ORDERING INFORMATION

Type	Order Designation	Description Options
Evaluation Board	iC-MN EVAL MN1D	iC-MN Evaluation Board ready to operate, accessible through GUI via PC adapter
Software	iC-MN GUI	GUI software for Windows PC (freeware) stores setup to file, communication to iC-MN, Download
	iC-MN DLL	iC-MN Product specific Dynamic Link Library (DLL) Available on request
PC Adapter	iC-MB4 iCSY MB4U	High Performance BiSS-to-PC Adapter (USB)

See also RELATED PRODUCTS AND DOCUMENTATION

BOARD MN1D

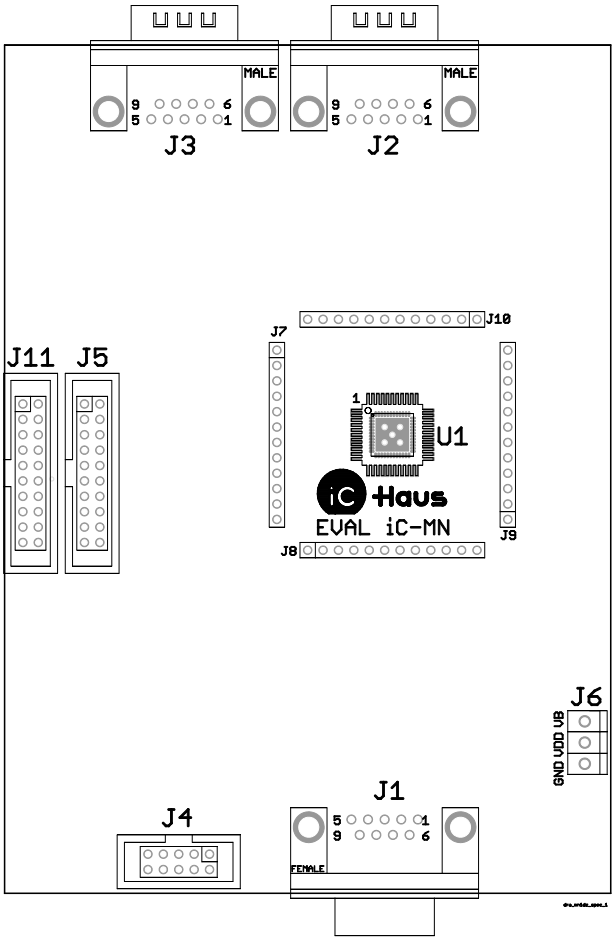

Figure 1: Evaluation board MN1D

PLUG	CONFIGURATION
J1	BiSS Interface input (to master)
J2	BiSS Interface output (to slaves)
J3	Multiturn Interface
J4	I^2C Interface
J5	Signal inputs
J6	Power supply terminals
J7...J10	iC-MN's pin signals
J11	Optional

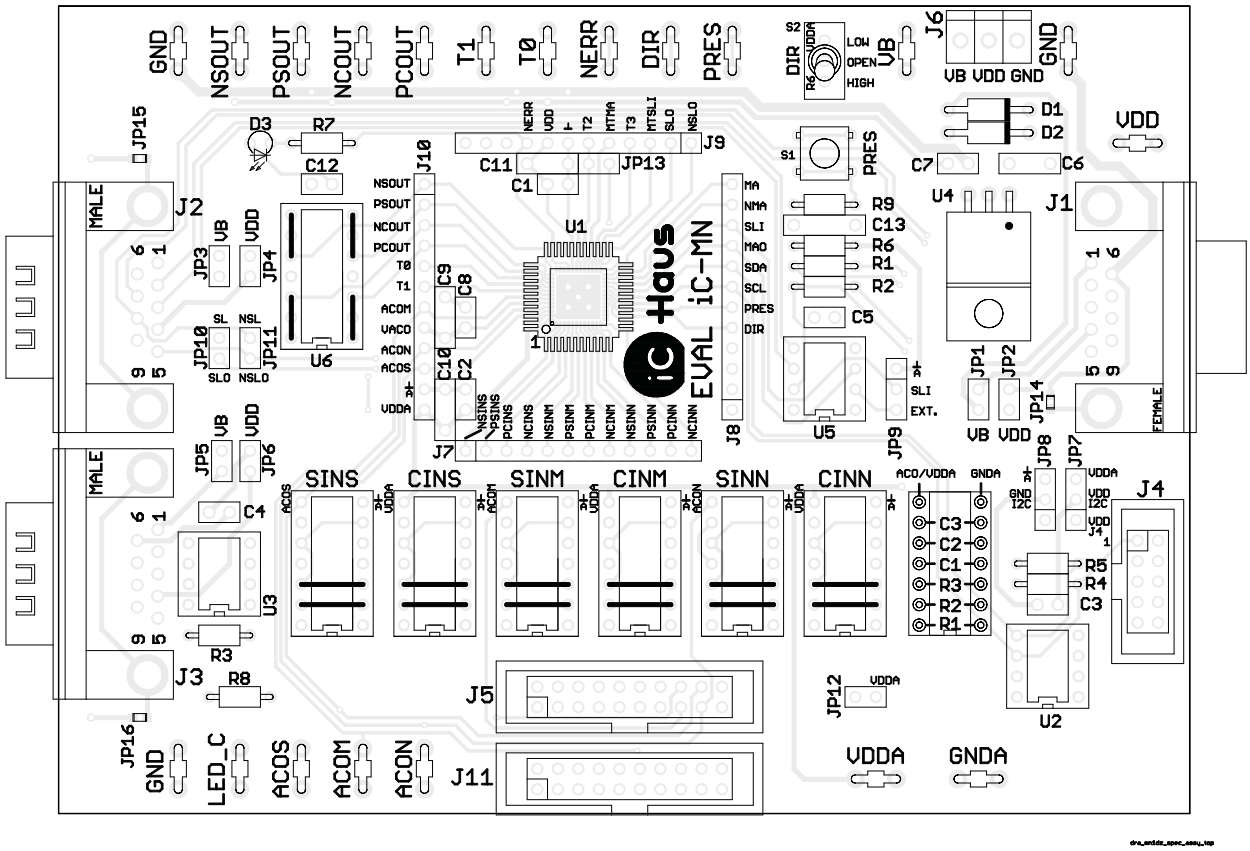

Figure 2: Component side (size 140 mm x 100 mm)

TERMINAL	DESCRIPTION
VB	+8 V to +15 V Supply Voltage (100mA)
VDD	+5 V Supply Voltage (100mA)
GND	0 V Ground
VDDA	Sub-System Positive Supply Output (+5 V, 20 mA max, for sensors and periphery)
GNDA	Sub-System Ground Output (for Sensors and Periphery)
LED_C	LED Cathode Ground Path (for encoder LED powered via ACOM)
ACOS	Signal Level Controller Output and VREFin Reference Voltage Input/Output
ACOM	Signal Level Controller Output (to encoder LED anode)
ACON	Signal Level Controller Output

TERMINAL	DESCRIPTION
PSOUT	Signal Output Sine +
NSOUT	Signal Output Sine -
PCOUT	Signal Output Cosine +
NCOUT	Signal Output Cosine -
T0	Test Pin
T1	Test Pin
NERR	Error Message Output / System Error Message Input
DIR	Sense of Rotation Preselection Input
PRES	Preset Input

CIRCUIT DESCRIPTION

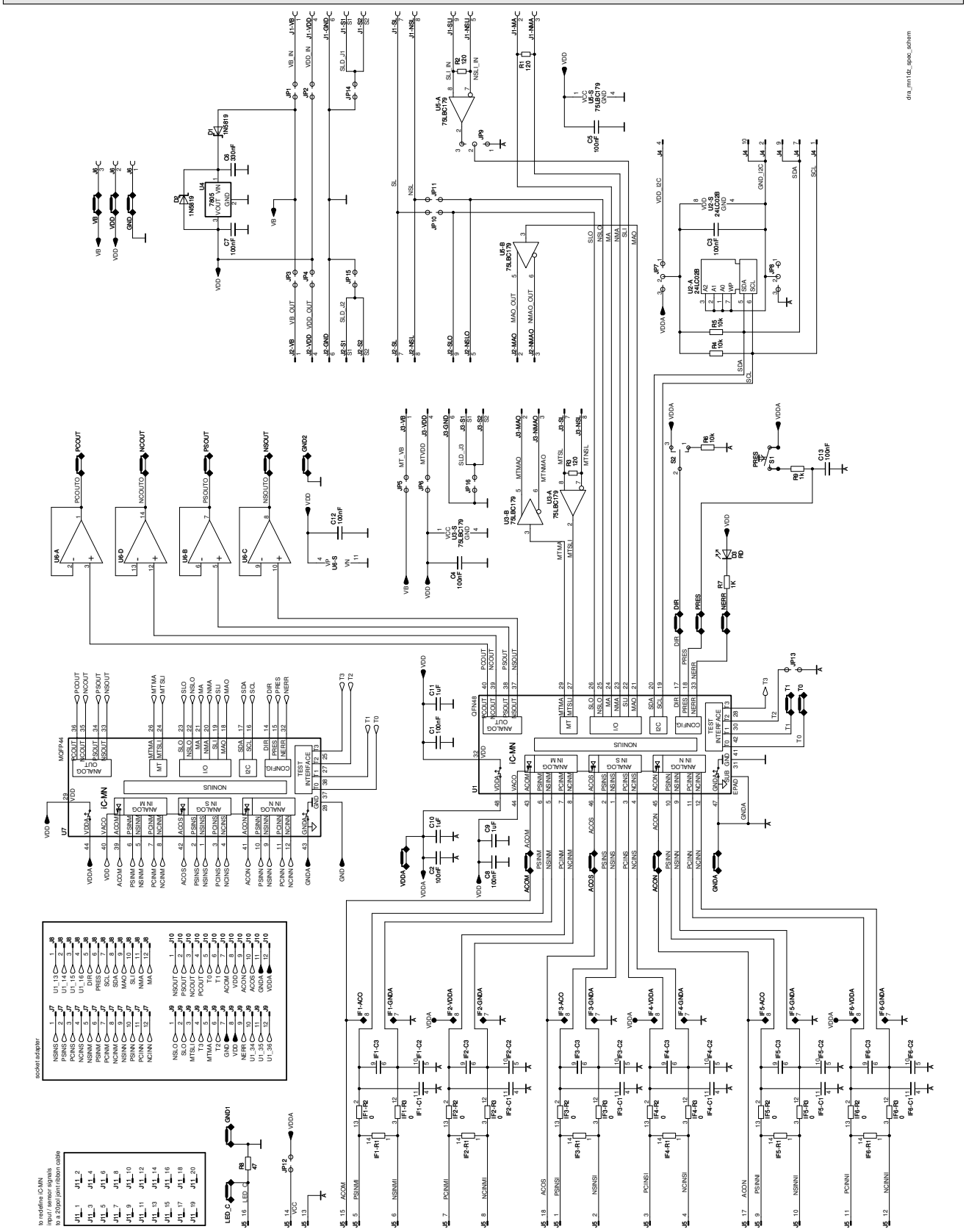

Figure 3: Circuit diagram including optional components

ASSEMBLY PART LIST

Device	Value (typical)	Comment
C1 - C5, C7, C8, C12, C13	100 nF	
C6	330 nF	
C9 - C11	1 µF	
D1, D2	1N5819	
D3	LED red 3mm	Indicator LED (red) for NERR Pin
IF1 - IF6	Socket DIL 14	Optional equipment
J1	SUB-D9F	Serial input connector
J2, J3	SUB-D9M	Serial output connector
J4	WSL10G	I^2C interface
J5	WSL20G	Sensor input signals
J11	WSL20G	Conncetor for individual wiring
J6	ALK059-03	Screwing terminal for power supply VB, VDD and GND
J7 - J10	BL10-12U	Socket for optional adapter PCB (PC129)
JP1 - JP6, JP10 - JP13	SL LP1/097 2G	Jumper
JP7 - JP9	SL LP1/097 3G	Jumper
R1 - R3	120 Ohm	Line termination resistors
R4 - R6	10 kOhm	
R7, R9	1 kOhm	
R8	47 Ohm	Measurement resistor for LED current
S1	Switch B3F1000	Preset taster
S2	Switch ATE1E	Direction switch
U2	IC 24LC02B	EEPROM
U3, U5	IC 65LBC179	Line driver for serial interface
U4	IC 7805	Voltage reglulator (5V)
U6	Socket DIL 14	Optional equipment
X1, X2	Socket MK015G	

BOARD, CONNECTOR PINOUT AND TERMINAL DESCRIPTION

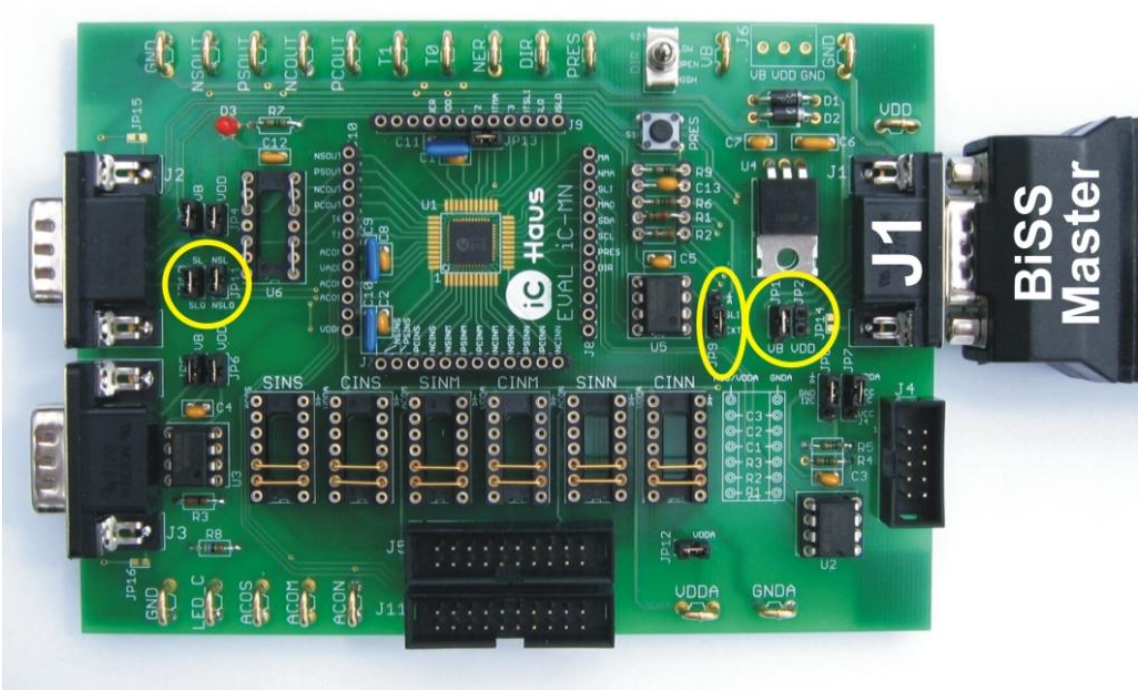

Figure 4: Top view

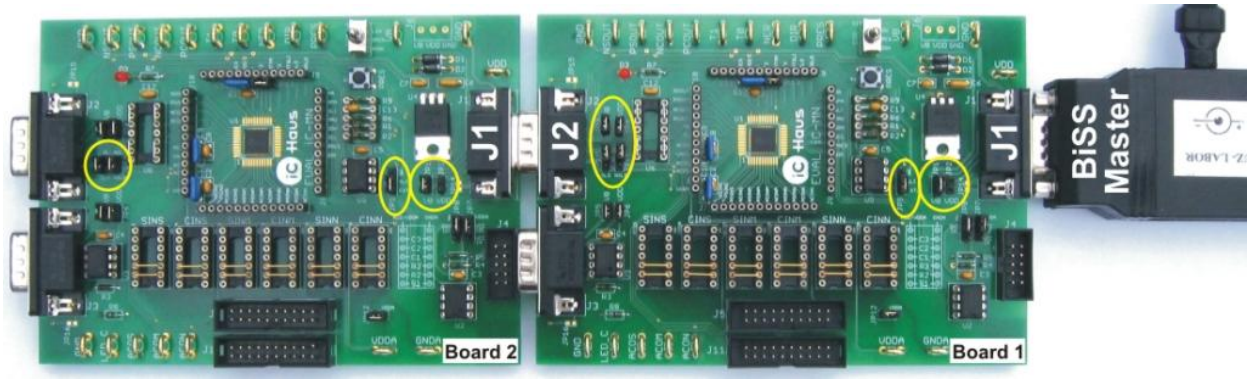

Figure 5: Board-to-board connection

Setup (MN1D connected via USB Adapter - MB3U)
The MN1D evaluation board is equipped with the iC-MN 25-bit Nonius Encoder. The board features two 9-pin SUB-D (J1 and J2) connectors for serial communication and one 9-pin SUB-D (J3) connectors for the multiturn interface. The PC-USB Adapter enables the evaluation board to be connected to a common Windows PC. Figure 4 shows a single board connected via the **IN** junction (J1).

Figure 5 shows another example where two MN1D evaluation boards are used at the same time. Here, the **IN** junction (J1) of the second board is plugged to the **OUT** junction (J2) of the first board.

An external power supply for MB3U (12 V - inner contact: negative pole - outer contact: positive pole) is required when operating two boards. iC-MN software can be used to access both boards from a Windows PC (see section "APPLICATION SOFTWARE" for more details).

Note: Please install the latest USB and/or LPT driver before you attach the PC Adapter to the PC.

Refer to "JUMPER DESCRIPTION" for the required jumper configuration marked by yellow circles.

J1: BiSS Interface input
9-pin Sub D Connector - female

PIN	Name	Function
1	VB	+12 V supply voltage
2	MA +	Clock input
3	MA -	Clock input (inverted)
4	VDD	+5 V supply voltage
5	SLI -	Data input (inverted)
6	GND	0 V ground
7	SL +	Data line
8	SL -	Data line (inverted)
9	SLI +	Data input

J2: BiSS Interface output
9-pin Sub D Connector - male

PIN	Name	Function
1	VB	+12 V supply voltage
2	MAO +	Clock output
3	MAO -	Clock output (inverted)
4	VDD	+5 V supply voltage
5	SLO -	Data output (inverted)
6	GND	0 V ground
7	SL +	Data line
8	SL -	Data line (inverted)
9	SLO +	Data output

J3: Multiturn Interface
9-pin Sub D Connector - male

PIN	Name	Function
1	VB	+12 V supply voltage
2	MAO +	Clock output
3	MAO -	Clock output (inverted)
4	VDD	+5 V supply voltage
5	n. c.	
6	GND	0 V ground
7	SL +	Data input
8	SL -	Data input (inverted)
9	n. c.	

J11: Free configurable
20-pin Connector - male

PIN	Name	Function
1 - 20	n. c.	reserved for customised configuration

J4: I^2C Interface
10-pin Connector - male

PIN	Name	Function
1	SCL	I^2C clock
2	GND_I^2C	I^2C ground
3	n. c.	
4	VDD_I^2C	I^2C +5 V supply voltage
5	n. c.	
6	n. c.	
7	SDA	I^2C data
8	n. c.	
9	SDA	I^2C data
10	GND_I^2C	I^2C ground

J5: Signal inputs
20-pin Connector - male

PIN	Name	Function
1	PSINSI	Signal Input Sine + (Segment)
2	NSINSI	Signal input Sine - (Segment)
3	PCINSI	Signal Input Cosine + (Segment)
4	NCINSI	Signal Input Cosine - (Segment)
5	PSINMI	Signal Input Sine + (Master)
6	NSINMI	Signal Input Sine - (Master)
7	PCINMI	Signal Input Cosine + (Master)
8	NCINMI	Signal Input Cosine - (Master)
9	PSINNI	Signal Input Sine + (Nonius)
10	NSINNI	Signal Input Sine - (Nonius)
11	PCINNI	Signal Input Cosine + (Nonius)
12	NCINNI	Signal Input Cosine - (Nonius)
13	GNDA	Sub-system ground output
14	VDDA (VCC)	Sub-system positive supply output
15	ACOM	Signal level controller output (Master channel, LED anode)
16	LED_C	LED cathode ground path
17	ACON	Signal level controller output
18	ACOS	Signal level controller output
		Reference voltage input/output (VREFin)
19	n. c.	
20	n. c.	

Note:
n. c. pin not connected

JUMPER DESCRIPTION

Voltage supply options with adapter MB3U

Voltage supply via board terminal[1] VB	Voltage supply via board terminal[4] VDD	Voltage supply via J1 plug[2]	Voltage supply via J2 plug	Component supply iC-MN	Jumper configuration **JP1** (VB) +12 V via J1	Jumper configuration **JP2** (VDD) +5 V via J1	Jumper configuration **JP3** (VB) +12 V via J2	Jumper configuration **JP4** (VDD) +5 V via J2
-	-	X	-	via J1 (VB)	bridged	open	don't care	don't care
-	-	X	-	via J1 (VDD)	open	bridged	don't care	don't care
-	-	-	X	via J2 (VB)	open	open	bridged	open
-	-	-	X	via J2 (VDD)	open	open	open	bridged
X	-	-	-	via board terminal VB	open	open	don't care	don't care
-	X	-	-	via board terminal VDD	open	open	don't care	don't care

Voltage supply options with adapter MB3A

Voltage supply via board terminal[1] VB	Voltage supply via board terminal[4] VDD	Voltage supply via J1 plug[3]	Voltage supply via J2 plug	Component supply iC-MN MB3A	Jumper configuration **JP1** (VB)	Jumper configuration **JP2** (VDD)	Jumper configuration **JP3** (VB)	Jumper configuration **JP4** (VDD)
-	-	none	X	via J2 (VB)	open	open	bridged	open
-	-	none	X	via J2 (VDD)	open	open	open	bridged
X	-	none	-	via board terminal VB	open	bridged	don't care	don't care
-	X	none	-	via board terminal VDD	open	bridged	don't care	don't care

Communication chain	**Board 1**		**Board 2**		
Information	**Jumper configuration** **JP10**	**JP11**	**Jumper configuration** **JP10**	**JP11**	**Comments**
Single-Board connection (see Figure 4)	bridged	bridged	N/A	N/A	shipment setup (only one board)
Board-to-Board connection. Set board 2 as the last slave in the line (see Figure 5)	open	open	bridged	bridged	Adapter → Board 1 (J1) Board 1 (J2) → Board 2 (J1)[5]
	open	open	N/A	N/A	don't use
	open	open	open	open	don't use
	bridged	bridged	open	open	don't use
	bridged	bridged	bridged	bridged	don't use

Notes [1]) Supply of +8 V to +15 V required to board terminals VB and GND
[2]) Supply voltage sourced from J1 plug out of PC adapter
[3]) MB3A needs to be externally supplied via the MN1D evaluation board
[4]) Supply of +5 V required to board terminals VDD and GND
[5]) Connect the two boards as shown in Figure 5

I²C Interface configuration

Jumper	Pin 1	Pin 2	Pin 3
JP8	n. c.	GND_I²C	GNDA
JP7	VDD_J4	VDD_I²C	VDDA

Serial data input configuration (SLI)

Jumper	Pin 1	Pin 2	Pin 3
JP9	GNDA	SLI	extern

JP12 is for disconnecting and current measuring at VDDA.

APPLICATION SOFTWARE

iC-MN's GUI software for PCs running on Windows operating systems, as well as the required USB and/or LPT driver are available as a ZIP file.

Installation
After unzipping the "iC-MN_xx.zip", the following files are located in the selected directory.
(xx is a placeholder for revisions)

→ **iC-MN_xx.msi**
→ **mb3u_usb_driver.exe**
→ **mb3_lpt_driver.exe**
→ **Mn1d_a1es.pdf**
→ **readme.txt**

Note : Administrator rights are essential to run installation.

1. The installation of the software starts by executing the iC-MN_xx.msi installation package.
→ Follow the on-screen instructions to finish the installation procedure.

2. USB and/or LPT driver need to be installed to access the evaluation board via the PC Adapter.
→ Execute the mb3u_usb_driver.exe and/or mb3_lpt_driver.exe installation package and follow the on-screen instructions. This process can take a few minutes.

3. Installation will make the software "iC-MN_xx.exe" available in the selected working directory. The execution of this file will start the software. Figure 6 shows a screenshot of the startup window.

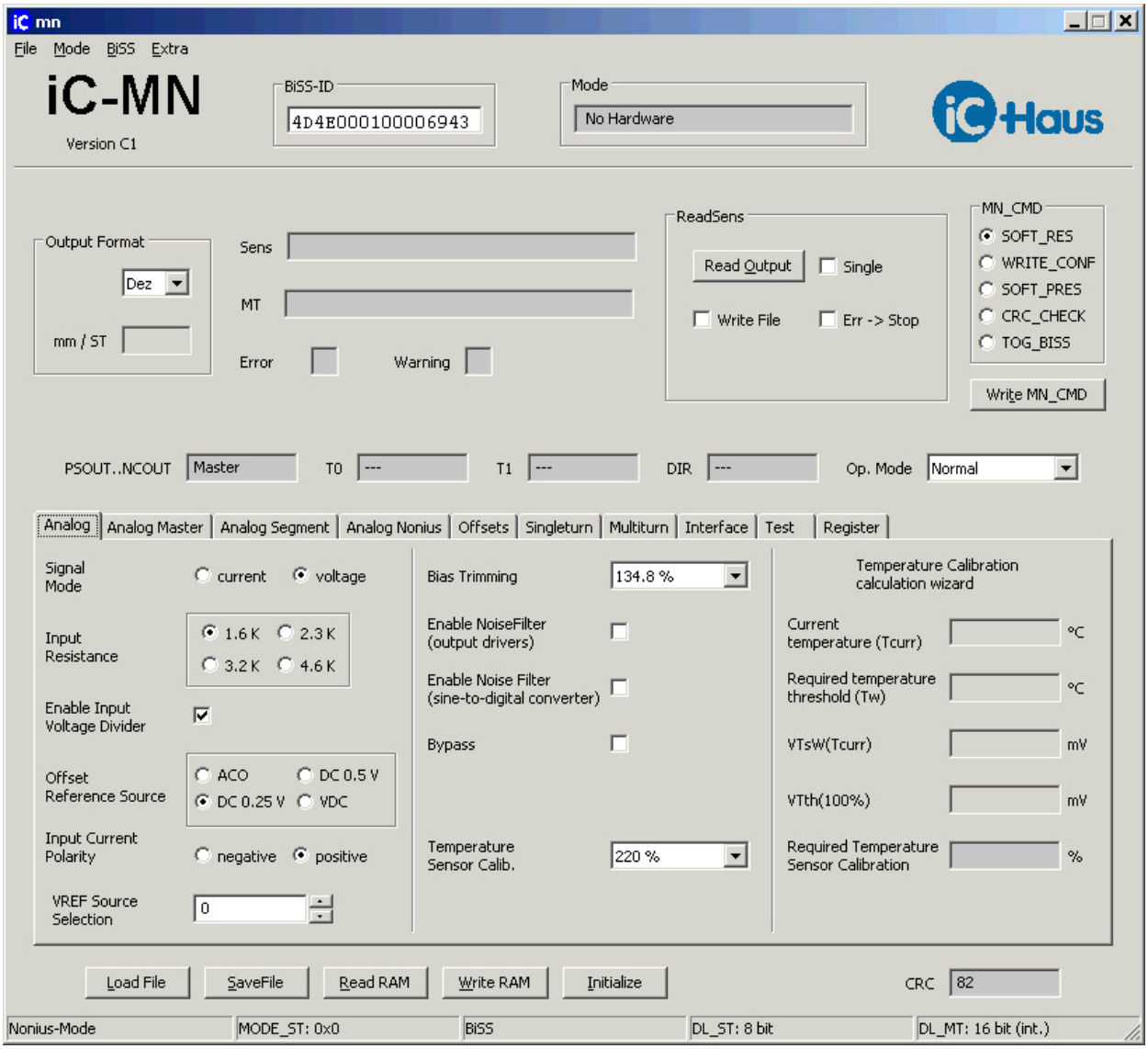

Figure 6: iC-MN software after startup

Instructions
The iC-MN software features:

- **Manual setup of iC-MN configuration parameters**
- **Save configuration parameters to EEPROM.**
- **Export of configuration parameter to Hex-files.**
- **Import of predefined configurations from Hex-files.**
- **Position data readout and display.**

The iC-MN software will start up in "No Hardware" mode. This state can be used to configure parameters without any hardware connected, for example to save the configuration into a Hex-file for later use. Connecting to iC-MN: Choose a <Mode> and then <Initialize> the BiSS bus. For example with MB3U: Choose <Mode> = <BiSS Master / USB-SPI-Mode> and then press <Initialize>.

Main Window

Menu Section

	Button	Description
<File>	Exit	Quit program
	Load File	Load configuration from file, Intel Hex file format (*.hex)
	Save	Save configuration into file, Intel Hex file format (*.hex)
<Mode>	No Hardware	Operation without connected adapters (resets adapter communication)
	BiSS Master / Intel Mode	Eval board MB3D-P
	BiSS Master / Motorola-Mode	Eval board MB3D-P
	BiSS Master / SPI-Mode	BiSS PC-LPT adapter MB3A / eval board MB3D-S
	BiSS Master / USB-SPI-Mode	BiSS PC-USB adapter MB3U
<BiSS>	Master Configuration	BiSS and SSI Interface configuration
	Initialize	Initializes the BiSS bus
	Read RAM	Reads in iC-MN's current configuration (RAM to PC)
	Write RAM	Transfers the displayed configuration to iC-MN (PC to RAM)
	Read Output	Reads out and displays position data of iC-MN
<Extra>	Enable Output Window	Enables separate display window (hexadecimal, decimal, binary, degree). Display is shown after starting <Read Output>
	LPT/USB-Port-Info	Additional information

Upper Section

Button	Description
BiSS-ID	BiSS device manufacturer ID and product code. Can be edited and stored to the configuration EEPROM (WRITE_CONF)
Mode	Shows hardware connection mode

Middle Section

	Button	Description
<Output Format>		Select sensor unit (Sens output field)
	mm / ST	Single turn per mm (only with <Output Format> = Lin (Linear))
	Sens	Position data
	MT	Multiturn data
	Error	Error bit (green = '0' / red = '1')
	Warning	Warning bit (green = '0' / red = '1')
<Read Sens>	Read Output	Starts cyclic readout sequences
	Single	Single readout sequence
	Write File	Writes sensor data to file with extension *.dat
	Err → Stop	Read output is halted in case of error
<MN_CMD>	SOFT_RES	Soft reset (new startup of iC-MN from RAM data)
	WRITE_CONF	Transfers RAM data to the EEPROM
	SOFT_PRES	Calls preset routine
	CRC_CHECK	Calls CRC verification routine (for iC-MN RAM data)
	TOG_BISS	Temporal toggle of interface protocol: SSI → BiSS Ce
	Write MN_CMD	Writes selected command

Bottom Section

Button	Description
Load File	See <File>
Save File	See <File>
Read RAM	See <File>
Write RAM	See <File>
Initialize	See <File>
CRC	Calculated CRC value (CRC_E2P for EEPROM adresses 0x4E and 0x4F)

For all parameter settings, please refer to iC-MN data sheet for a detailed description.

Status bar

This area shows the following parameters:

S/D Conversion Mode	MODE_ST	NBISS	DL_ST	DL_MT (MODE_MT)

Master configuration

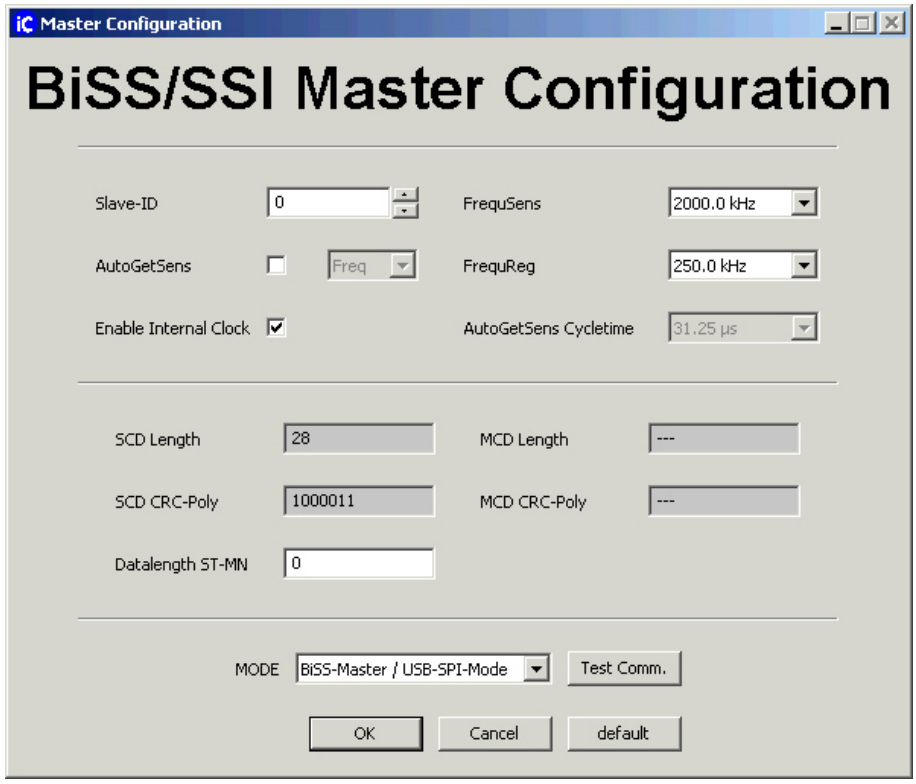

Figure 7: Master configuration

Button	**Description**
Slave-ID	Use “0” when only one iC-MN is connected. By a higher slave ID a r/w access to registers of further iC-MN’s connected in chain is possible (BiSS network).
AutoGetSens	Releases the BiSS Master to automatically repeat data readout cycles (Slave → BiSS Master)
Enable Internal Clock	Selects for on-chip clock oscillator
FrequSens	Sensor mode clock frequency
AutoGetSens Cycletime	Interval time for sensor mode cycles
SCD Length	Total length of Single Cycle Data (SCD)
SCD CRC-Poly	Used CRC polynomial
Datalength ST-MN	default 0
MODE	See description of Menu section
Test Comm.	Test communication to BiSS Master green = successful; red = failed

When moving the mouse cursor to a parameter input box, a tool tip is displayed identifying the corresponding parameter name as described in the specification. For a detailed description of the parameter settings please refer to iC-MN‘s Data Sheet.

APPLICATION EXAMPLE

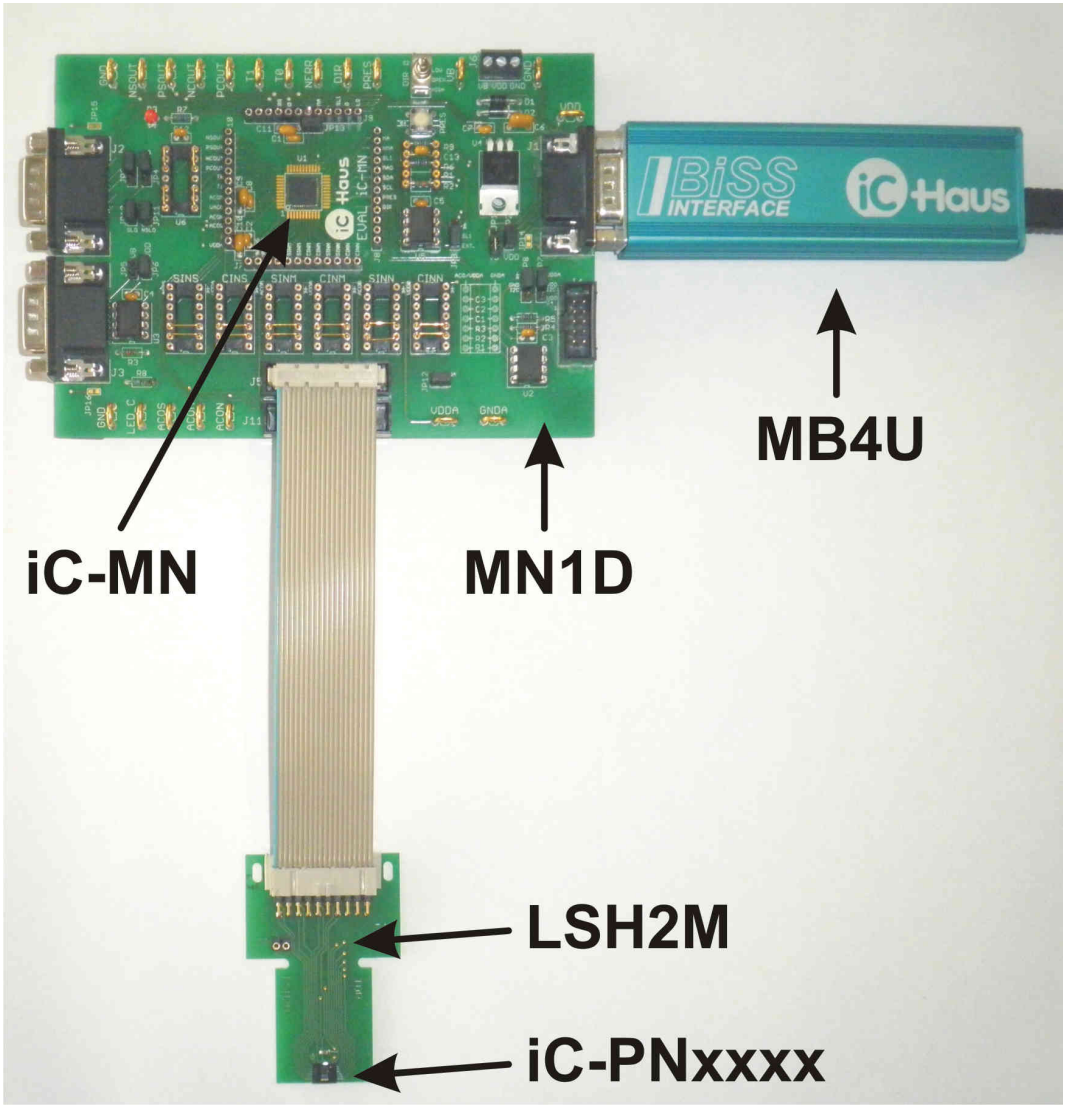

Figure 8: iC-MN EVAL MN1D connected to iC-PNxxxx EVAL LSH2M

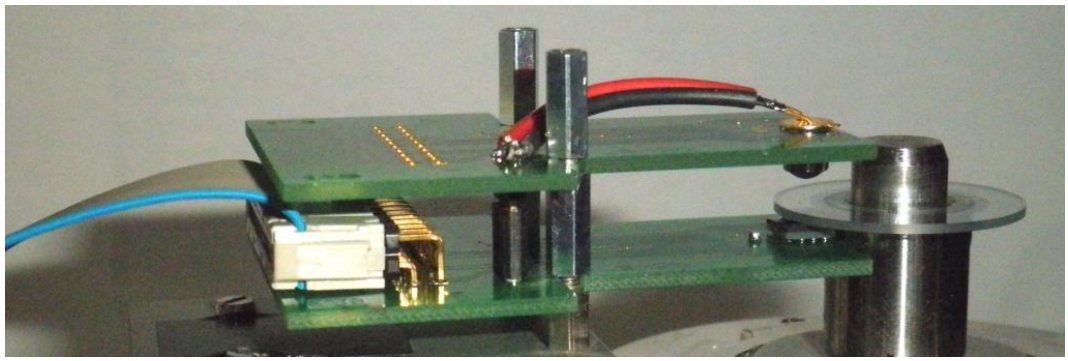

Figure 9: Encoder test application with iC-PNxxxx EVAL LSH2M

RELATED PRODUCTS AND DOCUMENTATION

Item	Description	Documentation and Information
iC-PN2656 LSHC4S 26-256N iC-PN2612 LSHC11S 26-512N iC-PN2624 LSHC1S 26-1024N iC-PN3312 LSHC9S 33-512N iC-PN3324 LSHC10S 33-1024N iC-PN3924 LSHC12S 39-1024N	Phased Array Nonius Encoder 26-256 Code disc for iC-PN2656 Phased Array Nonius Encoder 26-512 Code disc for iC-PN2612 Phased Array Nonius Encoder 26-1024 Code disc for iC-PN2624 Phased Array Nonius Encoder 33-512 Code disc for iC-PN3312 Phased Array Nonius Encoder 33-1024 Code disc for iC-PN3324 Phased Array Nonius Encoder 39-1024 Code disc for iC-PN3924	http://www.ichaus.de/product/iC-PNxxxx
iC-TL85 TO46-2L1 iC-SD85 BLCC SD1C	Encoder IR LED, 850 nm, with lens Encoder IR LED, 850 nm, with lens, SMT	http://www.ichaus.de/product/iC-TL85 http://www.ichaus.de/product/iC-SD85
iC-MN QFN48 iC-MN EVAL MN1D	Nonius Interpolator Evaluation Board of iC-MN	http://www.ichaus.de/product/iC-MN
iC-MB4 iCSY MB4U	High Performance BiSS-to-PC Adapter (USB)	http://www.ichaus.de/product/MB4U
iC-SCY SinCosYzer	SinCosYzer Workstation - Sine Encoder Signal Acquisition with Graphical Analysis	http://www.ichaus.de/product/SinCosYzer

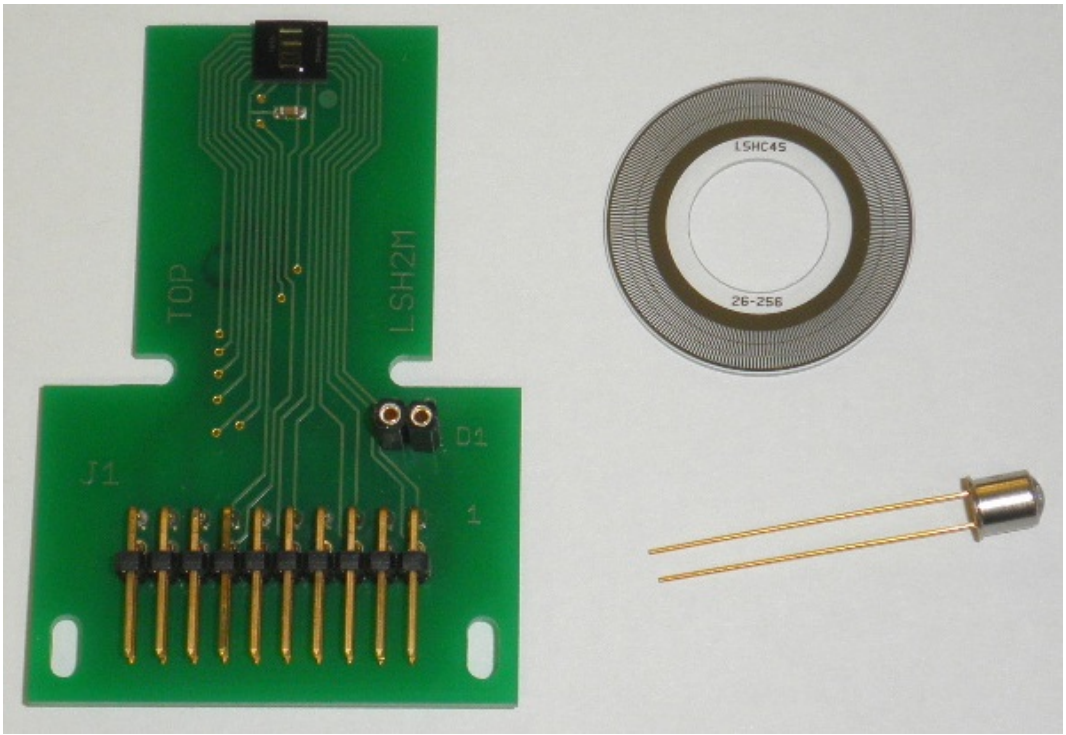

Figure 10: Evaluation kit iC-PN2656 EVAL LSH2M

REVISION HISTORY

Rev	Notes	Pages affected
A1	Initial version	
A2	Update Ordering Information, New Chapter Application Example, Related Products and Documentation	1 13 - 14