OPERATION MANUAL

Precision torque sensor model 8625
Interfaces manual

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Contents

1 For your safety

The following symbols in this operation manual warn of hazards.

1.1 Symbols used in the instruction manual

1.1.1 Signal words

The following signal words are used in the operation manual according to the specified hazard classification.

DANGER
High degree of risk: indicates a hazardous situation which, if not avoided, will result in death or serious injury.
WARNING
Moderate degree of risk: indicates a hazardous situation which, if not avoided, may result in death or serious injury.
CAUTION
Low degree of risk: indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.
NOTICE
Property damage to the equipment or the surroundings will result if the hazard is not avoided.

Note: It is important to heed these safety notices in order to ensure you handle the Precision torque sensor model 8625 correctly.

Caution: Follow the information given in the operation manual.

1.1.2 Pictograms

Symbol	Description
	Warning concerning the use and installation of the device and software.
	Observe the advice for protecting the instrument.

2 Introduction

2.1 General safety instructions

DANGER

Warning concerning use of the precision torque sensor model 8625

- Observe all safety notices, instructions and regulations.
- Safety equipment must be in working order during operation.
- The precision torque sensor model 8625 must only be used if it is undamaged.

CAUTION

The following points must be observed to prevent injuries and damage to property:

- Avoid excessive torques, bending moments or axial forces.
- Protect the precision torque sensor model 8625 from knocks.
- Make electrical connections to precision torque sensor model 8625 during fitting. Check the measurement signal. It must stay within the perwithted range.
- Support the precision torque sensor model 8625 while it is being fitted.
- Avoid dropping the precision torque sensor model 8625.
- When measuring dynamic torques, operating the precision torque sensor model 8625 close to natural resonance will result in permanent damage.
- The frequency of dynamic torques must lie below the natural frequency of the mechanical test setup.
- Liwith the peak-to-peak variation of dynamic torques to 70% of the rated torque.

2.2 Intended use

The precision torque sensor model 8625 is designed to measure torques. This measured quantity is suitable for open-loop and closed-loop control functions.

- The precision torque sensor model 8625 is **no** safety component.
- Transport and store the precision torque sensor model 8625 correctly.
- The used device must be fitted, commissioned, operated and removed properly.
- Always follow the applicable regulations and safety instructions.

2.3 Notes on CE labeling

burster equipment carrying the CE mark meets the requirements of the EU directives and the harmonized European standards (EN) cited therein.

The EU declarations of conforwithy are available to the relevant authorities as specified in the directives. A copy of the declaration of conforwithy is included in the relevant equipment documentation.

3 Serial communication

3.1 Parameters of the serial interface

Serial data is tunneled through a USB interface. These are the interface parameters:

Baud rate	921600
Data bits	8
Stop bits	1
Parity	None
RTS/CTS	No handshake

3.2 Communication protocol

Control Characters:	<STX>	0x02	=> Start of Text
	<ETX>	0x03	=> End of Text
	<ENQ>	0x05	=> Enquiry
	<ACK>	0x06	=> Acknowlege
	<S>oder ` `	0x20	=> Space
	<NAK>	0x15	=> Not Acknowledged
	<LF>	0x0A	=> Line Feed
	<EOT>	0x04	=> End Of Transmission
	<NUL>	0x00	=> NUL-Sign

ANSII Norm X3.28-1976 Subcategory 2.5, A3 is used as communication protocol. This protocol is used in systems, where a master communicates with a slave in a direct point-to-point connection. Slave addressing is not used.

3.2.1 Commands without parameters

aaaaB<LF>

with

aaaa	Command name, 4 ASCII-characters
B	Type of command, ´?´ for questions, ´!´ for executing commands
<LF>	Line Feed, 0x0A

3.2.2 Commands with parameters

aaaaB<S>P1,P2,...,Px<LF>

with

aaaa	Command name, 4 ASCII-characters
B	Type of command, ´?´ for questions, ´!´ for executing commands
<S>	Space, 0x20
P1,P2,...,Px	Parameter 1 to x, seperated by comma
<LF>	Line Feed, 0x0A

3.2.3 Structure of an answer to a question

The question command was:

aaaa?<LF>

with

aaaa	Command name, 4 ASCII-characters
?	Type of command, ´?´ for questions
<LF>	Line Feed, 0x0A

Now follows the answer with e.g. 3 parameters:

P1<NUL>,P2<NUL>,P3<NUL><LF>

with

Px	Parameter x
<NUL>	NUL-sign, 0x0
<LF>	Line Feed, 0x0A

3.2.4 Communication Example

The following example shows the communication of a host controller and a 8625 with a question command

Controller sends: <STX>info?<LF><ETX>
Command Sequence: The 8625 is being asked for the answer of the info-command

8625 responds: <ACK>
8625 signals, that it has understood and knows the info command, otherwise it would have replied with <NAK>

Controller sends: <EOT>
The Host Controller gives the right to talk to the 8625

8625 responds: <STX>burster 8625 info-answer-string<LF><ETX>
Here comes the answer to the info-command

Controller sends: <ACK>
The controller has received and accepted the answer. The right to talk is still with the 8625, is there anything more it wants to say?

8625 responds: <EOT>
No. Then the communication sequence is finished and the right to talk is back at the controller.

3.3 General information

3.3.1 Interface timeouts - Timer A (Response Timer)

Timer A is used by the 8625 to detect invalid responds or no answer at all.

- **Start**: Timer A ist started, after a transmission has ended with <ETX>. The device now waits for an acknowledgement from the master.
- **Stop**: Timer A is stopped, if a valid answer (e.g. <ACK>) was received.
- **Timeout**: If a timeout occurs, the 8625 sends <EOT> and returns back to its basic state,
- waiting for a new command

Timeout A is set to 5 seconds.

3.3.2 Interface timeouts - Timer B (Receive Timer)

Timer B is used by the receiving station in order to detect a missing <ETX> sign.

- **Start**: Timer B is started after the reception of a <STX> sign.
- **Restart**: Timer B will be restarted every time data bytes are received. This allows the reception of variable data block lengths.
- **Stopp**: Timer B is stopped after the reception of a <ETX> sign.
- **Timeout**: If a timeout occurs, all received command data will be discarded. The device returns
- back to its basic state, waiting for a new command

Timeout B is set to 5 seconds.

3.3.3 Command description comments

CAUTION

- Use only commands described in this manual. The usage of other, undocumented commands may cause device malfunction or damage.
- In floating point numbers the decimal point (´.´) is used (and not the comma.)
- The number of parameters is fix for each command and has to be complied with.

4 Interface Commands

4.1 Basic Setup

4.1.1 INFO Info-String

Set a new value

This command can not set a new value.

Read the current value

INFO? reads the info-string out of the device.

Host sends: <STX>INFO?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1,P2,P3,P4<LF><ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	e.g. “8625-0000-V0000“	Device Type
P2	“SN_123456“	Serial Number
P3	“AbglDat_02.07.2016“ (AbglDat_DD.MM.YYYY)	Calibration Date
P4	Integer Number	Calibration Counter
P5	“V201600“	Software Version

4.1.2 DIGI Version Info for PC-Software

Set a new value

This command can not set a new value.

Read the current value

DIGI? reads the Version-info-string for the PC-Software.

This is used to documentate special characteristics of this device software version.

Parameter P4 and P5 are bit-coded and determine special software behaviour in curtomer speciffic software versions.

Bit0 is the LSB and BIT7 is the MSB.

Caution: Currently there is no customer speciffic software available, so all parameters are set to zero

Host sends: <STX>DIGI?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1,P2,P3,P4,P5<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	0...255: bit-coded, reserved	Device characteristics regarding the sensor system
P2	0...255: bit-coded, reserved	Device characteristics regarding the communication system
P3	Will be incremented with every new software version, which has a different behaviour regarding the RS232 communication. This counter starts at Version V201700 with 0	Communication counter
P4	Bit0: reserved Bit1: reserved Bit2: reserved Bit3: reserved Bit4: reserved Bit5: reserved Bit6: reserved Bit7: reserved	First byte for recognition of the special features of a customer specific software (bit-coded)
P5	Bit0: reserved Bit1: reserved Bit2: reserved Bit3: reserved Bit4: reserved Bit5: reserved Bit6: reserved Bit7: reserved	Second byte for recognition of the special features of a customer specific software (bit-coded)

4.1.3 MIWE Set up Mean Value

Set a new value

The MIWE! Command sets the number of mean values that have to be accumulated to get a measurement value. The calculation base of this setting is 100us, maximum number of mean values is 50‘000 which leads to a measurement time of 5s for each measurement value

Host sends: <STX>MIWE! P1<LF><ETX>

8625 responds: <ACK>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	1 ... 50‘000	Number of mean values

Read the current value

The MIWE? command reads the current setting of the number of mean values

Host sends: <STX>MIWE?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	1...50'000	Number of mean values

4.1.4 FILT Filter Setup

Set a new value

The FILT! Command sets a digital filter which is used upon the measured Signal

Host sends: <STX>FILT! P1<LF><ETX>

8625 responds: <ACK>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	0: Off 1: 5 Hz 2: 10 Hz 3: 25 Hz 4: 50 Hz 5: 100 Hz 6: 200 Hz 7: 400 Hz 8: 1 kHz	Filter Setup

Read the current value

The FILT? command reads the current setting of the Filter

Host sends: <STX>FILT?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	0: Off 1: 5 Hz 2: 10 Hz 3: 25 Hz 4: 50 Hz 5: 100 Hz 6: 200 Hz 7: 400 Hz 8: 1 kHz	Filter Setup

4.2 General Settings

4.2.1 DEFU Write Default-Setup for User-Settings

Set a new value

The DEFU! command writes the default setup of the user settings and data container contents. All current entries of the user setup and data container will be overwritten with default values and stored in the internal EEPROM.

Host sends: <STX>DEFU!<LF><ETX>

8625 responds: <ACK>

Read the current value

This command can not be read.

4.3 Measurement

4.3.1 WERT Read the current torque measurement value

Set a new value

This command can not set a new value.

Read the current value

The WERT? command reads the current torque measurement value

- Only available with sensors with USB measurement output
- Only, if measurement output „USB“ is selected

Host sends: <STX>WERT?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	Float value	measurement value without unit

4.3.2 VOLT Read output voltage

Set a new value

This command can not set a new value.

Read the current value

The VOLT? command reads the actual output voltage

- Only available with sensors with USB measurement output
- Only, if measurement output „USB“ is selected

Host sends: <STX>VOLT?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	Float value	Output voltage without unit

4.3.3 TARA Tare Function

Set a new value

The TARA! command measures a new tare value. It overwrites the previous value.

- Taring is only allowed within 5% of the nominal sensor range. If the TARA! Command tries to exceed the 5%, the command will be rejected and the sensor will send a NAK and reset the tare value to 0.0. If this happens, TARA? Command will answer once with 909090.0

Host sends: <STX>TARA!<LF><ETX>

8625 responds: <ACK>

Read the current value

The TARA? command reads the current tare value that is subtracted from every measurement result.

Host sends: <STX>TARA?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1,P2<LF><ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	Float value	Tare value for voltage output
P2	Float value	Tare value in [Nm]

4.3.4 RTAR Tare Reset

Set a new value

The RTAR! command resets the tare value to 0.0

Host sends: <STX>RTAR!<LF><ETX>

8625 responds: <ACK>

Read the current value

This command cannot be read.

4.3.5 SPOM Speed optimized polling mode

With the speed optimized polling mode the measurement values can by read out of the device very quickly.

- Only available with sensors with USB measurement output
- **When spom is active, Signal Ua will not change!**

Caution: This mode violates the usual interface protocol!!

The command SPOM? starts the sequence. Every block of data must be requested for by sending a special control character (0x0e / 0x0c). If another control character is send instead, the spom-mode will be finished and normal interface communication is possible again.

When spom-mode is active, there is no timeout control on the serial interface.

Control character 0x0e:

Requests a group of the most recent 50 measurement values.

Control character 0x0c:

Requests the most recent single measurement value.

Control character 0x0f:

Finishes the SPOM-mode. Now normal interface communication is possible again.

Set a new value

This command cannot set a new value.

Read a group of values

Host sends: <STX>SPOM?<LF><ETX>
8625 responds: <ACK>

Host sends: <EOT>
8625 responds: <STX>SPOM-START-NOW<ETX>
Host sends: <0x0E>
8625 responds: P1
Host sends: <0x0E>
8625 responds: P1
Host sends: <0x0E>
8625 responds: P1
Host sends: <0x0E>
8625 responds: P1
(…)
Host sends: <0x0E>
8625 responds: P1
Host sends: <0x0F>
8625 responds: <EOT>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	250 Byte binary data, every float values is coded in 5 bytes, see remark below	50 measurement values

Read a single value

Host sends: <STX>SPOM?<LF><ETX>
8625 responds: <ACK>

Host sends: <EOT>
8625 responds: <STX>SPOM-START-NOW<ETX>
Host sends: <0x0C>
8625 responds: P1
Host sends: <0x0C>
8625 responds: P1
Host sends: <0x0C>
8625 responds: P1

Host sends: <0x0C>

8625 responds: P1

(…)

Host sends: <0x0C>

8625 responds: P1

Host sends: <0x0F>

8625 responds: <EOT>

Meaning of the parameters Pn

Parameter	Value	Meaning
P1	5 Byte binary data, the float value is coded in 5 bytes, see remark below	Single measurement values

4.3.6 5-byte-coded float value

A float number is stored with 4 bytes in the interface (according to IEEE754). These four bytes are binary data, which can have every available value (0x00…0xff). These bytes cannot be transmitted over the interface, because the serial interface protocol defines a number of special values as control characters with special meaning. If one of those control characters would occur in the float number data, it would be misinterpreted and disrupt the serial connection.

In order to avoid this problem, in every transmitted byte the leading bit (MSB) has to be set. So it is impossible for the transmitted data to look like a control character accidentally. The information of the four leading bits will be transmitted in a fifth byte (which has of course its MSB set)

An example:

Float value: 0x03 0x1f 0xfe 0x11

(1) set all leading bits

(a)0x83 (b)0x9f (c)0xfe (d)0x91

(2) create fifth bit

In byte (a) MSB was not set, bit0 = 0

In byte (b) MSB was not set, bit1 = 0

In byte (c) MSB was set, bit2 = 1

In byte (d) MSB was not set, bit3 = 0

bit 7 has also to be set to avoid misinterpretation as control character. Bits 4,5,6 are don’t care and are set to 1

So the fifth byte is binary 0b1111 0010 Hex 0xF2

So the transmitted bytes are:

0x83

0x9f

0xfe

0x91

0xF2

4.4 Commands for data container use

Here the sensor works as data storage for Digivision.

4.4.1 GBEZ Instrument name

Set a new value

The GBEZ! command stores the instrument name choosed.

Note: This string will be stored immediately in the EEPROM

Host sends: <STX>GBEZ! P1<LF><ETX>

8625 responds: <ACK>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	String with max- 240 characters	instrument name

Read the current value

The command GBEZ? reads the actual instrument name

Host sends: <STX>GBEZ?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	String with max- 240 characters	instrument name

4.4.2 GBEM Instrument remark

Set a new value

The command GBEM! stores a commentary text for the instrument remark

Note: This string will be stored immediately in the EEPROM

Host sends: <STX>GBEM! P1<LF><ETX>

8625 responds: <ACK>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	String with max. 240 characters	Commentary text instrument remark

Read the current value

The command GBEM? reads the actual commentary text instrument remark

Host sends: <STX>GBEM?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX>P1<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	String with max. 240 characters	String with max. 240 characters Commentary text instrument remark

4.4.3 ENZA Collective instruction commentary text

Set a new value

The command ENZA! stores several comment texts

Note: This string will be stored immediately in the EEPROM

Host sends: <STX>ENZA! P1,P2,P3,P4,P5,P6,P7,P8,P9,P10,P11,P12,P13<LF><ETX>

8625 responds: <ACK>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	Float value	Commentar text float1
P2	Float value	Commentar text float2

P3	Float value	Commentar text float3
P4	Float value	Commentar text float4
P5	16-Bit-unsigned-decimal numberl	Commentar text short
P6	String with max. 11 characters	Commentar text string1
P7	String with max. 11 characters	Commentar text string2
P8	String with max. 11 characters	Commentar text string3
P9	String with max. 11 characters	Commentar text string4
P10	16 Bit decimal number	Commentar text short1
P11	16 Bit decimal number	Commentar text short2
P12	16 Bit decimal number	Commentar text short3
P13	16 Bit decimal number	Commentar text short4

Read the current value

The command ENZA? reads the commentary texts.

Host sends: <STX>ENZA?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX> P1,P2,P3,P4,P5,P6,P7,P8,P9,P10.P11,P12,P13<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	Float value	Commentar text float1
P2	Float value	Commentar text float2
P3	Float value	Commentar text float3
P4	Float value	Commentar text float4
P5	16-Bit-unsigned- decimal number	Commentar text short
P6	String with max. 11 characters	Commentar text string1
P7	String with max. 11 characters	Commentar text string2
P8	String with max. 11 characters	Commentar text string3
P9	String with max. 11 characters	Commentar text string4
P10	16 Bit decimal number	Commentar text short1
P11	16 Bit decimal number	Commentar text short2
P12	16 Bit decimal number	Commentar text short3
P13	16 Bit decimal number	Commentar text short4

4.4.4 ENZB Extension to the collective instruction commentary text

Set a new value

The command ENZB! stores complementary informations to the ENZA-command.

Note: This string will be stored immediately in the EEPROM

Host sends: <STX>ENZB! P1,P2,P3,P4,P5,P6,P7,P8,P9,P10,P11,P12<LF><ETX>

8625 responds: <ACK>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	Float value	Commentary text Limit value 1
P2	Float value	Commentary text Limit value 2
P3	Float value	Commentary text Limit value 3
P4	Float value	Commentary text Limit value 4
P5	16 Bit decimal number	Commentary text Allocation Limit value 1
P6	16 Bit decimal number	Commentary text Allocation Limit value 2
P7	16 Bit decimal number	Commentary text Allocation Limit value 3
P8	16 Bit decimal number	Commentary text Allocation Limit value 4
P9	16 Bit decimal number	Commentary text Limit value modus Limit value 1
P10	16 Bit decimal number	Commentary text Limit value modus Limit value 2
P11	16 Bit decimal number	Commentary text Limit value modus Limit value 3
P12	16 Bit decimal number	Commentary text Limit value modus Limit value 4

Read the current value

The command ENZB? reads the complementary informations

Host sends: <STX>ENZB?<LF><ETX>

8625 responds: <ACK>

Host sends: <EOT>

8625 responds: <STX> P1,P2,P3,P4,P5,P6,P7,P8,P9,P10,P11,P12<ETX>

Host sends: <ACK>

8625 responds: <EOT>

Meaning of parameters Pn

Parameter	Value	Meaning
P1	Float value	Commentary text Limit value 1
P2	Float value	Commentary text Limit value 2
P3	Float value	Commentary text Limit value 3
P4	Float value	Commentary text Limit value 4
P5	16 Bit decimal number	Commentary text Allocation Limit value 1
P6	16 Bit decimal number	Commentary text Allocation Limit value 2
P7	16 Bit decimal number	Commentary text Allocation Limit value 3
P8	16 Bit decimal number	Commentary text Allocation Limit value 4
P9	16 Bit decimal number	Commentary text Limit value modus Limit value 1
P10	16 Bit decimal number	Commentary text Limit value modus Limit value 2
P11	16 Bit decimal number	Commentary text Limit value modus Limit value 3
P12	16 Bit decimal number	Commentary text Limit value modus Limit value 4