Installation Manual
KSM54

Installation manual for KSM 54 device.

Note: The German version is the original version of the installation manual.

Status: 06/2013

Subject to change without prior notification

The content of this documentation has been collated with greatest care and corresponds with our present status of information. However, we would like to point out, that this document cannot always be updated at the same time as the technical development of the products develops. Note information and specifications can be changed at any time. Please keep yourself informed about the current version under www.kollmorgen.com.

Devices of the

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Index

1   Important Advice

Target audience of this operating manual:
Maintenance, replacement, electricians, users

1.1   Definitions

The synonym KSM is used as generic term for all derivates of the KSM product line.
If the manual points directly to a certain derivate, though the entire term will be used. (i.e. KSM 12)

The following term "safe" is used for safe function according to the EN 954-1 respectively according to EN 61508 in the particular category or level.

1.2   Definitions of Terms

Abbreviation	Meaning
CAN ID	The SafePLC programmed CAN Identifier for the back plane communication of the KSM1X. A KSM1X uses CAN protocol 2.0A with 11 bit addresses on the back plane.
NodeID	A CANopen network consists of at maximum 127 participants. The NodeID is in this context the address of the KSM54.
OD	Abbreviation for object dictionary. A CANopen specific term. Every CANopen participant has its own object dictionary as central data structure. An entry within the OD is addressed with an index and a subindex. There are a set of default entries and ranges for device specific information.
SDO	Abbreviation for service data objects. This is one communication alternative to access the OD of a device.
PDO	Abbreviation for process data objects. This communication alternative is faster than SDO, but has some restrictions.
TPDO	The PDOs are divided into RPDOs (= receive process data objects) and TPDOs (= transmit process data objects).
COB-ID	Every CAN telegram has a message identifier. CAN protocol 2.0A defines a size of 11 bit, CAN protocol 2.0B defines a size of 29 bit. The message identifier is called COB-ID within CANopen context. A set of COB-IDs is defined as standard, but there are others which can be changed.
Heartbeat	A CANopen participant with the feature to produce heartbeat messages can produce them in cyclical intervals. The heartbeat messages can be used from other participants to monitor the device.

2   Safety Advice

2.1   Operating and Service

Before installation and demounting, or the disconnecting of signal- and power supply cables, the modules have to be de-energized.
It has to be avoided to get electrostatics at the terminal blocks and connectors during the dismounting of the KSM modules.

Guarantee and safety approval is void, if the module has been manipulated.
The KSM can only be operated in a temperature range between 0° and 50° C. Make sure that this temperature range will not be violated.

3   Device

3.1   Device Settings

Dip Switches for Bus Termination

3 LEDs Show Operating Mode

CAN Interface

Rotary Dip Switches for Selecting Address and Baudrate

3.2   Shipment

- Device KSM54
- Installation manual
- x.eds – file
- backplane connector

3.3   Label
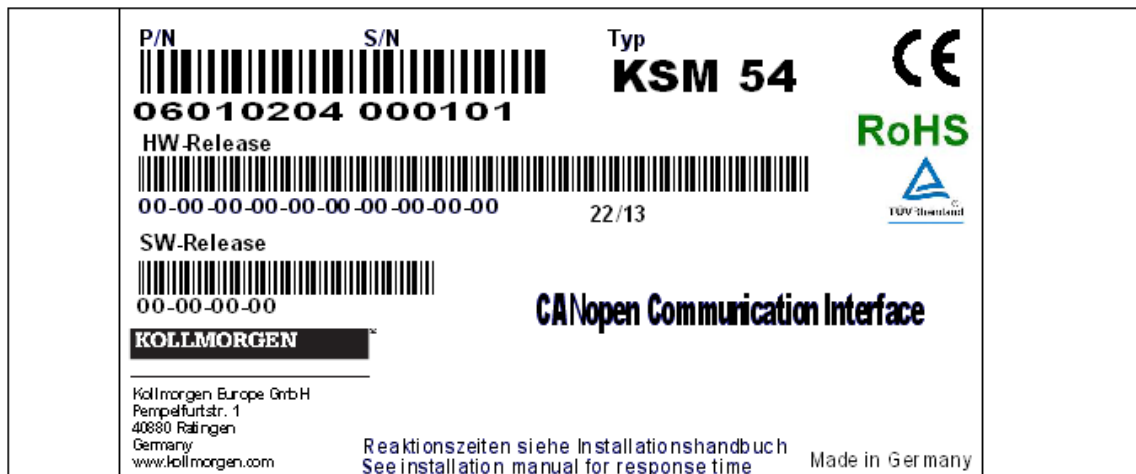
The label is placed on the left side of the device.

Following information's is listed:
- product code
- serial number
- device type
- hardware version
- firmware version

4 Modification of an Installation

The commissioning or changing of an installation of KSM can only achieved by qualified personal! Contact the company, who did the safety related test report. By changing the configuration the safety function of the module can be lost.

5 Parameterizing the Back Plane Communication

The used KSM1X devices have to be configured with for the network unique CAN IDs. These CAN IDs have to be entered per SDO into the OD index 0x6200 and the corresponding subindex for the device.

Index	Subindex	Meaning
0x6200	1	CAN ID of the 1. mapped device or 0, if not used
0x6200	2	CAN ID of the 2. mapped device or 0, if not used
0x6200	3	CAN ID of the 3. mapped device or 0, if not used
0x6200	4	CAN ID of the 4. mapped device or 0, if not used
0x6200	5	CAN ID of the 5. mapped device or 0, if not used
0x6200	6	CAN ID of the 6. mapped device or 0, if not used
0x6200	7	CAN ID of the 7. mapped device or 0, if not used
0x6200	8	CAN ID of the 8. mapped device or 0, if not used

An example: If you want the TPDO5 contain the diagdata of the KSM1X with the CAN ID 0x107, then you have to write the value 0x107 into the OD index 0x6200, subindex 5.

6 Parameterizing the CANopen Communication

Every CANopen participant has to have a unique NodeID. The NodeID of a KSM54 is configured with the rotary dipswitches on the front side. Each of the rotary dipswitches has 16 possible positions. You can understand the two rotary dipswitches as high and low nibble of a byte. They are labeled "HIGH" and "LOW" on the front side. So the value of the rotary dipswitches can be calculated as follows:

RDSvalue = 16 x (value of the "HIGH" rotary dipswitch) + (value of the "LOW" rotary dipswitch).

Please take into account, that if you use more than one KSM54 in the same CANopen network, their addresses have to differ at least by 2! As for the fact a CANopen participant can only have an address within the range from 1 to 127, the most significant bit is used for selecting the baud rate.

The KSM54 supports 500 kBaud and 1 MBaud. If the most significant bit of RDSvalue is 0, the device uses 500 kBaud, if it is 1, the device uses 1 MBaud. Because of the number of generated TPDOs as further restriction a limitation for the highest configurable address applies. So the range for the address is 1 to 126. (If you configure the address as 127, the device sees it as 126) If you want the KSM54 to generate heartbeat messages, you can configure the "producer heartbeat time" as described in "Heartbeat producer" below.

An example: "HIGH" rotary dipswitch has the value 10, the "LOW" rotary dipswitch has the value 3.
- ⇨ RDSvalue = 10*16 + 3 = 163 = 0xA3
- ⇨ The most significant bit is set, so the KSM54 CANopen interface would be configured with 1 MBaud.
- ⇨ The NodeID is represented from the lower significant 7 bit, so it can be calculated with: (0xA3 & 0x7F) = 0x23 = 35.

Please note: At the moment, the KSM54 supports only a baudrate of 500 kBaud.

As described in "TPDOs" below, knowing the NodeID, the COB-IDs can be calculated:

TPDO	COB-ID
TPDO1	0x180 + 0x23 = <u>0x1A3</u>
TPDO2	0x280 + 0x23 = <u>0x2A3</u>
TPDO3	0x380 + 0x23 = <u>0x3A3</u>
TPDO4	0x480 + 0x23 = <u>0x4A3</u>
TPDO5	0x180 + 0x23 +1 = <u>0x1A4</u>
TPDO6	0x280 + 0x23 +1 = <u>0x2A4</u>
TPDO7	0x380 + 0x23 +1 = <u>0x3A4</u>
TPDO8	0x480 + 0x23 +1 = <u>0x4A4</u>

If you want to, you can change the COB-IDs of the TPDOs by writing the desired values into the appropriate positions into the OD.

7   Device Specific OD Entries

Index	Subindex	Type	Meaning
0x6000	0x00	UINT8	Number of used subindexes (const 8)
0x6000	0x01	UINT8	1. byte diagdata of the 1. mapped device
0x6000	0x02	UINT8	2. byte diagdata of the 1. mapped device
0x6000	0x03	UINT8	3. byte diagdata of the 1. mapped device
0x6000	0x04	UINT8	4. byte diagdata of the 1. mapped device
0x6000	0x05	UINT8	5. byte diagdata of the 1. mapped device
0x6000	0x06	UINT8	6. byte diagdata of the 1. mapped device
0x6000	0x07	UINT8	7. byte diagdata of the 1. mapped device
0x6000	0x08	UINT8	8. byte diagdata of the 1. mapped device
0x6001	0x00	UINT8	Number of used subindexes (const 8)
0x6001	0x01	UINT8	1. byte diagdata of the 2. mapped device
0x6001	0x02	UINT8	2. byte diagdata of the 2. mapped device
0x6001	0x03	UINT8	3. byte diagdata of the 2. mapped device
0x6001	0x04	UINT8	4. byte diagdata of the 2. mapped device
0x6001	0x05	UINT8	5. byte diagdata of the 2. mapped device
0x6001	0x06	UINT8	6. byte diagdata of the 2. mapped device
0x6001	0x07	UINT8	7. byte diagdata of the 2. mapped device
0x6001	0x08	UINT8	8. byte diagdata of the 2. mapped device
0x6002	0x00	UINT8	Number of used subindexes (const 8)
0x6002	0x01	UINT8	1. byte diagdata of the 3. mapped device
0x6002	0x02	UINT8	2. byte diagdata of the 3. mapped device
0x6002	0x03	UINT8	3. byte diagdata of the 3. mapped device
0x6002	0x04	UINT8	4. byte diagdata of the 3. mapped device
0x6002	0x05	UINT8	5. byte diagdata of the 3. mapped device
0x6002	0x06	UINT8	6. byte diagdata of the 3. mapped device
0x6002	0x07	UINT8	7. byte diagdata of the 3. mapped device
0x6002	0x08	UINT8	8. byte diagdata of the 3. mapped device
0x6003	0x00	UINT8	Number of used subindexes (const 8)

Index	Subindex	Type	Meaning
0x6003	0x01	UINT8	1. byte diagdata of the 4. mapped device
0x6003	0x02	UINT8	2. byte diagdata of the 4. mapped device
0x6003	0x03	UINT8	3. byte diagdata of the 4. mapped device
0x6003	0x04	UINT8	4. byte diagdata of the 4. mapped device
0x6003	0x05	UINT8	5. byte diagdata of the 4. mapped device
0x6003	0x06	UINT8	6. byte diagdata of the 4. mapped device
0x6003	0x07	UINT8	7. byte diagdata of the 4. mapped device
0x6003	0x08	UINT8	8. byte diagdata of the 4. mapped device
0x6004	0x00	UINT8	Number of used subindexes (const 8)
0x6004	0x01	UINT8	1. byte diagdata of the 5. mapped device
0x6004	0x02	UINT8	2. byte diagdata of the 5. mapped device
0x6004	0x03	UINT8	3. byte diagdata of the 5. mapped device
0x6004	0x04	UINT8	4. byte diagdata of the 5. mapped device
0x6004	0x05	UINT8	5. byte diagdata of the 5. mapped device
0x6004	0x06	UINT8	6. byte diagdata of the 5. mapped device
0x6004	0x07	UINT8	7. byte diagdata of the 5. mapped device
0x6004	0x08	UINT8	8. byte diagdata of the 5. mapped device
0x6005	0x00	UINT8	Number of used subindexes (const 8)
0x6005	0x01	UINT8	1. byte diagdata of the 6. mapped device
0x6005	0x02	UINT8	2. byte diagdata of the 6. mapped device
0x6005	0x03	UINT8	3. byte diagdata of the 6. mapped device
0x6005	0x04	UINT8	4. byte diagdata of the 6. mapped device
0x6005	0x05	UINT8	5. byte diagdata of the 6. mapped device
0x6005	0x06	UINT8	6. byte diagdata of the 6. mapped device
0x6005	0x07	UINT8	7. byte diagdata of the 6. mapped device
0x6005	0x08	UINT8	8. byte diagdata of the 6. mapped device
0x6006	0x00	UINT8	Number of used subindexes (const 8)
0x6006	0x01	UINT8	1. byte diagdata of the 7. mapped device
0x6006	0x02	UINT8	2. byte diagdata of the 7. mapped device
0x6006	0x03	UINT8	3. byte diagdata of the 7. mapped device
0x6006	0x04	UINT8	4. byte diagdata of the 7. mapped device
0x6006	0x05	UINT8	5. byte diagdata of the 7. mapped device
0x6006	0x06	UINT8	6. byte diagdata of the 7. mapped device
0x6006	0x07	UINT8	7. byte diagdata of the 7. mapped device
0x6006	0x08	UINT8	8. byte diagdata of the 7. mapped device
0x6007	0x00	UINT8	Number of used subindexes (const 8)
0x6007	0x01	UINT8	1. byte diagdata of the 8. mapped device
0x6007	0x02	UINT8	2. byte diagdata of the 8. mapped device
0x6007	0x03	UINT8	3. byte diagdata of the 8. mapped device
0x6007	0x04	UINT8	4. byte diagdata of the 8. mapped device
0x6007	0x05	UINT8	5. byte diagdata of the 8. mapped device
0x6007	0x06	UINT8	6. byte diagdata of the 8. mapped device
0x6007	0x07	UINT8	7. byte diagdata of the 8. mapped device
0x6007	0x08	UINT8	8. byte diagdata of the 8. mapped device
0x6200	0x00	UINT8	Number of used subindexes (const 8)
0x6200	0x01	UINT32	CAN ID of the 1. mapped device or 0, if not used
0x6200	0x02	UINT32	CAN ID of the 2. mapped device or 0, if not used
0x6200	0x03	UINT32	CAN ID of the 3. mapped device or 0, if not used

Index	Subindex	Type	Meaning
0x6200	0x04	UINT32	CAN ID of the 4. mapped device or 0, if not used
0x6200	0x05	UINT32	CAN ID of the 5. mapped device or 0, if not used
0x6200	0x06	UINT32	CAN ID of the 6. mapped device or 0, if not used
0x6200	0x07	UINT32	CAN ID of the 7. mapped device or 0, if not used
0x6200	0x08	UINT32	CAN ID of the 8. mapped device or 0, if not used

8 TPDOs

When initializing the KSM54, the following COB-IDs are used for the TPDOs. They can be changed on the default position within the OD (index 0x1800 to 0x1807, subindex 1).

TPDO	COB-ID	assigned device
TPDO1	0x180 + NodeID	device 1
TPDO2	0x280 + NodeID	device 2
TPDO3	0x380 + NodeID	device 3
TPDO4	0x480 + NodeID	device 4
TPDO5	0x180 + NodeID +1	device 5
TPDO6	0x280 + NodeID +1	device 6
TPDO7	0x380 + NodeID +1	device 7
TPDO8	0x480 + NodeID +1	device 8

The mapping of the TPDOs can not be changed, but can be read from the OD index 0x1A00 to 0x1A07.

A TPDO telegram is generated whenever there is a change in the received diagdata from the mapped device.

As example: if there is a change in at least one byte of the diagdata received from the KSM54 on the back plane bus from device 3, then a TPDO3 will be generated.

9 SDO

The data communication with SDO uses the standard COB-IDs 0x580 + NodeID for sending and 0x600 + NodeID for receiving.

The OD entry 0x2000 contains type information about the KSM installed. This information is only valid if only one KSM is connected to the KSM54.

Index	Subindex	Description
0x2000	0x00	number of used subindexes (6)
0x2000	0x01	4 Byte Serial number
0x2000	0x02	First byte firmware version
0x2000	0x03	Second byte firmware version
0x2000	0x04	Third byte firmware version
0x2000	0x05	Fourth byte firmware version
0x2000	0x06	2 Byte Device ID

The version number consists of four numbers. For example "2.0.2.46".
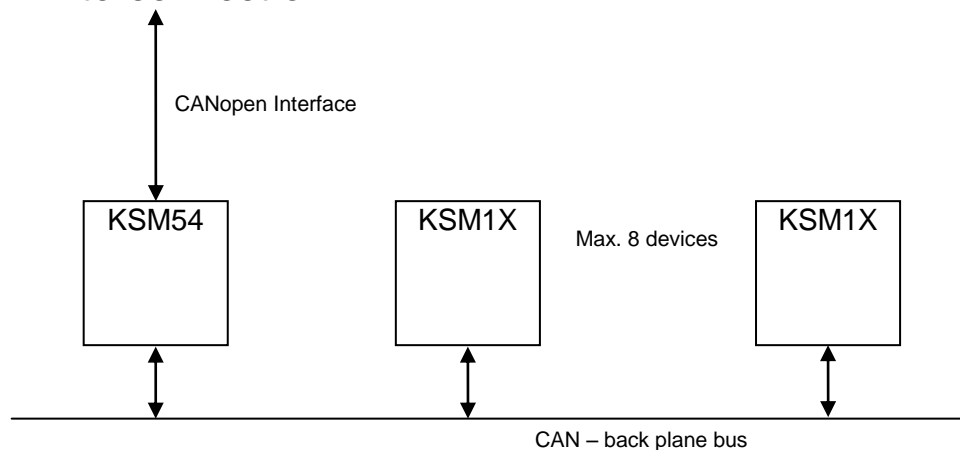
10 Heartbeat Producer

The KSM54 is a heartbeat producer in terms of the CANopen standard.

The "producer heartbeat time" is adjustable and can be changed by writing into the OD index 0x1017.

The default value is 0, which means that the production of heartbeat messages is switched off.

Valid values are in the range from 0 to 60000. The unit is 1 ms.

11 Interconnection

12 Diagdata

Description of the telegram "Diagdata" sending on the backplane bus is in the document "TD-37350-810-51-04F-EN Status Message Data"

13 LEDs

There are 3 LEDs on the front side of the KSM54:

LED Name	State	Meaning	Solution
RUN	Constant red or green	Internal error	KSM54 damaged
	green blinking	KSM54 is working	-
ST	Constant red	The CANopen controller is bus off	Check connection
	Red single flash	Warning limit	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)
	Red double flash	Error control event	A guard event (NMT-slave or NMT-master) or a heartbeat event (heartbeat consumer) has occurred
	Green blinking	CANopen state PREOPERATIONAL	The device is in state PREOPERATIONAL
	Green single flash	CANopen state STOPPED	The device is in state STOPPED
	Constant green	CANopen is operating	
XB	Constant red	No device mapping has been configured.	Write the mapping into the OD index 0x6200, subindex 1 to 8
	Orange blinking	At least one device is mapped. For at least 1 second no diagdata was received from at least one mapped device	Is the OD index 0x6200 configured with the right values? They has to match with the CAN ID of the mapped KSM1X. Is the KSM1X up and working?
	Green flashing	Within the last second diagdata was received from all mapped devices.	-
RUN ST XB	off red off	Invalid NodeID	Select a NodeID with the rotary dipswitch within the range from 1 to 126.

Note: If both LEDs (green/red) are switched on at the same time, the color of the LED is orange

14 CAN Bus Termination

For CAN to work properly it is necessary to terminate both ends of the wires with a resistor with 120 ohm.

If the KSM54 is at the end of the wire and the terminator resistor is not integrated in the jack, it can be patched in with dipswitch XB.

dipswitchindex XB	Assigned Bus
1	CANopen Interface
2	Back plane bus

In the ON position, the 120 ohm resistor for termination is active.

15 Modification / Procedures with Changes at the Modules or Installation

Repair – Repair of a module may only be achieved by Kollmorgen.

Guarantee – By changing the KSM layout or opening the enclosure the guarantee and safety approval is lost

Mechanical Modification – Through modification of drives / mechanical transmission or changing the sensors (encoders) the safety function could be lost. Talk to the company who has installed or delivered the KSM modules, or to the person who has created the safety test report.

Electrical Modification – Through modification of the cabling or wiring of the KSM modules the safety function could be lost. Talk to the company who has installed or delivered the KSM modules, or to the person who has created the safety test report.

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16 Maintenance

Exchange of a KSM Module

After a KSM module has been changed it has to be assured, that the spare module contains the same configuration.

Follow these instructions for changing a KSM module:

- Disconnect the drive from the power supply
- Switch off the power supply of the KSM and disconnect all cables and connections
- Get the KSM from the (DIN) rail and pack the KSM according to EMC prescriptions
- Install the new KSM at the (DIN) rail
- Rebuild all connections
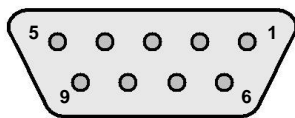- Switch on the power supply

17 Technical Data

17.1 Environmental Condition

Class of Protection	IP 20
Ambient Temperature	0°C... 50°C
Climatic Category	-25°C…70°C
Lifetime	20 years at 50°C ambient

17.2 Assignment

Assignment for CANopen:

Pin	Assignment
1	
2	CAN_L
3	GND
4	
5	
6	
7	CAN_H
8	
9	

About Kollmorgen

Kollmorgen is a leading provider of motion systems and components for machine builders. Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions that are unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For assistance with your application needs, visit www.kollmorgen.com or contact us at:

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