

# **E201** USB Encoder Interface

The E201 is a single-channel USB encoder interface suitable for use with a wide variety of rotary and linear encoders. It allows encoders to be easily interfaced and powered from a PC using only a USB cable. The product is available in 4 different options for different encoder communication interfaces.



# **Features and benefits**

- Can be used for a variety of applications
- Easy to use with USB
- ▶ Pin compatibility with RLS encoders
- Status LED indicators

- Compatibility with absolute and incremental encoders
- ► 5 V power supply

# **General information**

# Choose your E201 USB encoder interface



\* E201-9S also works with bidirectional BISS C encoders (AksIM-2 and AksIM-4, Orbis), but using E201-9B provides more features.

COMPATIBLE ENCODERS	E201-9Q	E201-9S	E201-9B	E201-9P
AksIM-2 & AksIM-4		✓	✓	✓
Artos	<b>√</b> **	✓		
FlexIN	✓			
HiLin	✓			
LA11		✓		✓
LinACE		✓		
LM10/13/15	✓			
Orbis		✓	✓	<b>v</b>
RE22/36	✓	✓		
RLB	✓			
RLM	✓			
RM22/36	✓	✓		
RM44/58	✓	✓		
SpinCo	✓			

\*\* Only with PCB-A for DI and SI option.



# Applications

The E201 is intended for applications such as functional testing, configuration, commissioning and diagnostics of encoders, metrology, gauging and PC-based machinery.

#### What you need



\* Supplied with E201 interface.

#### E201 dimensions

Dimensions and tolerances in mm.



# E201-9Q – for 5 V incremental encoders

The E201-9Q counts edges from 5 V incremental encoders and allows the count value to be read by a PC using simple ASCII commands over the USB connection.

#### Software installation

Download and install the **Software for E201-9Q and E201-9S.** To install drivers, follow the steps in the following chapter. When the installation is complete, connect the E201 interface and configure the software for the encoder you are using. The supply voltage and current consumption of the encoder can be read by the software. The encoder's power supply can be turned on and off by the software.

If the software is blocked by "Microsoft Defender SmartScreen", make sure that your computer is online and Windows can connect to the Internet to verify the authenticity.

A detailed explanation of the ASCII commands for the development of customised software can be found in chapter **<u>Command</u> <u>set</u>**.

#### Installing the USB drivers

USB drivers for Windows 10 or newer, use Windows Update to install the "Inbox drivers". For more information see **link**. For Windows 8 or older, or if the installation of the Inbox driver fails, the drivers must be downloaded from **RLS Media center**.

The E201 interface appears as a new Virtual COM port on the computer. The actual port number assigned depends on how many COM ports are already in use on the PC. In Windows you can find this under:

Control Panel > System > Device Manager > Ports (COM & LPT)

Supported operating systems: 32-bit and 64-bit Windows (XP, Vista, 7 and 8/8.1, 10, 11) Linux and Mac OS X. The E201 USB interface should be automatically detected on Linux and Mac OS X. It uses the "Communication Device Class driver (CDC)". VID = 0483 & PID = 5740



# Technical specifications

Power supply	5 V over USB port
Power consumption	65 mA (without encoder connected)
Encoder power supply	5 V or lower as supplied from the computer. Consider voltage drop over USB cable, USB hubs and encoder cable. Output is fused.
Inputs	RS422 differential A, B, Z, A–, B–, Z–
Maximum count rate	10 MHz, if using reference marks 40 MHz, if not using reference marks
Encoder connector	D-Sub 9 pin, female
USB connector	USB 1.1 Full Speed; USB 5 pin mini-B connector
Drivers	Windows, Linux, Mac
Cable length	1 m standard A to mini-B USB cable (supplied). Maximum length 5 m.
Operating temperature	0 °C to +45 °C
Environmental sealing	IP20 – indoor use only
Mass	42 g (interface without USB cable)

## Status LEDs

LED colour	USB	Encoder
Red	Disconnected	Reference mark found
Yellow	Connected	Encoder not moving
Green	Communication in progress	Encoder moving

# Connections

Pin	Function
1	GND (0 V)
2	Z+
3	B+
4	A+
5	5 V
6	Z-
7	В-
8	A-
9	GND (0 V)

Connections are directly compatible with the pin-out for RLS encoders. When used with Renishaw encoder, the encoder pinout might need to be modified.

# Software for E201-9Q

1. Open the software and wait for the device to be found.

E201 USB Encoder Interface		<b>S</b>
POSITION (mm)		OME
Ver. 2.4.5.7 E201 not detected	A RENISHAW@ associate co	ompany

2. At the bottom of the interface click on text that says "(Double click to change)" to enter settings.

5,065	REFERENCE MARK <b>1,696</b>	НОМЕ
4675 m/ / 33 mA	A F	ENISHAW: associate company
	5,065	REFERENCE MARK 5,065 1,696

3. In the settings fill out data according to data sheet of the encoder you are using.

	E201 Settings	×	
Select type of the encoder	Encoder Type	🔽 Distance Coded Ref Marks 🔶	Check this box if your encoder
	Encoder Interface	SSI Frequency	has a distance coded reference mark to enable "Distance Coded Deference Mark Settinge"
Resolution of the connected encoder:	Resolution		Reference Mark Settings
counts - Rotary: Number of counts	SSI / BiSS Mode Settings Padding bits Status bits D	etail.status CRC bits	
per revolution			
This section is enabled by checking the box "Distance Coded Ref Marks". Fill it out according to the data sheet of the encoder you are	Nominal Increment (Periods)     Nominal Increment K (mm)     2000     Show Reference Marks	Counts Per Period 20 Periode Lenght (mm) © 2 © 5	
using. Select preferred units	Display Unit - Linear • mm Olnch	Enocder Status	
for display	Cµm Cmil	Show Status Colors     Active Status LOW	
	Direction	E201 Interface Status	Encoder power supply, current
	Recording data     Capture positions to a list     Save position to a file every	1 seconds	status.
		OK Cancel	
	Ver 2 4 5 7 / E201-90 v2 31		



#### Communications

The E201 interface responds to ASCII commands received over the USB acting as a virtual serial port. No CR character is required after any command. Speed settings of the virtual serial port can be any value.

# E201-9Q Command set

This section is only required if you want to develop your own software. The E201 comes with basic display software described in the previous chapter.

Ascii	Action	Interface recourse (with example)
V	E201.00 returns coffware version + CP	
S	Internal serial number in 8 Hex numbers	(0029002d : 55345712 : 20363236 + CR) aaaaaaaa : bbbbbbbb : cccccccc + CR
r	Interface product serial number (6 characters; written on Interface housing)	(51X499 + CR) nnnnnn + CR where: n = product serial number
?	Encoder position E201-9Q returns 3 decimal values (width not fixed) separated by colons and terminated with CR	(3412:2596:1 + CR9 nnnn:rrrr:ssss + CR where: n = encoder count r = count value when reference/index was last seen s = status (status value of 1 shows that a reference was detected – use "c" command to clear)
!	Encoder position E201-9Q returns 4 decimal values (width not fixed) separated by colons and terminated with CR	(3412:2596:1:3574 + CR) nnn:rrrr:sss:tttt + CR where: n = encoder count r = count value when reference/index was last seen s = status (status value of 1 shows that a reference was detected – use 'c' command to clear) t = timestamp of position in μs Note: available in E201 interface version 1.18 (and later)
>	Encoder position E201-9Q returns 24 character hexadecimal string + CR comprising 3 sets of 8 character hexadecimal strings	(00000d5400000a240000001 + CR) nnnnnnnrrrrrrrsssssss + CR where: n = encoder count (signed 32 bit) r = count value when reference/index last seen (signed 32 bit) s = status (status value of 1 shows that a reference was detected – use "c" command to clear)
<	Encoder position E201-9Q returns 32 character hexadecimal string + CR comprising 4 sets of 8 character hexadecimal strings	(00000000000000000000003425fcd8 + CR) nnnnnnnnrrrrrrrsssssssttttttt + CR where: n = encoder count r = count value when reference/index was last seen s = status t = timestamp of position in μs Note: Available in E201 interface version 1.18 (and later)

Command set continued

Ascii command	Action	Interface response (with example)
I	Begin Index mode. On every reference/index E201-9Q returns position as 8 character hexadecimal string	On command: no response On index: (I = 00000ec9 + CR) I = nnnnnnn + CR where: n = encoder count on reference/index
i	Stop Index mode (stops returning position on every reference/index)	-
с	E201-9Q clears reference status flag	-
Z	E201-9Q sets current count value to zero (this also affects reference mark position)	-
а	E201-9Q clears zero offset value stored by 'z' command	-
е	Read encoder supply status, voltage and current consumption (fixed width)	(1 : 4.975 V : 0070 mA + CR) s : a.aaa V : bbbb mA + CR
n	Turn on power supply to encoder (default at power-up)	ON + CR
f	Turn off power supply to encoder	OFF + CR
р	Status of hardware input pins on interface (0 or 1)	(110 + CR) abz + CR
1	Begin auto transmission of encoder position in decimal form at 500 Hz rate*	(1234 + CR) nnnn + CR
0	Stop auto transmission	-

\* Interfaces with firmware v2.30 and older transmit at 1 kHz, which can overload the USB connection in some cases. In this case, E201 no longer responds and must be disconnected and reconnected.

# E201-9S – for 5 V absolute SSI and BiSS C unidirectional encoders

The E201-9S interrogates an SSI or BiSS encoder and allows the data to be read by a PC using simple ASCII commands over the USB connection.

#### Software installation

Download and install the **Software for E201-9Q and E201-9S.** To install drivers, follow the steps in the following chapter. When the installation is complete, connect the E201 interface and configure the software for the encoder you are using. The supply voltage and current consumption of the encoder can be read by the software. The encoder's power supply can be turned on and off by the software.

If the software is blocked by "Microsoft Defender SmartScreen", make sure that your computer is online and Windows can connect to the Internet to verify the authenticity.

A detailed explanation of the ASCII commands for the development of customised software can be found in chapter **<u>Command</u>** <u>set</u>.

#### Installing the USB drivers

USB drivers For Windows 10 or newer, use Windows Update to install "Inbox drivers". For more information see <u>link</u>. For Windows 8 or older, or if inbox driver installation fails, drivers must be downloaded from <u>RLS Media center.</u>

The E201 interface appears as a new Virtual COM port on the computer. The actual port number assigned depends on how many COM ports are already in use on the PC. In Windows you can find this under:

Control Panel > System > Device Manager > Ports (COM & LPT)

Supported operating systems: 32-bit and 64-bit Windows (XP, Vista, 7 and 8/8.1, 10, 11) Linux and Mac OS X. The E201 USB interface should be automatically detected on Linux and Mac OS X. It uses the "Communication Device Class driver (CDC)". VID = 0483 & PID = 5740

## **Technical specifications**

Power supply	5 V over USB port
Power consumption	65 mA (without encoder connected)
Encoder power supply	5 V or lower as supplied from the computer. Consider voltage drop over USB cable, USB hubs and encoder cable. Output is fused.
Data outputs	Clock/MA (differential pair – RS422)
Data inputs	Data/SLO (differential pair – RS422)
Encoder connector	D-Sub 9 pin, female
USB connector	USB 1.1 Full Speed; USB 5 pin mini-B connector
Drivers	Windows, Linux, Mac
Cable length	1 m standard A to mini-B USB cable (supplied). Maximum length 5 m.
Operating temperature	0 °C to +45 °C
Environmental sealing	IP20 – indoor use only
Mass	42 g (interface without USB cable)

# Status LEDs

LED colour	USB	Encoder
Red	Disconnected	Encoder not connected
Yellow	Connected	-
Green	Communication in progress	Encoder connected

## Connections

Din	Function		
P10	SSI encoder	BiSS encoder	
1	GND (0 V)	GND (0 V)	
2	Clock+	MA+	
3	Clock–	MA-	
4	NC	NC	
5	5 V	5 V	
6	Data+	SLO+	
7	Data–	SLO-	
8	NC	NC	
9	GND (0 V)	GND (0 V)	

BiSS is hardware compatible with SSI.

Connections are directly compatible with the pin-out for RLS encoders. When used with Renishaw encoder, the encoder pinout might need to be modified.



# Software for E201-9S

1. Open the software and wait for the device to be found.

E 201 USB Encoder Interface		
	POSITION (mm)	
Vie 2457 E201 not detected		A RENISHAW⊉ associate company

2. At the bottom of the interface click the "(Double click to change)" to enter settings.

g E201 USB Encoder Interface		
	POSITION (mm)	
	134,904	
Ver. 2.4.5.7 E201-95 V1.22 on CDM4	SSI Linear / 1 µm / 140 kHz / 24 bits (Double click to change)	A RENISHAW associate company

3. In the settings fill out data according to data sheet of the encoder you are using.

	E201 Settings	×	
Select type of the encoder ———	Encoder Type Clinear C Rotary	Distance Coded Ref Marks	
Select interface of the encoder ———	Encoder Interface	SSI Frequency 140 kHz	
Fill in according to communication section in data sheet of the encoder you are using	Resolution µm 1 ▼ SSI / BiSS Mode Settings Padding bits Status bits Do 0 ↓ 0 ↓ 0	Position Data (Bits) 24 • etail. status CRC bits • 6 • 0	
Select proferred units for display	Distance Coded Reference M Monimal Increment (Periods) 1000 C Basic Increment K (mm) 2000 Show Reference Marks Display Unit - Linear m C Inch	Aarks Settings Counts Per Period Periode Lenght (mm) © 2 © 5 Enocder Status I Show Encoder Status	Standard settings for BiSS C compliant encoders: - Status bits: 2
	Cµm Omil	<ul> <li>Show Status Colors</li> <li>Active Status LOW</li> </ul>	- CRC bits: 6 - Active status Low (checked)
	Direction	E201 Interface Status	Facaday active actively
	Recording data Capture positions to a list Save position to a file every	1 seconds	current consumption and input pins status.
		OK Cancel	

#### Communications

The E201 interface responds to ASCII commands received over the USB acting as a virtual serial port. No CR character is required after any command. Speed settings of the virtual serial port can be any value.

## E201-9S Command set

This section is only required if you want to develop your own software. The E201 comes with basic display software.

Ascii command	Action	Interface response (with example)	SSI encoder	BiSS encoder
v	E201-9S returns software version + CR	E201-9S V1.22 + CR	~	~
S	Internal serial number in 8 Hex numbers	(0029002d : 55345712 : 20363236 + CR) aaaaaaaa : bbbbbbbb : cccccccc + CR	~	<b>~</b>
r	Interface product serial number (6 characters; written on Interface housing)	(78J077 + CR) nnnnnn + CR where: n = product serial number	<b>v</b>	~
?	Encoder position E201-9S returns encoder position in decimal representation (width not fixed)	(1234 + CR) nnnn + CR where: n = encoder count	<b>~</b>	
>	Encoder position E201-9S returns 8 Hex digits with encoder position	(00000d54 + CR) nnnnnnn + CR where: n = encoder count (signed 32 bit)	¥	
!	Encoder position E201-9Q returns 2 decimal values (width not fixed) separated by colon and terminated with CR	(1234:5678 + CR) nnnn:tttt + CR where: n = encoder count t = position timestamp in μs	•	
4	Encoder position E201-9S returns 16 character hexadecimal string + CR comprising 64 SLO bits, synchronised to 64 MA clocks Used for BiSS C-mode (unidirectional) encoders Note: Available in E201 interface version 1.16 (and later)	(c004c9ba71753000 + CR) nnnnnnnnnnnnn + CR where: n = SLO bits in 16 Hex digits, comprising Ack, Start, Cds (always '0') in BiSS C mode (unidirectional), Position, Status and CRC bits.*		~
b	Read current word width that is read from encoder	(31 bit + CR) nn bit + CR	~	
Bnn+CR	Set word width; n can be one or two characters	(OK 31 bit + CR or B param error + CR) OK nn bit + CR N = 1 to 31	<b>~</b>	
m	Read current encoder clock frequency	3 = 140 kHz + CR or 9 = ERROR n = xxx kHz + CR	~	<b>~</b>
Mn	Set SSI and BiSS clock frequency: 8 = 4.4 MHz 7 = 2.2 MHz 6 = 1.1 MHz 5 = 560 kHz	(frequency 5 + CR or M param error + CR) frequency n + CR where: n = 1 to 7	~	~
	4 = 280 kHz 3 = 140 kHz (default) 2 = 70 kHz 1 = 35 kHz			



#### Command set continued

Ascii command	Action	Interface response (with example)	SSI encoder	BiSS encoder
е	Read encoder supply status, voltage and current consumption (fixed width)	(1 : 4.975 V : 0070 mA + CR) s : a.aaa V : bbbb mA + CR	~	~
n	Turn on power supply to encoder (default at power-up)	ON + CR	~	~
f	Turn off power supply to encoder	OFF + CR	¥	~
p	Status of hardware input pins on interface	(_11 + CR) xcd + CR x = space character c = clock pin (0 or 1), should be 1 d = data pin (0 or 1), should be 1	~	v
1	Begin auto transmission of encoder position in decimal form at 500 Hz rate	(1234 + CR) nnnn + CR	~	
0	Stop auto transmission	-	¥	

\* Reading BiSS C position

The user must decode the SLO bits into Position, Status and CRC according to the corresponding bit lengths. Eg.: If the Position, Status and CRC length is 26 bits, 2 bits and 6 bits respectively, the response c004c9ba71753000 is decoded as 0x19374E2 (Position), 0x03 (Status) and 0x2A (CRC,  $x^6 + x^1 + 1$  polynomial, inverted).

Additional information can be found in the document E201D02 at **RLS Media center**.

Verifying the BiSS data structure and CRC can be simplified using the BiSS CRC calculator tool at **RLS media center.** 

# E201-9B – for BiSS C bidirectional encoders

The E201-9B interrogates a BiSS C encoder and allows the data to be read by a PC using simple ASCII commands over the USB connection.

## Software installation

Download and install the **EncoSight v4 software** and USB drivers. To install drivers, follow the steps in the following chapter. When the installation is complete, connect the E201 interface and configure the software for the encoder you are using. The supply voltage and current consumption of the encoder can be read by the software. The encoder's power supply can be turned on and off by the software.

If the software is blocked by "Microsoft Defender SmartScreen", make sure that your computer is online and Windows can connect to the Internet to verify the authenticity.

A detailed explanation of the ASCII commands for the development of customised software can be found in chapter **<u>Command</u> <u>set</u>**.

#### Installing the USB drivers

USB drivers can be downloaded from **RLS Media center.** 

The E201 interface appears as a new Virtual COM port on the computer. The actual port number assigned depends on how many COM ports are already in use on the PC. In Windows you can find this under:

Control Panel > System > Device Manager > Ports (COM & LPT)

Supported operating systems: 32-bit and 64-bit Windows (XP, Vista, 7 and 8/8.1, 10, 11)\* Linux\*\* and Mac OS X. The E201 USB interface should be automatically detected on Linux and Mac OS X. It uses the "Communication Device Class driver (CDC)".

VID = 0483 & PID = 5740

- \* Windows CE and Embedded do not have all files in the "Windows" folder for proper driver installation. Additional files must be copied from other Windows Desktop system.
- \*\* The E201 is Linux compatible as it uses a generic CDC driver, but this has not been tested internally and no support is available.



# Technical specifications

Power supply	5 V over USB port	
Power consumption	65 mA (without encoder connected)	
Encoder power supply	5 V or lower as supplied from the computer. Consider voltage drop over USB cable, USB hubs and encoder cable. Output is fused.	
Data outputs	Clock/MA (differential pair – RS422)	
Data inputs	Data/SLO (differential pair – RS422)	
Encoder connector	D-Sub 9 pin, female	
USB connector	USB 1.1 Full Speed; USB 5 pin mini-B connector	
Drivers	Windows, Linux, Mac	
Cable length	1 m standard A to mini-B USB cable (supplied). Maximum length 5 m.	
Operating temperature	0 °C to +45 °C	
Environmental sealing	IP20 – indoor use only	
Mass	42 g (interface without USB cable)	

#### **Status LEDs**

LED colour	USB	Encoder
Red	1	Power off
Yellow	/	Power on
Green	Power on	Communication active

# Connections

Dim	Function	
PIN	BiSS encoder	
1	GND (0 V)	
2	MA+	
3	MA-	
4	NC	
5	5 V	
6	SLO+	
7	SLO-	
8	NC	
9	GND (0 V)	

Connections are directly compatible with the pin-out for RLS encoders. When used with Renishaw encoder, the encoder pinout might need to be modified.

## Software for E201-9B: EncoSight v4

Software is only available for encoders with bidirectional BiSS C and a valid Electronic Data Sheet (EDS) in the encoder.

 Download the software at <u>RLS Media center</u>. No installation is required. Open the software and wait until the E201 device is found. If the connection is not established after a few seconds, make sure that you have installed the correct driver set, see chapter <u>Installing the USB drivers</u>.



2. Under "Interface settings" you can check encoder voltage and current readout. You can also change the BiSS frequency and switch the encoder power supply on and off. Here is also a list of responses to all ASCII commands. For more details see chapter **E201-9B Command set**.

EncoSight for E201-9B (4	4.0.0.255)		-		×
Interface info		Comm OK			
COM5		Comm OK		DI	G
E201-9B v1.0			<b>7</b>		
48,6	914 d	leg		wa	arning error
EDS AksIM S	Status	AksIM Config	,	Calibrati	on
Interface Settings	Enc	oder Position	Dire	ect registe	rs
Readout data					
E201-9B v1.0					
84:20					
22a019600000000					
04:2 MHz					
DataLength 64 bits					
1:4862 mV:118 mA					
1726 : 1530					
0026002f:4e585308:2	0333139				
5HXA72					
Set Data Length		Set Frequency	/		
8 🚔 bits		4	units		
(Result)		(Result)	1		
Set Encoder Power					
● ON					
OOFF					
- · ·					



3. Basic encoder BiSS-related configuration is available in "Direct Registers" section. Parameters for identifying the encoder are also listed here, such as part number, serial number and firmware version.

🖤 EncoSight fo	or E201-9B (4.0.0.2	55)	-		×
Interface info COM5 E201-9B v1	1.0	Comm OK	<b>?</b>	RL	<b>5</b> °
	35,9809	) deg		warn	ning or
EDS	AksIM Status	AksIM Cor	nfig	Calibration	
Interface S	Settings	Encoder Position	Dire	ct registers	
0x40 Ban	k Select	0x10		Deed	
0x41 EDS	Bank	0x10		Read	
0x42 Prof	île ID	0x62	Profile BP3		
0x43 SCD	length	0x15	SCD Lengt	h = 21	
0x44 Seri	al Number	0x305147C5			
0x48 Key			Wri	te	
0x49 Com	mand		Wri	te	
0x78 Dev	ice ID	0x000000	000000		
0x7E Man	ufacturer ID	0x5352 =	= "RS"	RLS	
RLS Serial Extended	number serial number	DEMC	OBDINA08		
RLS Part number		MB049DCC1	9BDINA08	_	
Encoder f	irmware revision	2.4.9.2	2710		

4. The "Encoder Position" section displays the raw BiSS frame received from the encoder (in hexadecimal and binary), the conversion factors to degrees (for rotary encoders) or millimeters (for linear encoders), and the raw encoder count values. By default, the EncoSight software automatically configures the number of bits for multiturn and singleturn based on the values stored in the encoder's Electronic Data Sheet (EDS). These are set at first connection to the encoder. However, if necessary, you can also configure these settings manually. Both values should be set according to the encoder's data sheet.

✓ EncoSight for E201-9B (4.0.0.255) -		
Interface info COM5 E201-98 v1.0 Comm OK EDS AksIM Status EDS AksIM Status Encoder Position Direct registers	Encoder position	When using the encoders with built- in Electronic Data Sheet (EDS), these settings are automatically populated.
199659000000000 -	— Data read from the encoder (i	n hex)
000110011001011001011001000000000000000	Data read from the second s	ne encoder (in binary)
Multiturn     0     Total data length       Singleturn     19     written in Dx43: 21       Status     2     Singleturn:	Number of bits in the BiSS 1	frame
Encoder resolution 360 🕃 524288 💭 deg	Conversion from counts to o denominator, unit of measu	display value (nominator, re)
	Multiturn counter	
52402 ┥	Singleturn position (in cou	nts)
CRC error		

5. To reset the multiturn counter, set a new zero point, or reset the encoder to factory settings, go to "AksIM Config" or "Orbis Config" as shown in the picture below. Factory reset function resets the zero position, error map, filters and self-calibration. You can set the zero position to the current encoder position by clicking on "Set zero here". If you want to set the position manually, you can do this using the following procedure: Read the current zero offset. Write the desired position offset (unit: encoder counts). The value must be between 0 and the maximum encoder count value. Press the Write button. This number is subtracted from the absolute encoder position. Zero position offset is stored in the encoder itself.





6. The "AksIM Status" or "Orbis Status" section is present when one of these encoders is connected. It displays the real-time operation status of the encoder and shows possible errors or warnings, which can also be logged for further analysis. The air gap, i.e. the distance between the readhead and the magnetic ring, is calculated and displayed. With the "Draw" option, air gap will be plotted throughout the full rotation, to verify that it stays within the mounting tolerances. The "Copy" function prepares installation data in the text form and places it into the clipboard for logging into the external database. Persistent status (if supported by the encoder) accumulates all the detailed status bits since the encoder power-up and can be very useful for troubleshooting intermittent problems with the system.

🖹 EncoSight for E201-9B (4.0.0.255) — 🗆 🗙	
Interface info	
338,2553 deg warning	
Interface Settings         Encoder Position         Direct registers           EDS         AksIM Status         AksIM Config         Calibration           Status bits         0000000000000         Serial BiSS: 0x305147C5	Detailed status bits read from the encoder
Temperature         43         Serial decoded: DEMOJP           Signal Level         3174         Firmware: 2.4.9.2710           Velocity         0         0	Visualized status bits
Encoder Status  Frror Warning Sensor Init No Calibration Generation Generatio	Double-click on "Air gap" text to set the ne zero position (on touch)
Sector Lit         Mong medang           Ext Magn field         Acc err/Speed           Signal High         Tenerature           Signal Lost         Multiturn Err           Signal Lost         Multiturn Err	Calculates statistical data from the measured data plot and places prepared short report onto the clipboard.
500 450 400	Error limit
360 300 250	Warning limits
200	
0 0 0 45 90 135 180 225 270 315 360	

7. To ensure optimal performance of the encoder, it is possible to perform a self-calibration in the "Calibration" menu. For more information about the self-calibration function, refer to the data sheet of the connected encoder.



#### Communications

The E201 interface responds to ASCII commands received over the USB acting as a virtual serial port. No CR character is required after any command. Speed settings of the virtual serial port can be any value.

#### E201-9B Command set

This section is only needed if you want to develop your own software. The E201 comes with the basic display software described in the previous chapter.

#### Connecting to the interface:

- 1. Install the USB drivers as described in chapter **Installing the USB drivers**.
- 2. Verify correct installation in Windows Device manager.
- 3. Sending the command "v" via the correct COM port will return the E201 type and Firmware version.

Ascii		
command	Action	Interface response (with example)
v	E201-9B returns software version + CR	E201-9B V1.0 + CR
S	Internal serial number in 8 Hex numbers	(0029002d : 55345712 : 20363236 + CR) aaaaaaaa : bbbbbbbb : cccccccc + CR
r	Interface product serial number (6 characters; written on Interface housing)	(78J077 + CR) nnnnn + CR where: n = product serial number
4	Encoder position E201-9B returns 16 character hexadecimal string Decode according to document (E201D02)	(00181907FD606002 + CR) nnnnnnnnnnnnn + CR where: n = SLO bits in 16 Hex digits, comprising Position, Status and CRC bits.
m	Read current encoder clock frequency	(3 : 140 kHz + CR or 16 = ERROR) n : xxx kHz + CR
Мху	Set BiSS frequency. xy is a parameter from 00 to 31, excluding 16. They correspond to frequencies from 63 kHz to 10 MHz. Default after reset is 2 MHz. To check the set frequency use command m. Set SSI and BiSS clock frequency:	(frequency 5 + CR or M param error + CR) frequency x + CR
е	Read encoder supply status, voltage and current consumption (fixed width)	(1 : 4.975 V : 0070 mA + CR) s : a.aaa V : bbbb mA + CR
N	Turn on power supply to encoder (default at power-up)	ON + CR
F	Turn off power supply to encoder	OFF + CR

#### **Reading position:**

1. Send command "4".

2. Wait for data until CR character is received (must be 17 bytes).

3. "Encoder BiSS timeout error" is received, if encoder is disconnected.

4. Received value is in HEX.

5. Decode according to the document E201D06 at **RLS Media center.** 



#### Accessing BiSS C registers:

Use the application notes of <u>AksIM-2 (MBD02)</u> and <u>Orbis (BRD05)</u> encoders to find out the correct registers and memory layout. Note that the BiSS registers are in Big endian format.

ТХ	RX	Command explanation
Rxy:abc	<ul> <li>S:nn:dddd, where S is status, nn is details and dddd are requested data bytes.</li> <li>0:00 - ok,</li> <li>1:xy - End of bank reached</li> <li>2 - CRC error or incorrect data length</li> <li>3 - address &gt; 127 or number of bytes &gt; 64 or zero</li> <li>4 - timeout</li> </ul>	Read <b>xy</b> (decimal) number of bytes, starting on address <b>abc</b> (decimal).
	(example: 0:00:0218)	
WsQWE:abc	<b>S</b> 0 - ok 1 - non-writable address 2 - CRC error or incorrect data length 3 - address > 127 or no communication 4 - timeout during communication	Write single register. Write byte <b>QWE</b> (decimal) into address <b>abs</b> (decimal).

# E201-9P – for SPI, EncoLink and PWM encoders

The E201-9P interrogates a SPI or PWM encoder and allows the data to be read by a PC using simple ASCII commands over the USB connection. Also supports complete functionality of the EncoLink protocol over SPI interface.

#### Software installation

Download and install the **EncoLink software** and USB drivers. To install drivers, follow the steps in the following chapter. When the installation is complete, connect the E201 interface and configure the software for the encoder you are using. The supply voltage and current consumption of the encoder can be read by the software. The encoder's power supply can be turned on and off by the software.

If the software is blocked by "Microsoft Defender SmartScreen", make sure that your computer is online and Windows can connect to the Internet to verify the authenticity.

A detailed explanation of the ASCII commands for the development of customised software can be found in chapter **<u>Command</u>** <u>set</u>.

#### Installing the USB drivers

USB drivers can be downloaded from the **RLS Media center.** 

The E201 interface appears as a new Virtual COM port on the computer. The actual port number assigned depends on how many COM ports are already in use on the PC. In Windows you can find this under:

Control Panel > System > Device Manager > Ports (COM & LPT)

Supported operating systems: 32-bit and 64-bit Windows (XP, Vista, 7 and 8/8.1, 10, 11)\* Linux\*\* and Mac OS X. The E201 USB interface should be automatically detected on Linux and Mac OS X. It uses the "Communication Device Class driver (CDC)". VID = 0483 & PID = 5740

\* Windows CE and Embedded do not have all files in the "Windows" folder for proper driver installation. Additional files must be copied from other desktop systems.

\*\* The E201 is Linux compatible as it uses a generic CDC driver, but this has not been tested internally and no support is available.



# **Technical specifications**

Power supply	5 V over USB port
Power consumption	65 mA (without encoder connected)
Encoder power supply	5 V or lower as supplied from the computer. Consider voltage drop over USB cable, USB hubs and encoder cable. Output is fused.
Data outputs	NCS, SCK, MOSI (3.3 V LVTTL)
Data inputs	MISO, PWM, Status (3.3 V LVTTL)
Encoder connector	D-Sub 9 pin, female
USB connector	USB 1.1 Full Speed; USB 5 pin mini-B connector
Drivers	Windows, Linux, Mac
Cable length	1 m standard A to mini-B USB cable (supplied). Maximum length 5 m.
Operating temperature	0 °C to +45 °C
Environmental sealing	IP20 – indoor use only
Mass	42 g (interface without USB cable)

#### Status LEDs

LED colour	USB	Encoder
Red	/	Power off
Yellow	/	Power on
Green	Power on	Communication active

#### Connections

Dim	Function				
PIN	SPI	PWM			
1	GND (0 V)	GND (0 V)			
2	SCK	Status			
3	NCS	(DNC)			
4	Status*	Status			
5	5 V	5 V			
6	MISO	PWM			
7	MOSI	(DNC)			
8	(DNC)	(DNC)			
9	GND (0 V)	GND (0 V)			

DNC = Do Not Connect (leave floating)

 $\star$  Used only on AksIM-1 MHAxSPSxxxxxxx and MBAxSPSxxxxxxx part numbers.

Connections are directly compatible with the pin-out for RLS encoders. When used with Renishaw encoder, the encoder pinout might need to be modified.

## Software for E201-9P: EncoSight for AksIM SPI EncoLink encoders

This software supports only AksIM-2 and AksIM-4. For Orbis refer to page 27. For other encoders contact RLS.

1. Download the software at **RLS Media center.** No installation is required. Open the software and wait until the E201 device is found. If the connection is not established after a few seconds, make sure that you have installed the correct driver set, see chapter **Installing the USB drivers.** 

nterface info  Gearching for interface	Encoder info Encoder information		
	Position in units	warning	
nitialization Signal level Configur	ation Self-Calibration Diagnostics		Log Encoder Errors
Power 3.3V  5V ON C SPI clock frequency 5 = 1.5 MHz	)FF	Position RX CRC Error Encoder resolution	
Connect Enco	der	360 🛊 1 🛊 deg Position MT	
Delay between readings	(ms)	Position ST	
Read constantly			

2. When the interface is found, first select power type of your encoder and then press "ON" (your encoder will turn on). Then connect the encoder and press "Read Position" (if you want to have a constant information about the position check the box "Read constantly").

Interface info COM6 [IIIIII] E201-9P v1.12.10004 E201-9P v1.12.10004 E201-9P v1.12.10004			
69,370 deg         Initialization         Signal level         ON         OFF         1: 4957 mV: 118 mA         SPI clock frequency         5 = 1.5 MHz         Connect Encoder         Read Position         Delay between readings (ms)         Signal constantly	31546371           CRC Error           360 (*)           524288 (*)           deg           0           101027	Log Encoder Errors OK5V 1:4956 mV:119 mA Setting SPI CINOL(NK_MODDE Setting SPI CINOL(NK_MODDE Setting SPI CINOL(NK_MODDE Setting SPI CINOL(NK_MODDE) Encoulink version:1 Part number: BH0033 FV version:25.13366 Registers present in the encoder: mT_ERF_TRESHOLD False PERSISTENT_STATUS False SIGNALLEVEL False SIGNALLEVEL False SIGNALLEVEL False SIGNALEREXISION True [4][4] Frequency: 0500 kHz	Encoder position converted into user units and general status flags Logs and error messages Raw data from the encoder Conversion factors from coun to display value (nominator, denominator, unit of measure Encoder position split into multiturn and singleturn counts



3. Air gap and temperature of the encoder can be logged in the section "Signal level" (check the boxes first). Errors can be logged for further analysis.

Interface info COM6 [I E201-9P	o ■ IIIII] v1.12.10004		Encoder info MB049SPL: 5HQQ39	19BDNT00 2.5.1.9356					
			69,37	'1 deg			warning error		
nitialization	Signal level	Configuration	Self-Calibrati	on Diagnostic:	s				g Encoder Errors
Signal In	evel irGap			Temperatu	i <b>re SEN: 4</b> erature	I		1:495 Setting Setting Setting	: mV : 119 mA : SPI_ENCOLINK_MODE : CPOL 00 CPHA 01 : D015
42- 41,9- 41,8-								Part n Serial FV ve	ink version: 1 umber: MB049SPL19BDNT00 number: 5HQQ39 rsion: 2.5.1.9356
41,7 - 41,6 - 41,5 -								MT_I PER: SIGN	IRR_TRESHOLD False INSTENT_STATUS False AL_LEVEL False
41,4 41,3 41,2								FIRM	_CAL_TIMEOUT Faise WARE_REVISION True [4] [4] noy: 1500 kHz
41,1				<u> </u>					
40,3 40,8 40,7									
40,6 40,5 40,4									
40,3 40,2 40,1									
40								J	

4. To preset the multiturn counter, set a new zero point or reset the encoder to the factory settings, go to the "Config" tab. The "Factory Reset" function resets the zero position, error map, filters and self-calibration. You can set the zero position to the current encoder position by clicking on "Set zero here". If you want to set the position manually, you can do this using the following procedure: Read the current zero offset. Write the desired position offset (unit: encoder counts). The value must be between 0 and the maximum encoder count value. Press the "Write Zero" button. This number is subtracted from the absolute encoder position. Zero position offset is stored in the encoder itself. Store the settings permanently with the button "Save to NVRAM". "Factory Reset" button restores all settings, including the self-calibration data.

nterface info COM6 [I E201-9P	o ■ IIIII] v1.12.10004	Encoder info MB049SPL19BDNT00 5HQQ39 2.5.1.9356		
		0,001 deg	warning error	
nitialization	Signal level Config	guration Self-Calibration Diagnostics		Log Encoder Errors     Other Error reading register     Coder Control Con
	Position offset	66248 Write Ze	Save to NVRAM	82m8: Had04:0000000 H2V: 0x#/6x000000000 Other Error reading register sCmd: Re004:0000004 RCV: 0x#f:0x00000000
	Position filter	180 Write Fi	ter	UN 6V 1:4957 mV:118 mA Setting: SPI_ENCOLINK_MODE Setting: CPOL 00 CPHA 01 Setting: D015
	Multitum error arc	Write MT	arc	EncoLink version: 1 Part number: MB043SPL19BDNT00 Serial number: 5HQQ39 FW version: 2.5.13356 Begisters cressent in the encoder:
	Multitum preset	0 Apply M	ſŢ	MT_ERR_TRESHOLD False PERSISTENT_STATUS False SIGNAL_LEVEL False SELF_CAL_TIMEOUT False FIRMWARE_REVISION True [4] [4] Frequency: 1500 kHz
Zero pre	set		Factory Reset	
Current Encode New ze	zero here : zero pos: 0 er pos: 66250 ero pos: 66248			

5. To ensure optimal performance of the encoder, it is possible to perform a self-calibration in the "Self-Calibration" section. For details refer to the encoder's data sheet MBD08 at **RLS Media center.** 

iterface info – COM6 [IIIIII]	Encoder info MB049SPL19BDNT00	
E201-9P v1.12.10004	SHQQ39 2.5.1.9356	
	11,876 deg	warning
tialization Signal level Conf	iguration Self-Calibration Diagnostics	Log Encoder Errors
Partial Arc (deg)	Self-calibration status	1:4923 mV : 118 mA Setting: SPL ENCOLINK_MODE Setting: CPDL 00 CPHA 01
360	Procedure finished Calibration successfull	Setting: D015 EncoLink version: 1 Part number: MB043SPL19BDNT00
Timeout (sec)	Timeout expired Calibration out of range	Serial number: 5HQQ39 F∀ version: 2.5.1.9356 Registers present in the encoder:
	No correction necessary User Error map in use	MT_ERR_TRESHOLD False PERSISTENT_STATUS False SIGNAL LEVEL False
Start self-cal	Encoder in Error state Numerical error	SELF_CAL_TIMEOUT False FIRMWARE_REVISION True[4][4] Frequency: 1500 kHz
	Radial displacement too high NVRAM Write error	
	Input Arc Length out of range Status: 00100001	
	Eccentricity: 10 um Ecc phase: 94 deg Badial abit: 242 um	
Read status	nduldi shiru -242 ulti	

6. Diagnostics screen displays Detailed status bits, Persistent status bits and other data available in different encoder types. For details refer to the encoder's data sheet MBD08 at **RLS Media center.** 

🕐 AksIM-2 & AksIM-4 SPI EncoLink (VEI	R: 2.9.0.57; PC: DP0016; USR: struznik)	×
Interface info	ncoder info MB049SPL19BDNT00 5HQQ39 2.5.1.9356	
	11,876 deg	warning error
Initialization Signal level Configuration	Self-Calibration Diagnostics	Log Encoder Errors
   Reset	Detailed status Persistent Status 000000000000000000000000000000000000	ON 5V 1:4923 mV:18 mA Setting: SPI_ENCOLINIK_MODE Setting: CPI_00 CPHA 01 Setting: CPI_00 CPHA 01 Setting: CPI_00 CPHA 01 Part number: MB0459FL9BEDNT00 Settial number: M
Reset EncoLink protocol		~



## Software for E201-9P: EncoSight for Orbis SPI encoders

 Download the software at <u>RLS Media center</u>. No installation is required. Open the software and wait until the E201 device is found. If the connection is not established within a few seconds, ensure that the correct driver set is installed (see chapter <u>Installing the USB drivers</u>). Once the interface is found, connect the encoder to the system, which will automatically search for the encoder. The "System Config" tab, which opens by default when the software starts, allows you to check information about the interface and set the SPI clock frequency and delay between readings.

EncoSi	EncoSight Encoder diagnostics tool - Orbis SPI						
			2	23,049	0		•
ystem Config	Encoder Identification	Position	Status	Installation	Encoder Config		
					Diagnos	tic log	Clear log
Interface find = $COMS$ E201-9P v1.13 Serial: 5J2M8 Encoder freque SPI CLK freque SPI CLK freque 70 Encoder power 0.5 V 3 1 : 4757 mV :	3.10014 7 nency ency n readings (ms) supply 3 V O OFF 57 mA				Interface & Protocol s SPI setting SPI setting SPI heque Encoder & Encoder &	sund on COMS ettings: EPI 19: CPOL 00 CPHA 01 19: OBS 19: ON Hz Jound . Isicomected! Jound .	

2. The "Encoder Identification" section provides information about the connected encoder. If an older version of the Orbis encoder is used, only the serial number and multiturn information is displayed and the magnet size must be entered manually. If a newer version of the encoder is used, the part number and firmware version are also displayed and the magnet size is set automatically.

<b>123,684</b> °						
ystem Config	Encoder Identification	Position	Status	Installation	Encoder Config	
acic encoder inf	0				Electronic datasheet	
Part number: BR	R10SPC14M12DD00				Encoder datasheet not present in this encoder typ	е.
Serial number: (	57YE08					
Firmware versio	n: 1.0.0.10030					
Multiturn: True						
Magnet size: 👖						
_	•					

3. All information on the current position reading can be found in the "Position" tab. In this tab, you can view the raw data read out by the encoder in hexadecimal and binary format, which is further decoded into multiturn and singleturn counts as well as error/warning messages. In addition, the position measurements can be recorded in a file or plotted on a graph, which can then be saved locally for further analysis.

			e	535,186	°		
system Config	Encoder Identification	Position	Status	Installation	Encoder Config		
Encoder r <mark>aw d</mark> ata	a (hex)						
0001C3B32B					Plot position over time	Save chart	Clear ch
Encoder raw data	a (bin)					Ouve chair	Cicar cir
000000000000000000000000000000000000000	01 11000011101100 11 001	01011					360
Encoder decoded	l postion data						315
Singleturn: 1	524						270
arning: False						1	
CRC validation							225
CRC					1		
							135
	Re	ording duratio	on (sec)				
Record positio	n to file (0 =	= no limit)	20	)			90
							45

4. The detailed status of the encoder, including the status bits and their descriptions, can be found in the "Status" section. This section also contains information about the temperature, speed and timestamp of the encoder.

EncoSight® for E20	.osight® for E201-9P and Orbis SPI encoders (ver: 1.0.0.5; IF sn: 5J2M87, fw: 1.13.10014; Encoder sn: 67VE08, pn: BR10SPC14M12DD00) EncoSight Encoder diagnostics tool - Orbis SPI					
		e	535,186	5 °	-	
System Config	Encoder Identification Position	Status	Installation	Encoder Config		
	Encoder temperatu	re		Encoder detailed status (bin)		
	Se,5 °C			Encoder Status		
	0,0 RPM Encoder timestam	)		Acceleration Safety comp. Signal High		
	0x07D3			Signal Low Temerature		
				Multiturn Err		



- 5. All information and settings that are useful for installing the encoder can be found in the "Installation" section. For newer versions of the Orbis encoders, this includes setting a zero point at the current position of the encoder\*, performing self-calibration and reading the air gap. The air gap reading over the encoder's measuring range can also be plotted and copied. For older versions of the encoder, only the options for performing self-calibration and setting the zero point at the current position of the encoder\* are available. Self-calibration ensures optimum encoder performance, which you can read about in the BRD09 data sheet in **RLS Media center**.
- \* If you want to set the zero position manually, you can do this in "Encoder Config" section, using the procedure described in section 7.

			313,6	6 <b>60</b> °		
system Config	Encoder Identification	Position St	atus Installa	tion Encoder C	config	
- Calibration	n			Air gap		
Start	self-calibration			Signal level: 3027	Air gap: 4,83 mm	Copy Clear cha
E	Encoder Status			10		
	Finished			9		
i	Timeout			7		
	Counter: 1			6		
				5		
				3		
				2		
Zero posit	lion			1		
Se	et zero here			0 5	0 100 150	200 250 300 350

#### Installation section for newer version of encoders

#### Installation section for older version of encoders

EncoSig	ght Encoder diag	nostics	tool -	Orbis SPI		
<b>172,463</b> °						
System Config	Encoder Identification	Position	Status	Installation	Encoder Config	
Calibration	۱					
Start	self-calibration					
There is when the and whe Observe	no visual feedback in the softy - calibration thurdion has finish ther it was sucessfull or not encoder's LED for the feedbac	vare led ck.				
– Zero posit	ion t zero here					

DATA SHEET E201D01\_09

6. Resetting the multiturn counter, setting the zero offset and restoring the factory settings can be found in the "Encoder Config" section. The "Factory Reset" function resets all settings, including zero position and self-calibration. To set the zero position manually, please proceed as follows: Read the current zero offset. Write the desired position offset (unit: encoder counts). The value must be between 0 and the maximum encoder count value. Press the "Write Zero" button. This number is subtracted from the absolute encoder position. The zero position offset is saved in the encoder itself. Finally, store the settings permanently with the "Save to NVRAM" button.

EncoSight® for E20 EncoSig	1-9P and Orbis SPI encoders (ve ght Encoder diag	er: 1.0.0.5; IF sn: 5J2M Inostics too	187, fw: 1.13.10014; Encoder sn: 6 D <b>I - Orbis SPI</b>	7YE08, pn: BR10SPC14M12DD00)	× Carls°			
	<b>313,660</b> °							
System Config	Encoder Identification	Position Sta	atus Installation End	oder Config				
			Reset to Factory settings	]				
		0	Set zero offset (counts)	Save to NVRAM				
		0	Preset multiturn counter					



#### Communications

The E201 interface responds to ASCII commands received over the USB acting as a virtual serial port. No CR character is required after any command. Speed settings of the virtual serial port can be any value.

#### E201-9P Command set

This section is only needed if you want to develop your own software. The E201 comes with the basic display software described in the previous chapter.

Ascii command	Action	Interface response (with example)
V	E201-9Q returns software version + CR	E201-9P v1.13 + CR
S	Internal serial number in 8 Hex numbers	(0029002d : 55345712 : 20363236 + CR) aaaaaaaa : bbbbbbbb : cccccccc + CR
r	Interface product serial number (6 characters; written on Interface housing)	(51X499 + CR) nnnnnn + CR where: n = product serial number
0	Read E201 interface FW version	10008 + CR nnnnn = firmware commit number (decimal)
n	Turn on power supply to encoder (default at power-up is OFF)	ON 5V + CR or ON 3.3V + CR
f	Turn off power supply to encoder	OFF + CR
e	Get power supply data	(1 : 5004 mV : 130 mA + CR) x:yyyy mV : zzz mA + CR x = encoder is powered by E201 yyyy = supply voltage [mV] zzz = suply current [mA]
Vx	Set E201 output power supply x – power supply voltage 5 = 5 V 3 = 3.3 V	Vx (V5 + CR) (V3 + CR)
Cx	Select communication protocol x – version of communication protocol: e = SPI EncoLink s = SPI Simple p = SPI Advanced, Timestamp w = PWM input	SPI_ENCOLINK_MODE + CR

#### Command set continued

#### All SPI protocols

Ascii command	Action	Interface response (with example)
Gx:y	Set clock polarity and phase settings x = set SPI Clock Polarity 0 or 1 (default = 0) y = set SPI Clock Phase 0 or 1 (default = 1)	CPOL 00 CPHA 01 + CR
Mx	Set SPI clock frequency x – 1-8 clock* frequency: 1 = 94 kHz 2 = 187 kHz 3 = 375 kHz 4 = 750 kHz 5 = 1500 kHz 6 = 3 MHz 7 = 6 MHz 8 = 12 MHz	(Frequency 5 + CR) frequency n + CR where: n = 1 to 8
m	Return selected SPI frequency	(1500 kHz + CR or 3 MHz + CR) xxxx kHz + CR or yyyy MHz + CR x = 94, 187, 375, 750, 1500 y = 3, 6, 12
Dxxx	Delay between NCS falling edge and first SCK edge xxx = Delay in microseconds (decimal, including leading zeroes)	
?xx:yyy	Read encoder position xx = number of bytes to read from the encoder (decimal, including leading zeroes) yy = one byte (command) to send over MOSI line to the encoder (decimal, including leading zeroes) Data length: EncoLink single-turn: 04 EncoLink multi-turn: 06 AksIM SPI Simple: 02 AksIM SPI Advanced: 05 AksIM SPI Timestamp: 07 Orbis SPI: Depending on the multiturn selection and the command sent to the encoder.	(57203dfe5 + CR) -ST (ffffe57203dfe5 + CR) -MT aaaabbbbbbbccdd + CR**

\* Although it is possible to set frequencies 7 and 8, RLS encoders are working up to 5 MHz.

\*\* Decode according to the SPI timing diagram in the data sheet of the encoder you are using.



#### Command set continued

#### EncoLink protocol

Ascii command	Action	Interface response (with example)
j	Get EncoLink identification	(17MB049SPL19MDNT00 + CR) v n (p x16) + CR v = EncoLink version of the encoder
		n = number of bytes in a frame (to be used with command "?" p = 16 characters of encoder part number
R:xxxx:yyyyyyyy	EncoLink read register* x – register length (bytes) (HEX) y – register address (HEX)	(0x9:0x0001a154) + CR 0xA:0xBBBBBBBB A = read status** B = requested register contents (HEX)
W:xxxx:yyyyyyyy:zzzzzzz	EncoLink write register* x – register number of bytes (HEX) y – register address (HEX) z – data to be written (HEX)	(0x9) + CR 0xA + CR A = write status**

\* Refer to the encoder's data sheet or application note for the register layout.

\*\* Read / Write returned status:

0x9 = Completed OK

0x26 = Invalid register address

0x56 = Value out of range

0x96 = Access denied

0xEE = Incorrect number of bytes (register length mismatch)

0xF6 = Write access is locked

0xF9 = CRC invalid on write

0xE6 = CRC invalid on read

#### PWM protocol

Ascii command	Action	Interface response (with example)
w	Read PWM input	xxxxxxx:yyyyyyyy:s + CR x - signal period (hex) y - high time (hex) s - status signal input (time unit = 1/48 µs)

DATA SHEET E201D01\_09

#### Example - setting up the AksIM SPI EncoLink encoder

To initialize the connection with the EncoLink encoder, first send the following set of ASCII commands in this exact order: v (check for E201 presence) r (get interface serial number) V5 (select 5 V power for the encoder) n (enable power output) e (verify current consumption) Ce (enable EncoLink Master library in the E201) G0:1 (set SCK polarity and phase) D015 (set CS communication delay) M7 + CR (set clock frequency) m (verify selected clock frequency) j (initialize EncoLink library and get basic encoder parameters)

#### Example - communication with AksIM SPI EncoLink encoder

Read position, read register, write register ?04:000 (read 4 bytes of position data from the encoder (suitable for single-turn encoder) ?06:000 (read 6 bytes of position data from the encoder (suitable for multi-turn encoder) R:0004:0000002B (read 4 byte long (U32) register at address 0x2B) W:0002:0000004E:00000012 (write value 0x12 into 2 byte long (U16) register at address 0x4E)

#### Example - setting up the Orbis SPI encoder

To initialize the connection with the Orbis encoder, first send the following set of ASCII commands in this exact order: v (check for E201 presence) r (get interface serial number) V5 (select 5 V power for the encoder) n (enable power output) e (verify current consumption) Cp (select standard SPI protocol in the E201) G0:1 (set SCK polarity and phase) D055 (set CS communication delay) M5 + CR (set clock frequency) m (verify selected clock frequency)

#### Example - communication with Orbis SPI encoder

Read position: ?03:000 (data length = 3, command = 0, encoder returns: singleturn + CRC) ?05:000 (data length = 5, command = 0, encoder returns: multiturn + singleturn + CRC) Request additional data: ?09:118 (data length = 9, command = 118, encoder returns: singleturn + serial number + CRC) ?11:118 (data length = 11, command = 118, encoder returns: multiturn + singleturn + serial number + CRC)



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#### **Global support**

Visit our **website** to contact your nearest sales representative.

#### **Document issues**

Issue	Date	Page	Description
8	18. 4. 2024	-	New design
		22-30	E201-9P version added
		6, 11, 16-19, 24-26	Software user guide added
		7-8, 12-13, 20-21, 27-29	Programming commands added for versions B and P
9	11. 9. 2024	27-30, 34	EncoSight for Orbis added

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