAR	ResetHeartbeatError	Bit
132	VAR	HeartbeatError	Bit

Tab. 7-1: *Local label for this program example*

7.3 Program

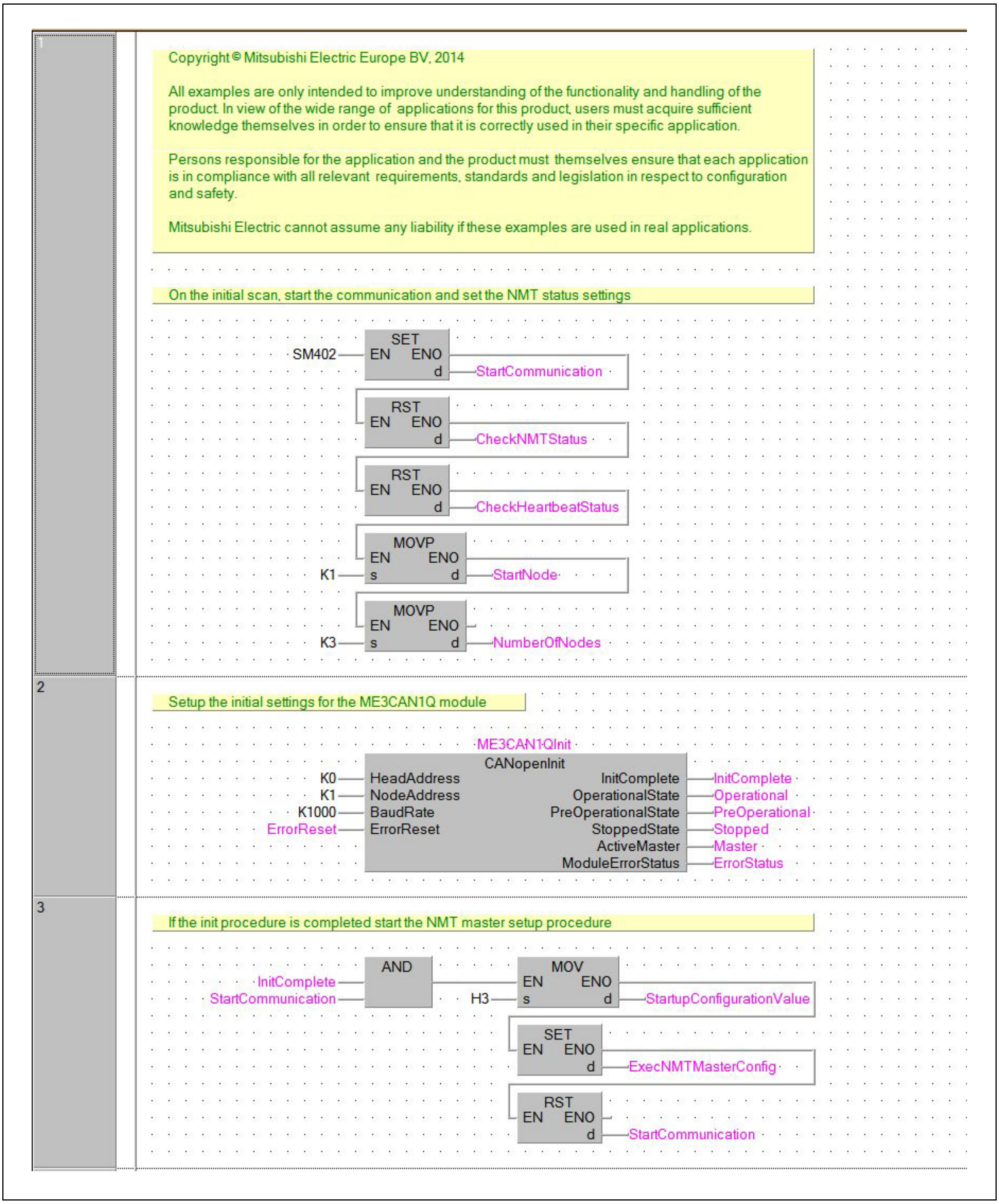


Fig. 7-2: *Example Program (1)*

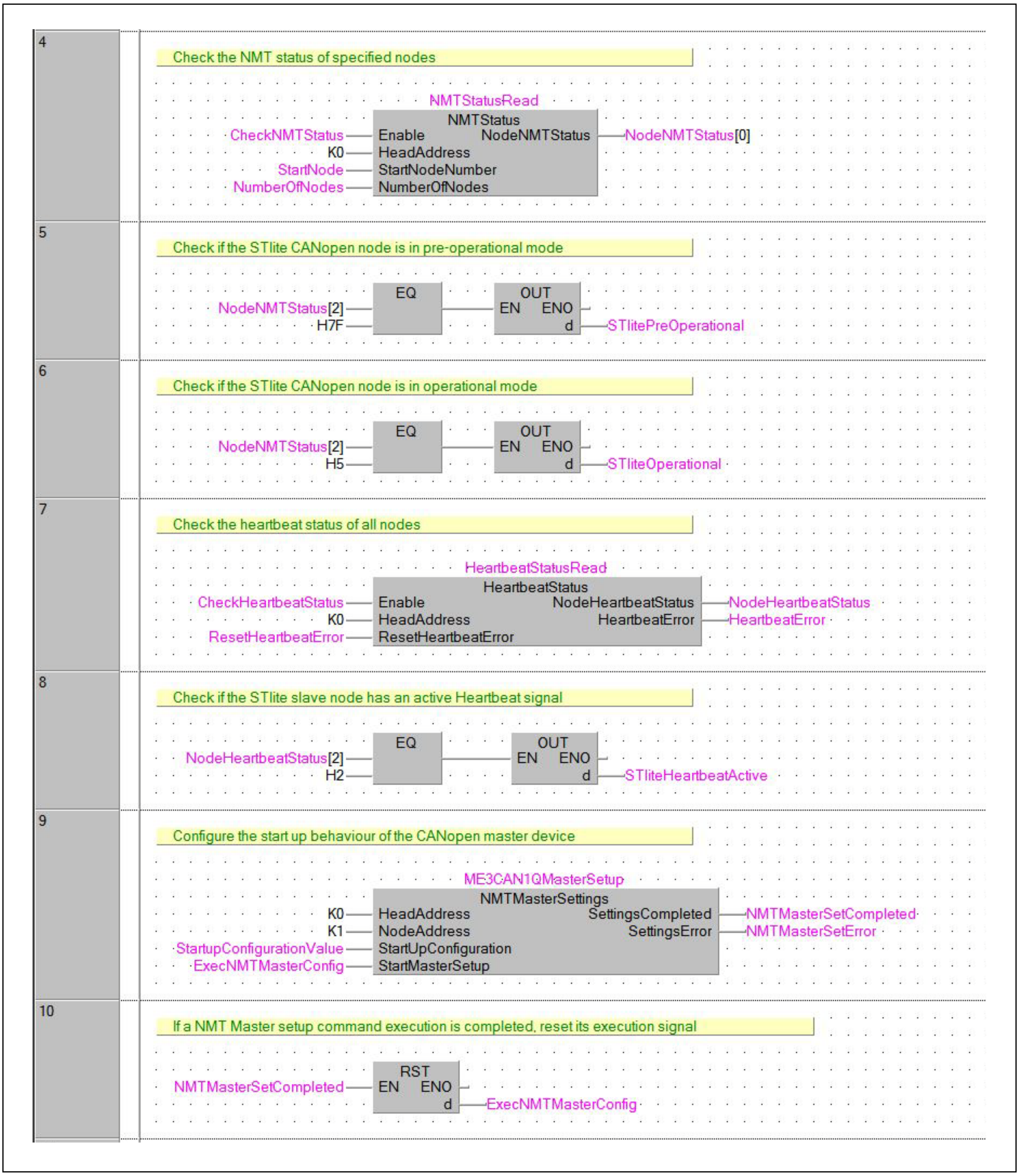


Fig. 7-3: *Example Program (2)*

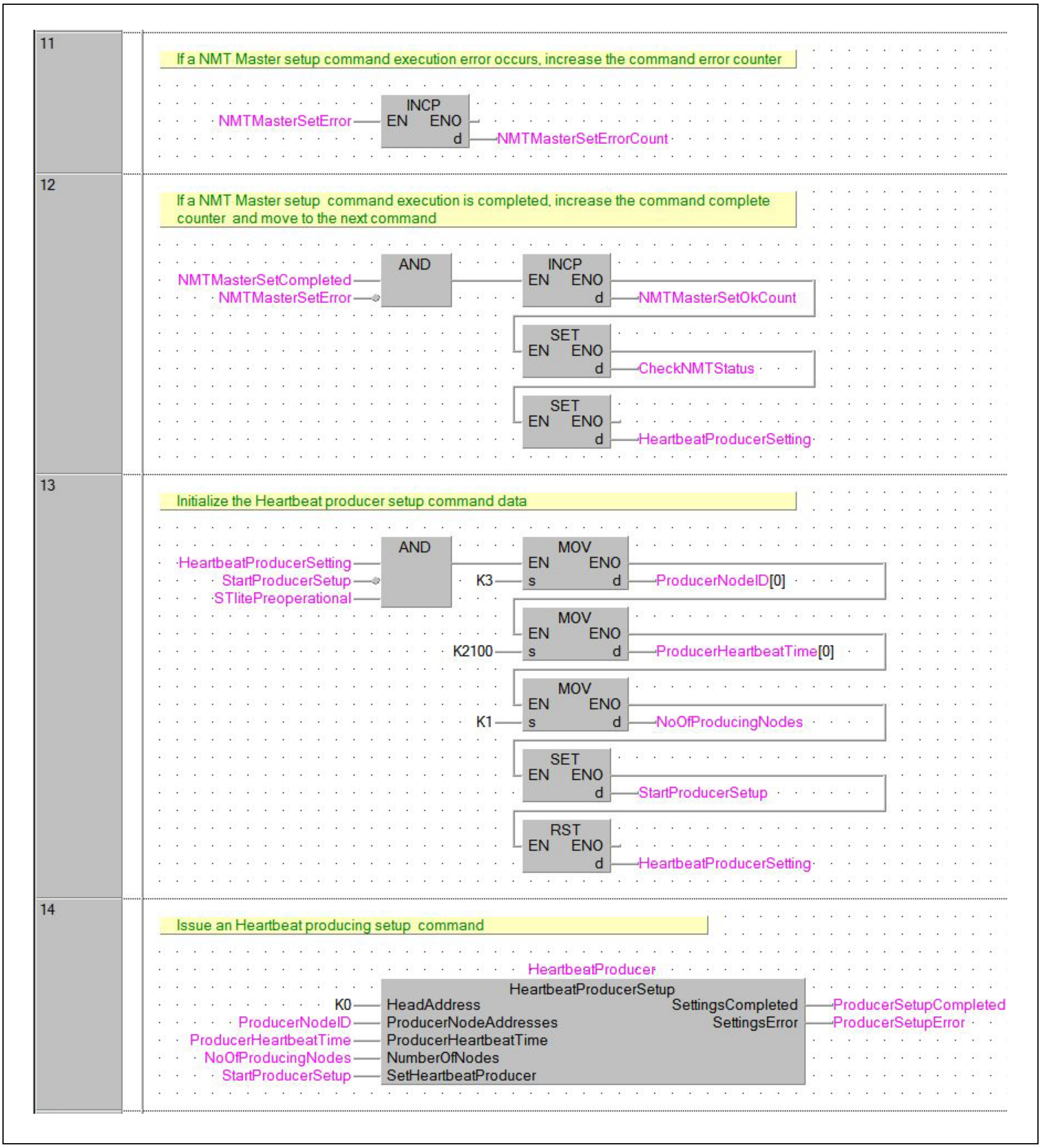


Fig. 7-4: *Example Program (3)*

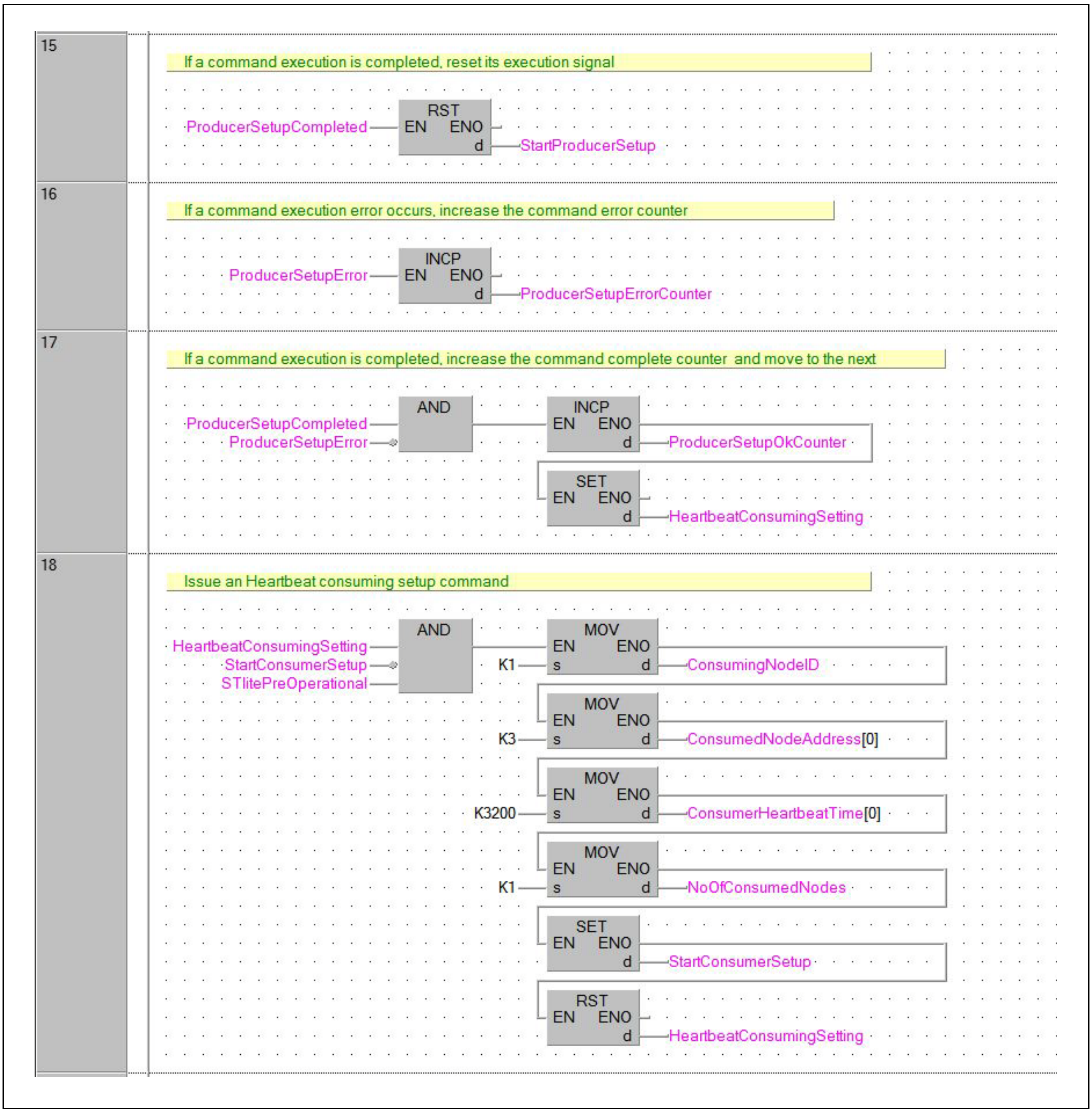


Fig. 7-5: *Example Program (4)*

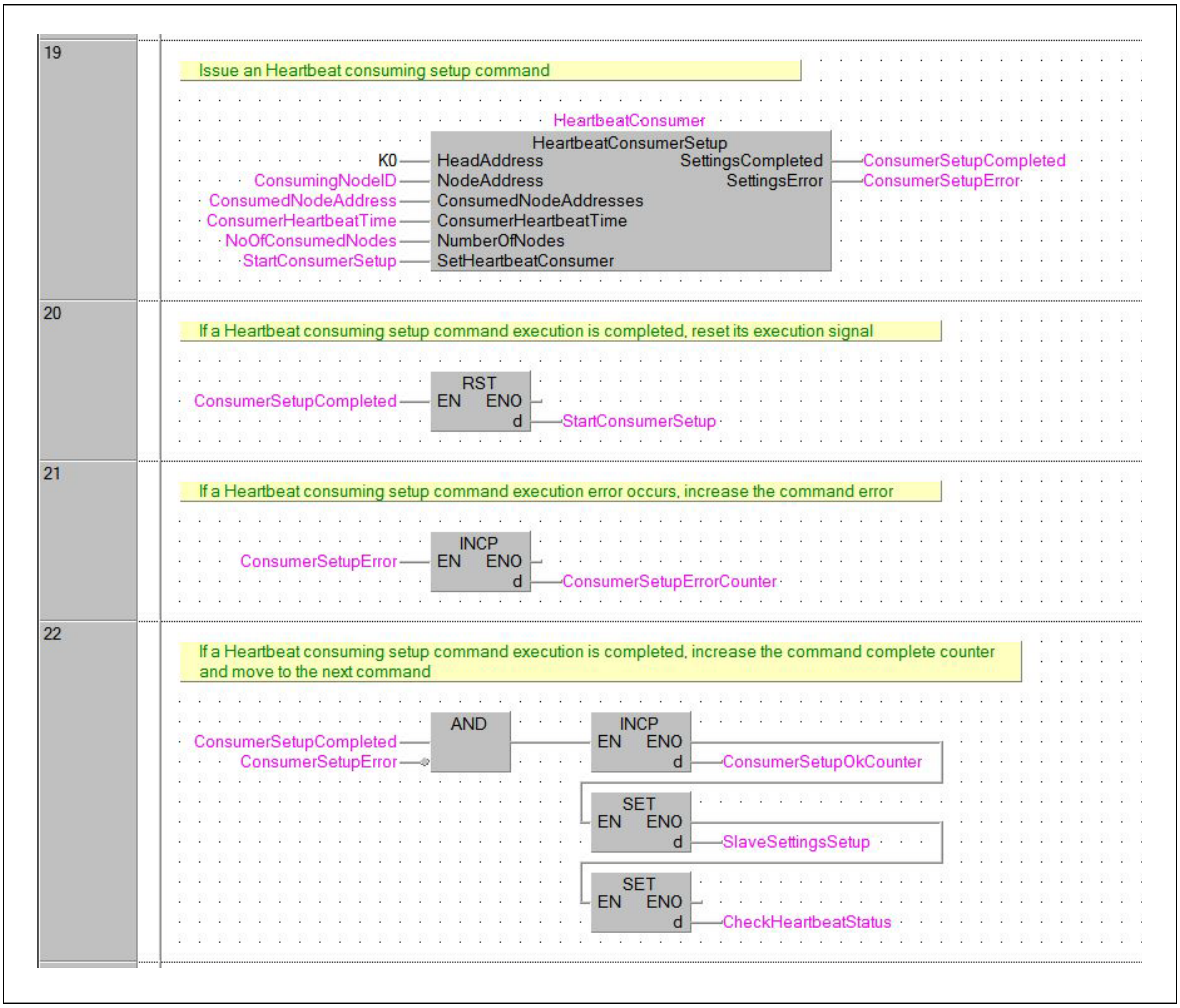


Fig. 7-6: *Example Program (5)*

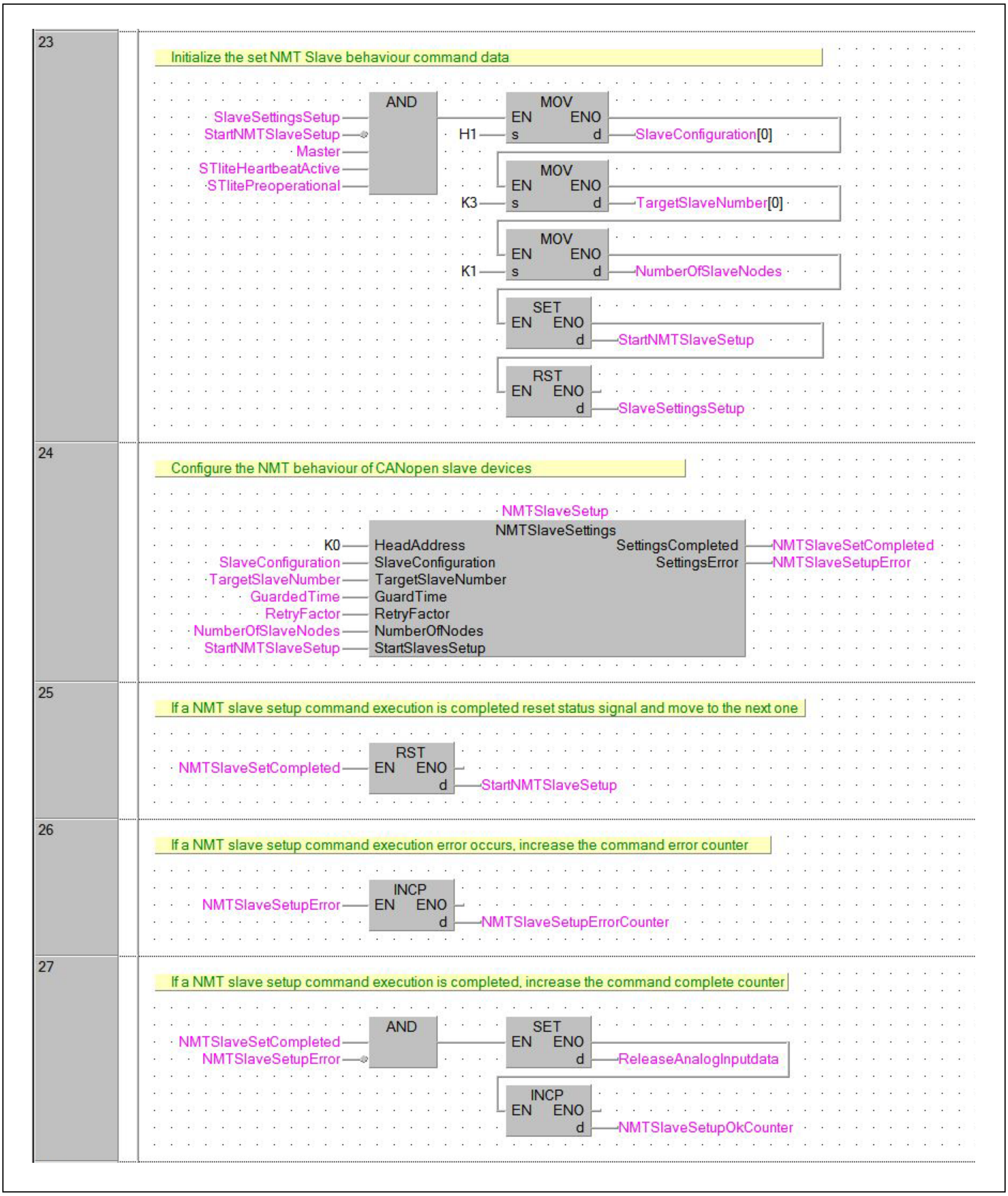


Fig. 7-7: *Example Program (6)*

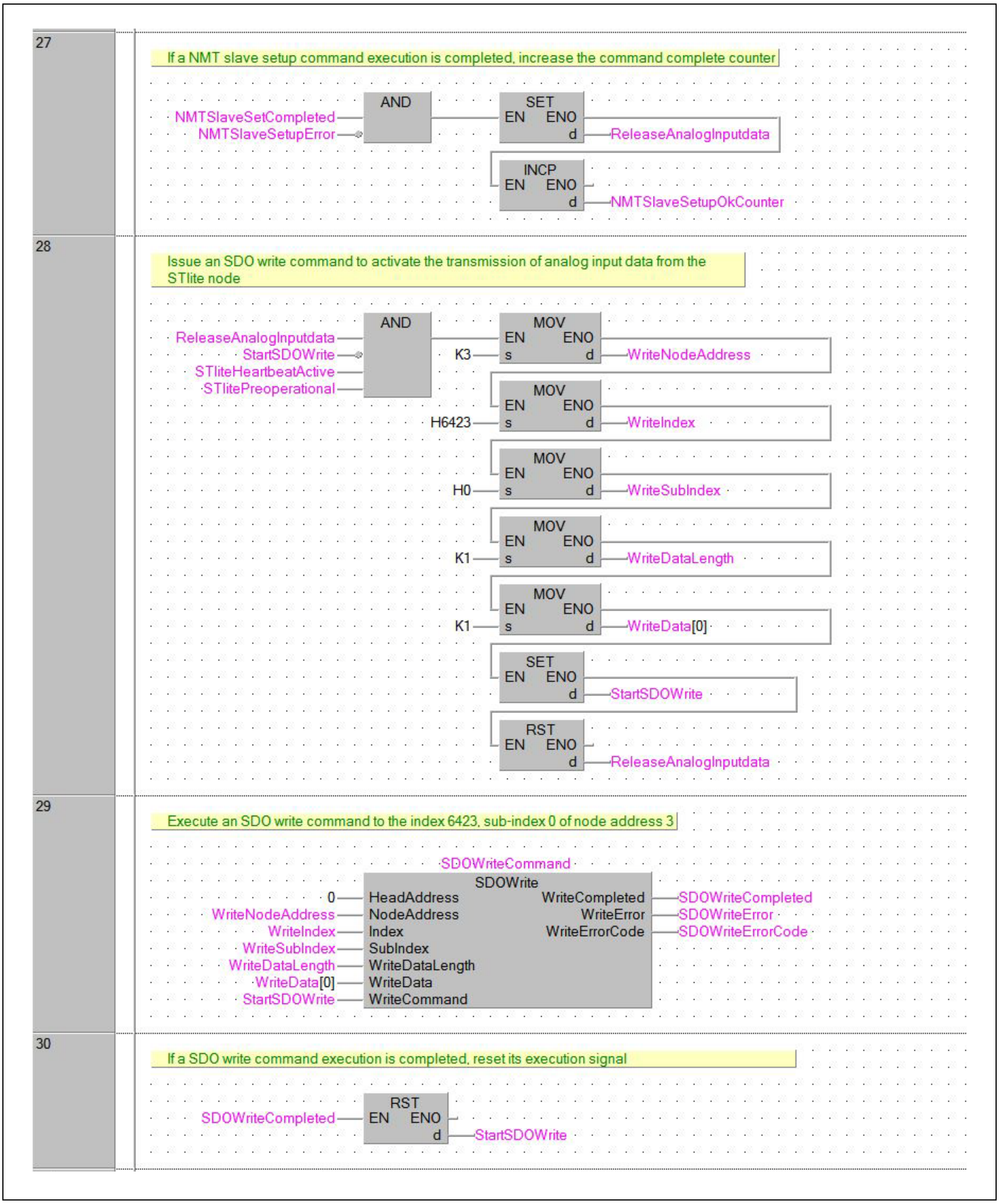


Fig. 7-8: *Example Program (7)*

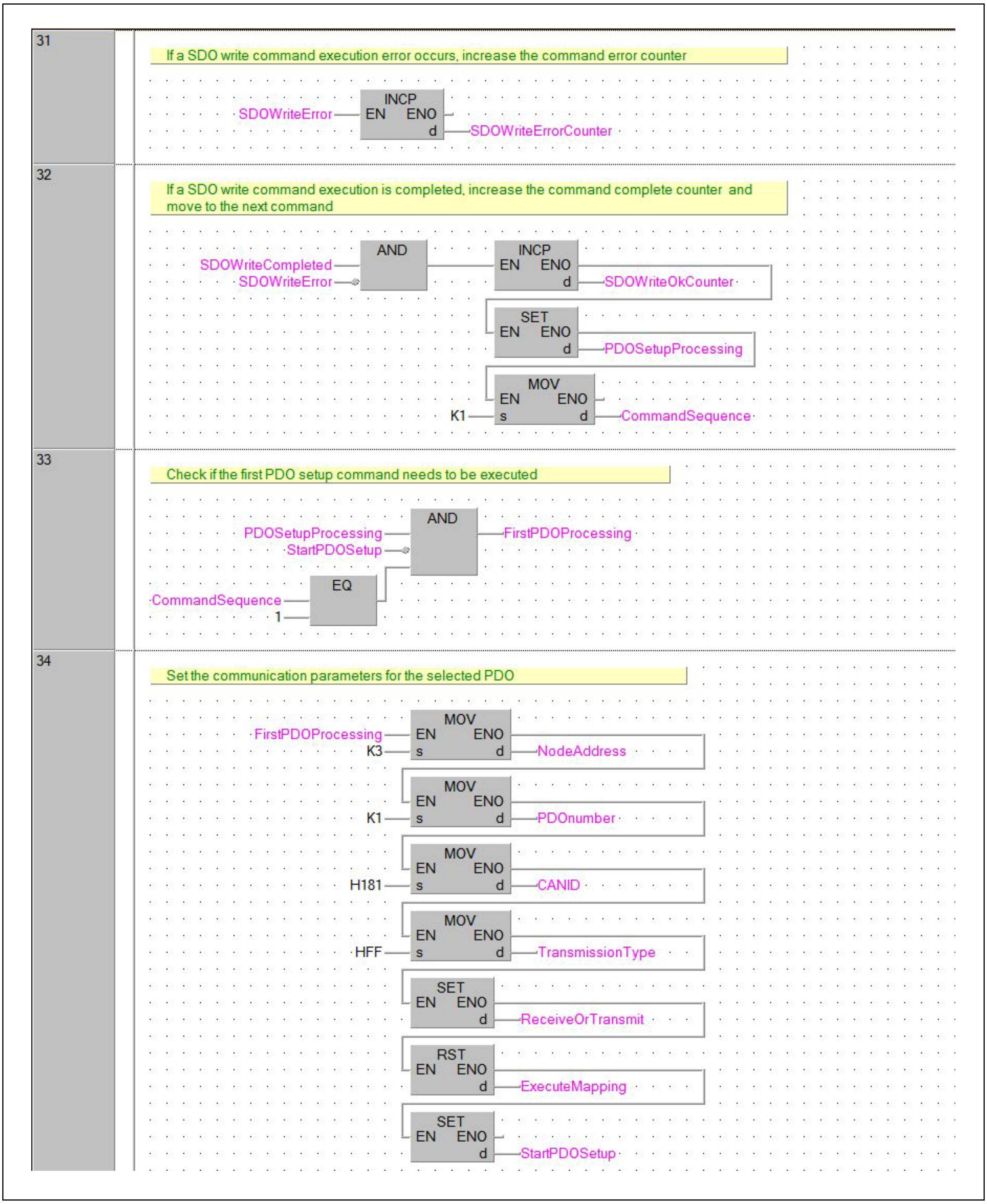


Fig. 7-9: *Example Program (8)*

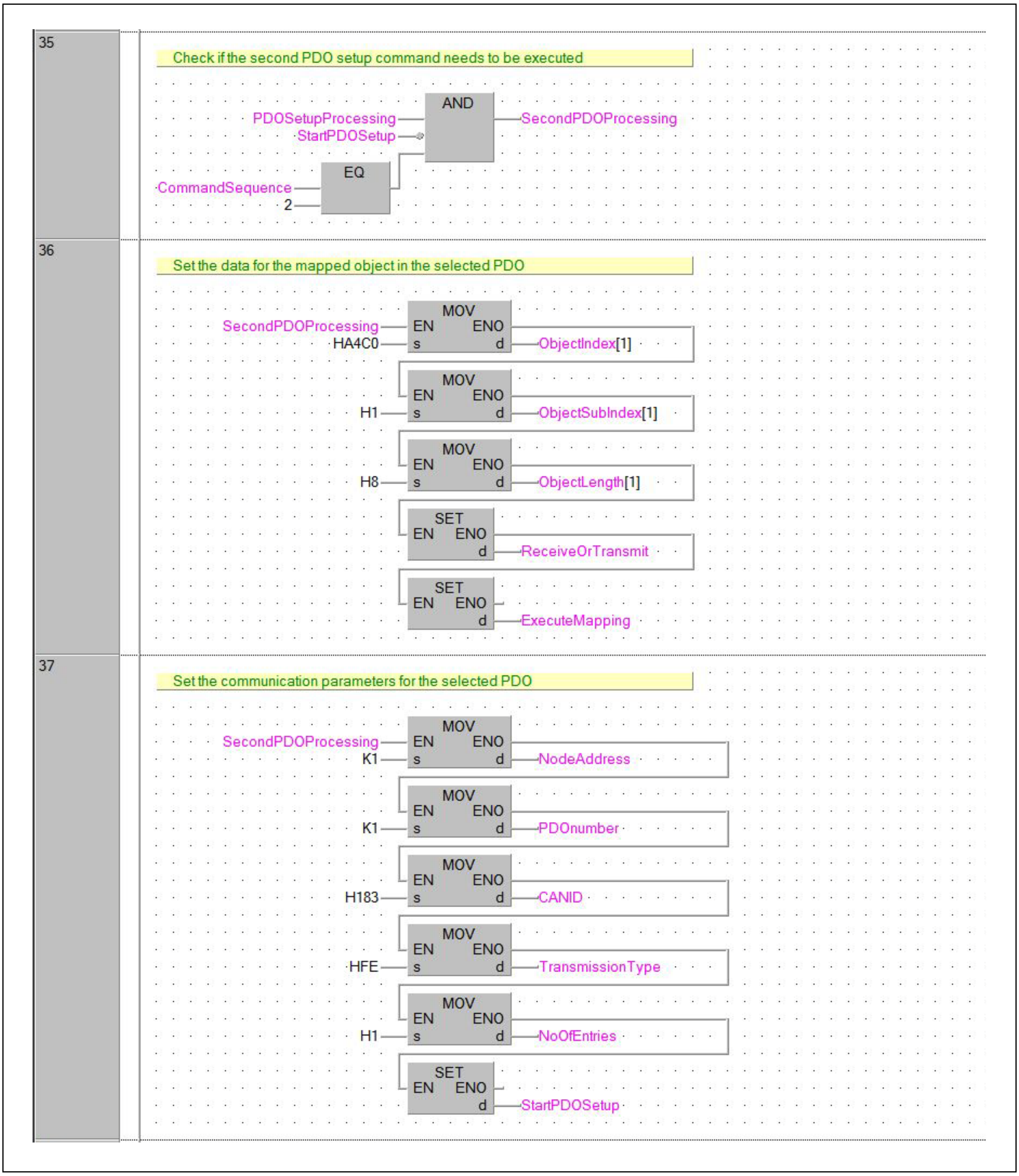


Fig. 7-10: *Example Program (9)*

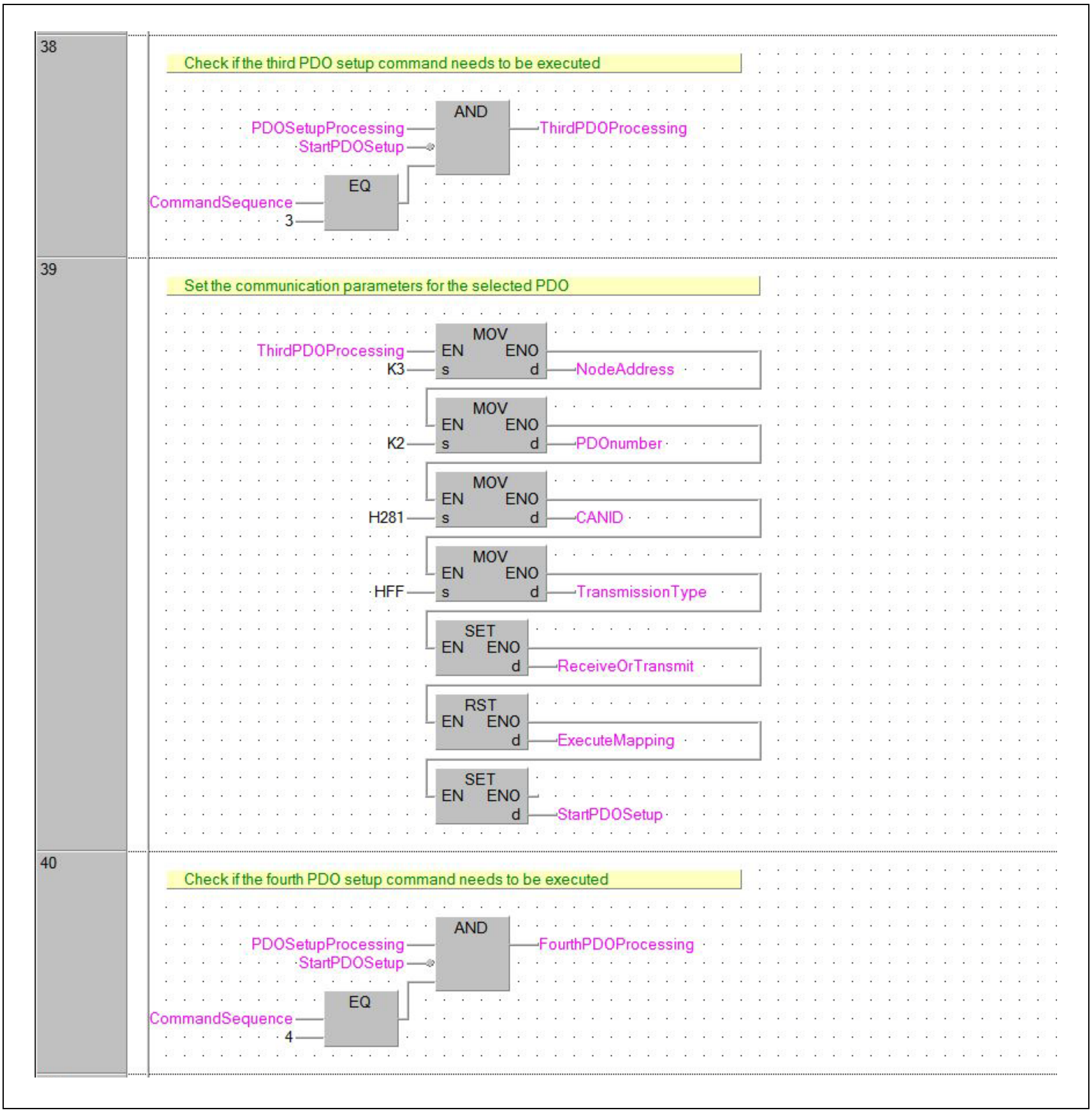


Fig. 7-11: *Example Program (10)*

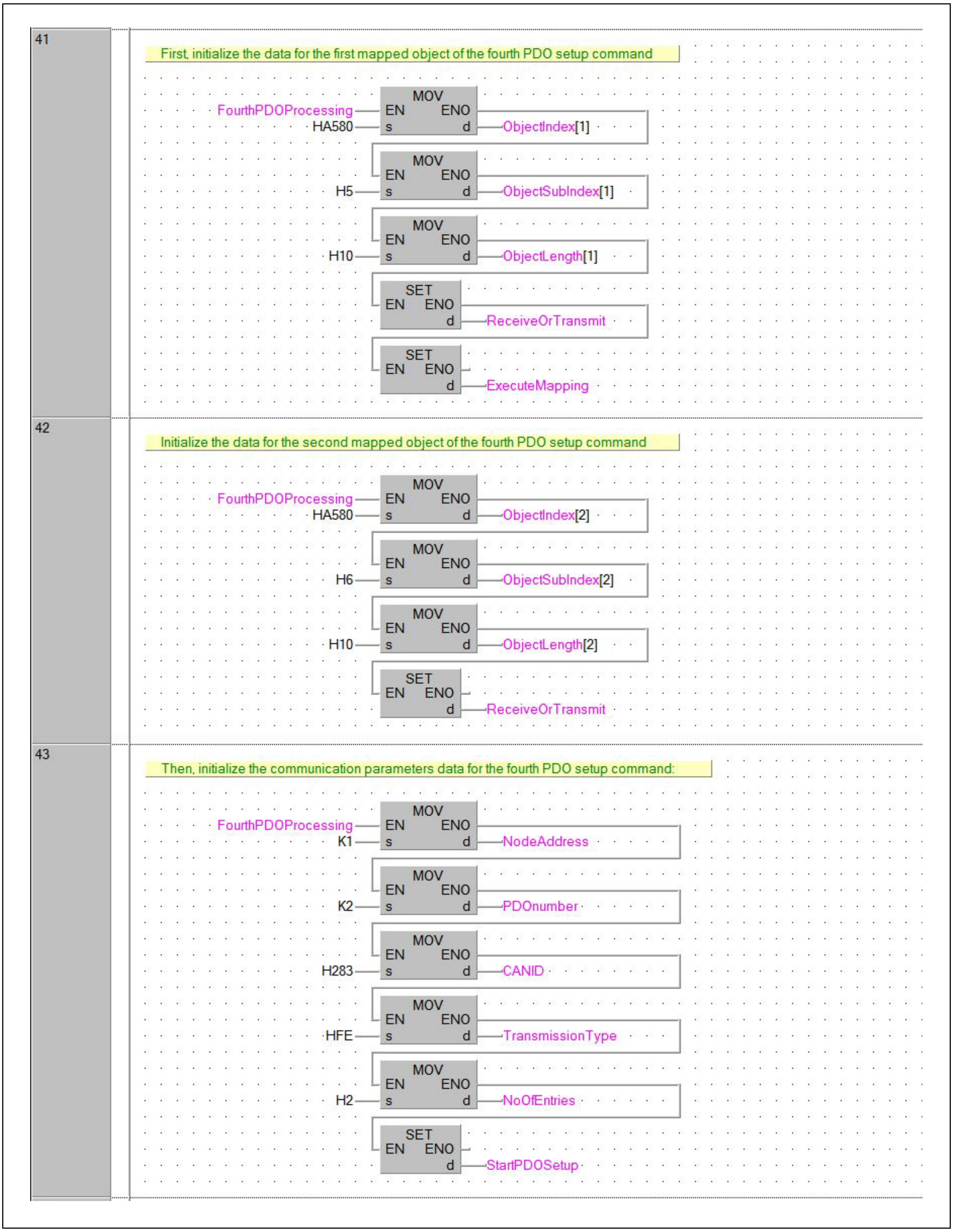


Fig. 7-12: *Example Program (11)*

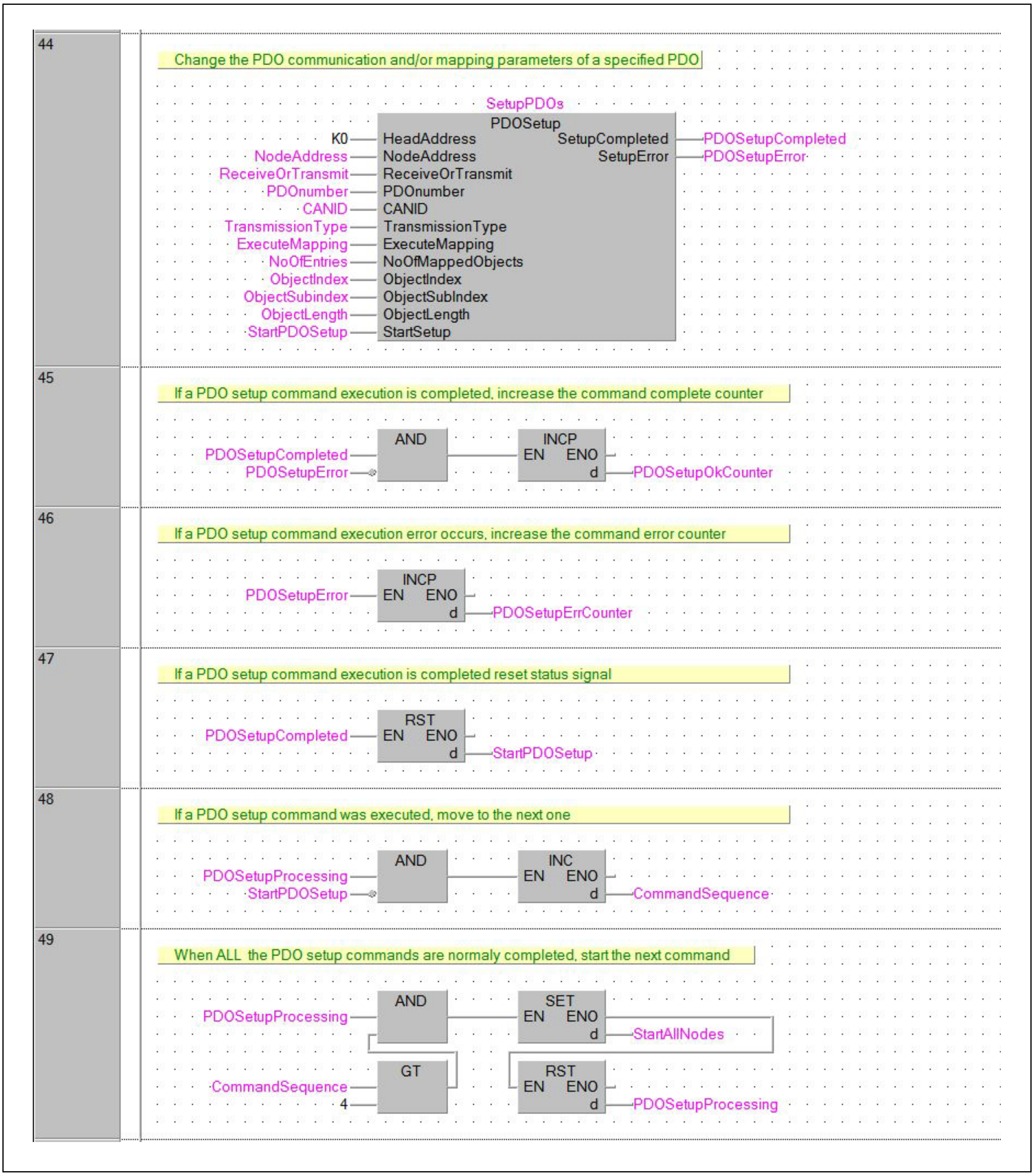


Fig. 7-13: *Example Program (12)*

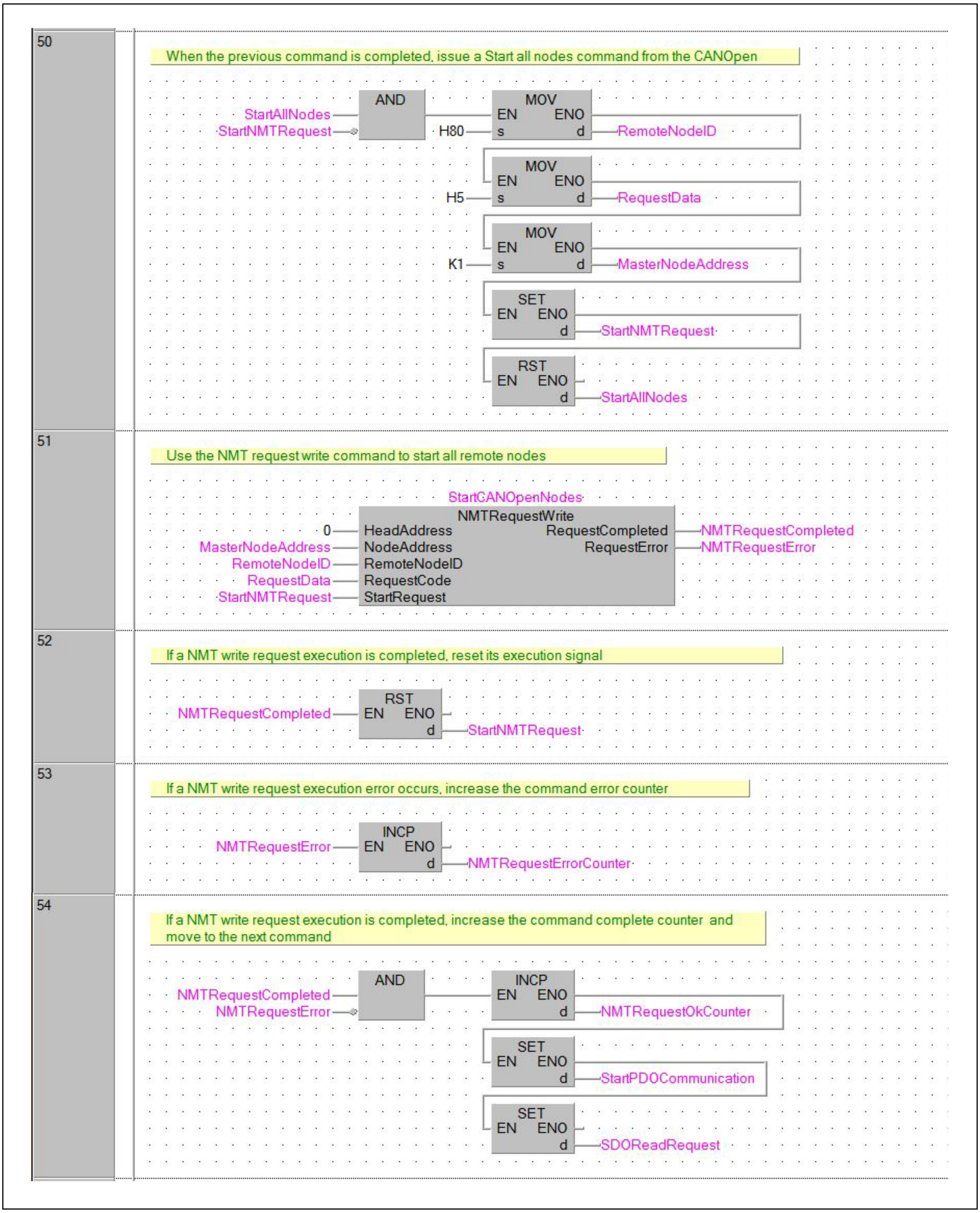


Fig. 7-14: *Example Program (13)*

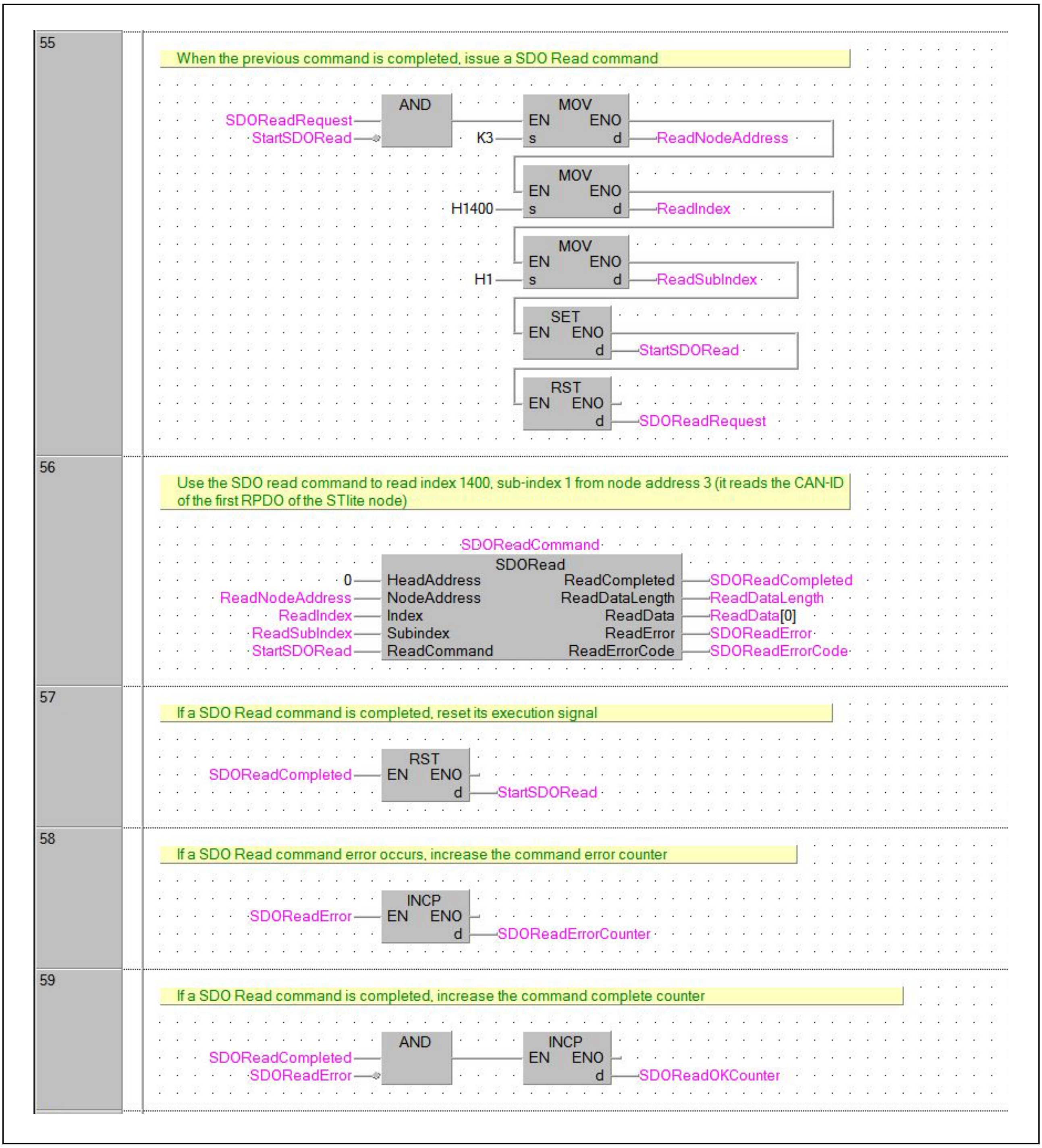


Fig. 7-15: *Example Program (14)*

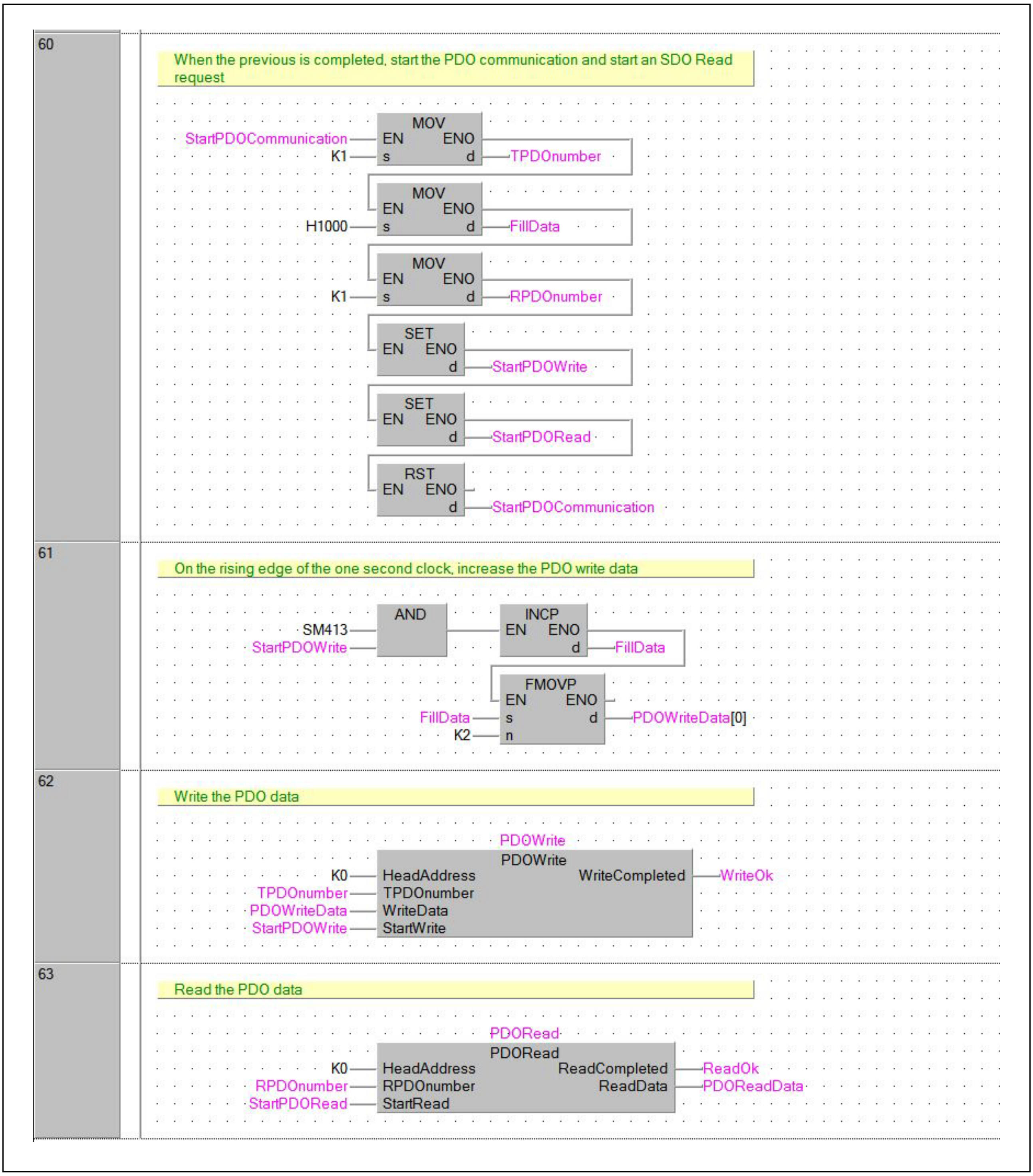


Fig. 7-16: *Example Program (15)*

8 Troubleshooting

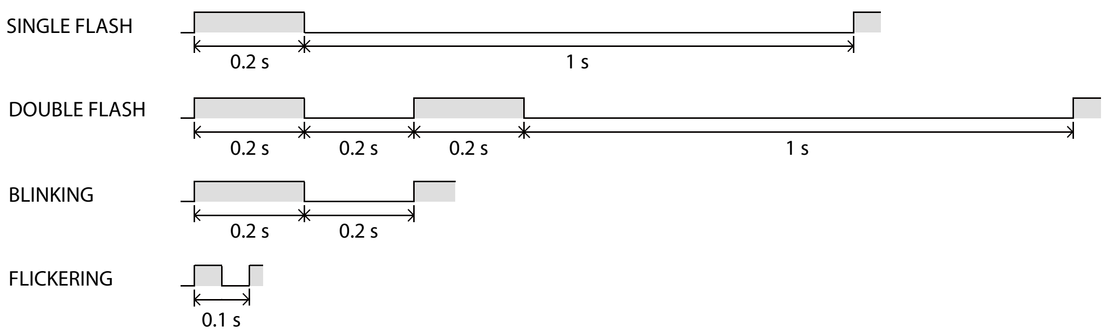
8.1 Error Processing and Recovery Method

8.1.1 Preliminary check by LED status

LED	Status	Cause	Action
RUN	OFF	The watchdog monitoring time has been exceeded.	Please consult your local Mitsubishi representative, explaining a detailed description of the problem.
CAN ERR	ON	• The CAN controller is bus OFF. • The CAN controller has too many transmission errors.	• Check the error status in Un\G29. • Check the ERROR LED of the PLC. • Check the sequence program for FROM/TO watchdog.
	FLICKERING*	LSS services in progress	—
	BLINKING*	General error	Check the error status in Un\G29.
	DOUBLE FLASH*	Error control event. A NMT guarding failure (NMT-Slave or NMT-Master) or a heart-beat failure (heartbeat con-sumer) has occurred.	Check the error status in Un\G29.
	SINGLE FLASH*	Warning limit reached	• Check that the terminating resistors at both ends of the network are connected. • Check that all nodes have the same baud rate setting. • Check that all nodes have a unique node-ID setting. • Check that the CAN_H, CAN_L and CAN_GND wires are not broken. • Check that the CAN_SHLD is grounded. • Check that the CAN_SHLD is connected at all nodes. • Check that the CAN cable wires do not short cir-cuit other CAN cable wires.
ERR.	ON	An unexpected error other than the errors described above has occurred.	Please consult your local Mitsubishi representative, explaining a detailed description of the problem.

Tab. 8-1: *Indication of errors*

* The LEDs CAN RUN and CAN ERR have four kinds of flicker states (according to CiA®-303-3 V1.4): single flash, double flash, blinking, and flickering. These LEDs flicker as follows.



8.1.2 Detailed error check

Please check the bit status of the buffer memory address Un\G29 (Error Status).

NOTE

The error flags bit 5, bit 6, bit 8, bit 10 and bit 15 are latched, and it is necessary to reset the appropriate bit of Un\G29 or to write "0" to the whole buffer memory address which will clear all latched error flags in Un\G29.
All other bits are reset automatically if the cause for the error is resolved.

Module failures

The module stays in initial status (Displayed in Un\G25). The CANopen® configuration may be faulty. Reset the Object Dictionary to factory default settings using the CIF (Refer to section 4.6.11).

Bit	Description	Action
0	Reserved	—
1	Hardware error	If this error flag is not cleared after a module restart (Yn2) or another power cycle, the ME3CAN1-Q is probably damaged. Please contact your local Mitsubishi Electric representative.
2	Reserved	—
3	• The CAN controller is bus OFF. • The CAN controller has too many transmission errors. (Refer to section 3.5.8)	Check the following points in the network, then restart the Module (Refer to section 3.5.5). • Check that the terminating resistors at both ends of the network are connected. • Check that all nodes have the same baud rate setting. • Check that all nodes have a unique node-ID setting. • Check that the CAN_H, CAN_L and CAN_GND wires are not broken. • Check that the CAN_SHLD is grounded. • Check that the CAN_SHLD is connected at all nodes. • Check that the CAN cable wires do not short circuit other CAN cable wires.
4	FLASH memory error Invalid data in the Flash memory might be caused by power loss during a write operation to the Flash ROM.	If this error flag is not cleared after a module restart (Yn2) or another power cycle, the ME3CAN1-Q is probably damaged. Please contact your local Mitsubishi Electric representative.
5	Layer 2 mode: Invalid write access to configuration buffer memory while in ONLINE/INIT mode.	Check user program, do not write into configuration buffer memory when module is ONLINE. ① In Un\G40 the buffer memory address where this failure occurred will be displayed.
6	Buffer memory setting error	Check Un\G39 for buffer memory address and correct the set value to the valid range. This bit is set if an attempt to write an invalid value into a buffer memory is detected. The target buffer memory address of the invalid write access is displayed in Un\G39 (Refer to section 3.5.10).
7	Reserved	—
8	Internal data queue overflow	Extreme bus load can cause the internal queues to overflow. Decrease the bus load. At a low baud rate a too fast data exchange (Refer to section 3.5.1) can overflow the CAN Transmit Buffer (Depends also on the bus-load of the CAN).
9 to 13	Reserved	—
14	CAN error active state/passive state. Bit = 0: Error active state Bit = 1: Error passive state ②	This bit will be reset automatically if the internal error counters return back below 128. (Refer to sections 3.5.8 and 3.5.9.)
15	Layer 2 Message Slot specific error exists.	Check the Message Slot specific error code in Un\G5001–Un\G5584 (Refer to section 3.6.1).

Tab. 8-2: *Indication of errors in buffer memory address Un\G29*

① Layer 2 modes: The configuration must not be changed when the module is set to ONLINE, before changing the configuration set Yn0 to OFF (configuration mode) and wait until Xn0 is OFF (module OFFLINE/INIT). The affected configurations buffer memories are Un\G10000 to Un\G10293, Un\G6000 to Un\G6167 and Un\G8400 to Un\G8402.

② Any CANopen® node will check all CAN messages on the bus for errors. Depending on the error state the action that the node will take is different:

- In error active state:
  The node will actively mark the frame as invalid.
- In error passive state:
  The node will not actively mark the frame as invalid to avoid bus disturbance if the node itself has an H/W problem.

8.2 Error Code and Error Message Summary

8.2.1 EMCY Emergency error codes

Error code (hex)	Description	Send by ME3CAN1-Q F/W
0000	Error reset or no error	✔
1000	Generic error	—
2000	Current - generic error	—
2100	Current, CANopen® device input side - generic	—
2200	Current inside the CANopen® device - generic	—
2300	Current, CANopen® device output side - generic	—
3000	Voltage - generic error	—
3100	Mains voltage - generic	—
3200	Voltage inside the CANopen® device - generic	—
3300	Output voltage - generic	—
4000	Temperature - generic error	—
4100	Ambient temperature - generic	—
4200	Device temperature - generic	—
5000	CANopen® device hardware - generic error	—
6000	CANopen® device software - generic error	—
6100	Internal software - generic	—
6200	User software - generic	✔
6300	Data set - generic	—
7000	Additional modules - generic error	—
8000	Monitoring - generic error	—
8100	Communication - generic	—
8110	CAN overrun (objects lost)	✔
8120	CAN in error passive mode	✔
8130	Life guard error or heartbeat error	—
8140	recovered from bus off	—
8150	CAN-ID collision	—
8200	Protocol error - generic	✔
8210	PDO not processed due to length error	✔
8220	PDO length exceeded	✔
8230	DAM MPDO not processed, destination object not available	—
8240	Unexpected SYNC data length	—
8250	RPDO time out	✔
8F01 to 8F7F	Life guard error or heartbeat error caused by Node-ID 1 to Node-ID 127.	✔
9000	External error - generic error	—
F000	Additional functions - generic error	—
FF00	Device specific - generic error	✔

Tab. 8-3: *EMCY Emergency error codes (according to CiA®-301)*

NOTE

More EMCY Emergency error codes are defined in the various CiA® Device/Application Profiles. For the case of not listed EMCY Error codes please refer to the manual of the device which sends the message.

8.2.2 EMCY Manufacturer specific error codes

Emergency Error code (hex)	Manufacturer specific error code (hex)	Description
FF00	4D45303031	"ME001": Main unit program/CPU error occurs
FF00	4D45303032	"ME002": Main unit state changed from RUN to STOP
6200	4D45303034	"ME004": Module restart by Yn2 (Refer to section 3.3.2)

Tab. 8-4: *EMCY Manufacturer specific error codes of the ME3CAN1-Q*

8.2.3 SDO Access abort codes

Abort code (hex)	Description
0503 0000	Toggle bit not alternated.
0504 0000	SDO protocol timed out. (ME3CAN1-Q default: 500 ms)
0504 0001	Client/server command specifier not valid or unknown.
0504 0002	Invalid block size (block mode only).
0504 0003	Invalid sequence number (block mode only).
0504 0004	CRC error (block mode only).
0504 0005	Out of memory.
0601 0000	Unsupported access to an object.
0601 0001	Attempt to read a write only object.
0601 0002	Attempt to write a read only object.
0602 0000	Object does not exist in the object dictionary.
0604 0041	Object cannot be mapped to the PDO.
0604 0042	The number and length of the objects to be mapped would exceed PDO length.
0604 0043	General parameter incompatibility reason.
0604 0047	General internal incompatibility in the device.
0606 0000	Access failed due to a hardware error.
0607 0010	Data type does not match, length of service parameter does not match
0607 0012	Data type does not match, length of service parameter too high
0607 0013	Data type does not match, length of service parameter too low
0609 0011	Sub-index does not exist.
0609 0030	Invalid value for parameter (download only).
0609 0031	Value of parameter written too high (download only).
0609 0032	Value of parameter written too low (download only).
0609 0036	Maximum value is less than minimum value.
060A 0023	Resource not available: SDO connection
0800 0000	General error
0800 0020	Data cannot be transferred or stored to the application.
0800 0021	Data cannot be transferred or stored to the application because of local control.
0800 0022	Data cannot be transferred or stored to the application because of the present device state.
0800 0023	Object dictionary dynamic generation fails or no object dictionary is present
0800 0024	No data available
5000 0000	Time out or impossible to allocate identifier for SDO transmission or Protocol mismatch
6060 0000	Buffer too small for received SDO data (this error will occur during initialization of the transmission)

Tab. 8-5: *SDO Access abort codes*

NOTE

More SDO Access abort codes are defined in the various CiA® Device Profiles and by the device manufacturer.
For the case of not listed SDO Access abort codes please refer to the manual of the device which responds the SDO Access abort code.

Index

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MITSUBISHI ELECTRIC

HEADQUARTERS

Mitsubishi Electric Europe B.V. **EUROPE**
Gothaer Straße 8
D-40880 Ratingen
Phone: +49 (0)2102 / 486-0
Fax: +49 (0)2102 / 486-1120

Mitsubishi Electric Europe B.V. **CZECH REP.**
Radlická 751/113e Avenir Business Park
CZ-158 00 Praha 5
Phone: +420 251 551 470
Fax: +420 251 551 471

Mitsubishi Electric Europe B.V. **FRANCE**
25, Boulevard des Bouvets
F-92741 Nanterre Cedex
Phone: +33 (0)1 / 55 68 55 68
Fax: +33 (0)1 / 55 68 57 57

Mitsubishi Electric Europe B.V. **IRELAND**
Westgate Business Park, Ballymount
IRL-Dublin 24
Phone: +353 (0)1 4198800
Fax: +353 (0)1 4198890

Mitsubishi Electric Europe B.V. **ITALY**
Viale Colleoni 7 Palazzo Sirio
I-20864 Agrate Brianza (MB)
Phone: +39 039 / 60 53 1
Fax: +39 039 / 60 53 312

Mitsubishi Electric Europe B.V. **NETHERLANDS**
Nijverheidsweg 23a
NL-3641RP Mijdrecht
Phone: +31 (0) 297250350

Mitsubishi Electric Europe B.V. **POLAND**
ul. Krakowska 50
PL-32-083 Balice
Phone: +48 (0) 12 347 65 00
Fax: +48 (0) 12 347 65 01

Mitsubishi Electric Europe B.V. **RUSSIA**
52, bld. 1 Kosmodamianskaya emb.
RU-115054 Moscow
Phone: +7 495 / 721 2070
Fax: +7 495 / 721 2071

Mitsubishi Electric Europe B.V. **SPAIN**
Carretera de Rubí 76-80 Apdo. 420
E-08190 Sant Cugat del Vallés (Barcelona)
Phone: +34 (0) 93 / 5653131
Fax: +34 (0) 93 / 5891579

Mitsubishi Electric Europe B.V. (Scandinavia) **SWEDEN**
Fjelievägen 8
SE-22736 Lund
Phone: +46 (0) 8 625 10 00
Fax: +46 (0) 46 39 70 18

Mitsubishi Electric Turkey Elektrik Ürünleri A.Ş. **TURKEY**
Fabrika Otomasyonu Merkezi
Şerifali Mahallesi Nutuk Sokak No.5
TR-34775 Ümraniye-İSTANBUL
Phone: +90 (0)216 / 526 39 90
Fax: +90 (0)216 / 526 39 95

Mitsubishi Electric Europe B.V. **UK**
Travellers Lane
UK-Hatfield, Herts. AL10 8XB
Phone: +44 (0)1707 / 28 87 80
Fax: +44 (0)1707 / 27 86 95

Mitsubishi Electric Europe B.V. **UAE**
Dubai Silicon Oasis
United Arab Emirates - Dubai
Phone: +971 4 3724716
Fax: +971 4 3724721

Mitsubishi Electric Corporation **JAPAN**
Tokyo Building 2-7-3
Marunouchi, Chiyoda-ku
Tokyo 100-8310
Phone: +81 (3) 3218-2111
Fax: +81 (3) 3218-2185

Mitsubishi Electric Automation, Inc. **USA**
500 Corporate Woods Parkway
Vernon Hills, IL 60061
Phone: +1 (847) 478-2100
Fax: +1 (847) 478-0328

EUROPEAN REPRESENTATIVES

GEVA **AUSTRIA**
Wiener Straße 89
A-2500 Baden
Phone: +43 (0)2252 / 85 55 20
Fax: +43 (0)2252 / 488 60

OOO TECHNIKON **BELARUS**
Prospect Nezavisimosti 177-9
BY-220125 Minsk
Phone: +375 (0)17 / 393 1177
Fax: +375 (0)17 / 393 0081

ESCO DRIVES **BELGIUM**
Culliganlaan 3
BE-1831 Diegem
Phone: +32 (0)2 / 717 64 60
Fax: +32 (0)2 / 717 64 61

KONING & HARTMAN B.V. **BELGIUM**
Woluwelaan 31
BE-1800 Vilvoorde
Phone: +32 (0)2 / 257 02 40
Fax: +32 (0)2 / 257 02 49

INEA RBT d.o.o. **BOSNIA AND HERZEGOVINA**
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0)1/ 513 8116
Fax: +386 (0)1/ 513 8170

AKHNATON **BULGARIA**
4, Andrei Ljapchev Blvd., PO Box 21
BG-1756 Sofia
Phone: +359 (0)2 / 817 6000
Fax: +359 (0)2 / 97 44 06 1

INEA CR **CROATIA**
Losinjska 4 a
HR-10000 Zagreb
Phone: +385 (0)1 / 36 940 - 01/ -02/ -03
Fax: +385 (0)1 / 36 940 - 03

AutoCont C. S. S.R.O. **CZECH REPUBLIC**
Kafkova 1853/3
CZ-702 00 Ostrava 2
Phone: +420 595 691 150
Fax: +420 595 691 199

Beijer Electronics A/S **DENMARK**
Lykkegardsvej 17
DK-4000 Roskilde
Phone: +45 (0)46/ 75 76 66
Fax: +45 (0)46 / 75 56 26

HANS FØLSGAARD A/S **DENMARK**
Theilgaards Torv 1
DK-4600 Køge
Phone: +45 4320 8600
Fax: +45 4396 8855

Beijer Electronics Eesti OÜ **ESTONIA**
Pärnu mnt.160i
EE-11317 Tallinn
Phone: +372 (0)6 / 51 81 40
Fax: +372 (0)6 / 51 81 49

Beijer Electronics OY **FINLAND**
Vanha Nurmijärventie 62
FIN-01670 Vantaa
Phone: +358 (0)207 / 463 500
Fax: +358 (0)207 / 463 501

PROVENDOR OY **FINLAND**
Teljänkatu 8 A3
FIN-28130 Pori
Phone: +358 (0) 2 / 522 3300
Fax: +358 (0) 2 / 522 3322

UTECO A.B.E.E. **GREECE**
5, Mavrogenous Str.
GR-18542 Piraeus
Phone: +30 (0)211 / 1206-900
Fax: +30 (0)211 / 1206-999

MELTRADE Kft. **HUNGARY**
Fertő utca 14.
HU-1107 Budapest
Phone: +36 (0)1 / 431-9726
Fax: +36 (0)1 / 431-9727

EUROPEAN REPRESENTATIVES

Beijer Electronics SIA **LATVIA**
Ritausmas iela 23
LV-1058 Riga
Phone: +371 (0)6 / 784 2280
Fax: +371 (0)6 / 784 2281

Beijer Electronics UAB **LITHUANIA**
Goštautų g. 3
LT-48324 Kaunas
Phone: +370 37 262707
Fax: +370 37 455605

ALFATRADE Ltd. **MALTA**
99, Paola Hill
Malta-Paola PLA 1702
Phone: +356 (0)21 / 697 816
Fax: +356 (0)21 / 697 817

INTEHSIS SRL **MOLDOVA**
bld. Traian 23/1
MD-2060 Kishinev
Phone: +373 (0)22 / 66 4242
Fax: +373 (0)22 / 66 4280

HIFLEX AUTOM. B.V. **NETHERLANDS**
Wolweverstraat 22
NL-2984 CD Ridderkerk
Phone: +31 (0)180 / 46 60 04
Fax: +31 (0)180 / 44 23 55

KONING & HARTMAN B.V. **NETHERLANDS**
Energieweg 1
NL-2627 AP Delft
Phone: +31 (0)15 260 99 06
Fax: +31 (0)15 261 9194

Beijer Electronics AS **NORWAY**
Postboks 487
NO-3002 Drammen
Phone: +47 (0)32 / 24 30 00
Fax: +47 (0)32 / 84 85 77

Fonseca S.A. **PORTUGAL**
R. João Francisco do Casal 87/89
PT-3801-997 Aveiro, Esgueira
Phone: +351 (0)234 / 303 900
Fax: +351 (0)234 / 303 910

SIRIUS TRADING & SERVICES SRL **ROMANIA**
Aleea Lacul Morii Nr. 3
RO-060841 Bucuresti, Sector 6
Phone: +40 (0)21 / 430 40 06
Fax: +40 (0)21 / 430 40 02

INEA SR d.o.o. **SERBIA**
Ul. Karadjordjeva 12/217
SER-11300 Smederevo
Phone: +386 (026) 461 54 01

SIMAP SK (Západné Slovensko) **SLOVAKIA**
Jána Derku 1671
SK-911 01 Trenčín
Phone: +421 (0)32 743 04 72
Fax: +421 (0)32 743 75 20

INEA RBT d.o.o. **SLOVENIA**
Stegne 11
SI-1000 Ljubljana
Phone: +386 (0)1 / 513 8116
Fax: +386 (0)1 / 513 8170

Beijer Electronics Automation AB **SWEDEN**
Box 426
SE-20124 Malmö
Phone: +46 (0)40 / 35 86 00
Fax: +46 (0)40 / 93 23 01

OMNI RAY AG **SWITZERLAND**
Im Schörli 5
CH-8600 Dübendorf
Phone: +41 (0)44 / 802 28 80
Fax: +41 (0)44 / 802 28 28

OOO "CSC-AUTOMATION" **UKRAINE**
4-B, M. Raskovoyi St.
UA-02660 Kiev
Phone: +380 (0)44 / 494 33 44
Fax: +380 (0)44 / 494-33-66

EURASIAN REPRESENTATIVES

TOO Kazpromavtomatika **KAZAKHSTAN**
UL. ZHAMBYLA 28,
KAZ-100017 Karaganda
Phone: +7 7212 / 50 10 00
Fax: +7 7212 / 50 11 50

MIDDLE EAST REPRESENTATIVE

I.C. SYSTEMS Ltd. **EGYPT**
23 Al-Saad-Al-Alee St.
EG-Sarayat, Maadi, Cairo
Phone: +20 (0) 2 / 235 98 548
Fax: +20 (0) 2 / 235 96 625

GIRIT CELADON Ltd. **ISRAEL**
12 H'aomanut Street
IL-42505 Netanya
Phone: +972 (0)9 / 863 39 80
Fax: +972 (0)9 / 885 24 30

ILAN & GAVISH Ltd. **ISRAEL**
24 Shenkar St., Kiryat Ariet
IL-49001 Petah-Tikva
Phone: +972 (0)3 / 922 18 24
Fax: +972 (0)3 / 924 0761

CEG LIBAN **LEBANON**
Cebaco Center/Block A Autostrade DORA
Lebanon-Beirut
Phone: +961 (0)1 / 240 445
Fax: +961 (0)1 / 240 193

AFRICAN REPRESENTATIVE

ADROIT TECHNOLOGIES **SOUTH AFRICA**
20 Waterford Office Park 189 Witkoppen Road
ZA-Fourways
Phone: + 27 (0)11 / 658 8100
Fax: + 27 (0)11 / 658 8101