WITTENSTEIN alpha

cynapse®

for firmware version 2.x

Operating manual

2022-D074893 Revision: 06

Revision history

Revision	Date	Comment	Chapter
01	09.05.2019	New Version	All
02	07.02.2020	Material resistance Process data, Commands, Annex	3.4, 7.2, 7.4, 10.2
03	06.08.2020	Events Clarification Parameter data	7.5 7.6 10.2
04	07.05.2021	Pin assignment Software Parameter data	6.1 7 10.2, 10.3
05	10.06.2022	cynapse® Trademark Specification humidity AssetID Index Powersupply	All, 3.2 7.3, 10.2.4 10.1.3
06	24.06.2024	Assignment IODD file and firmware version Units in m/s² Reset Commands Renaming of Operation Acceleration Time	7, 7.1 7.6.3 7.4 7.3, 10.3.6

Technical support

If there are any questions about customer service or repairs service, please contact our customer service team.

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Contents

1 About this manual

This manual contains information which is necessary for the safe use of cynapse®.
It is an extension of the operating manual for the gearbox which is supplied together with cynapse®.
The operator must ensure that all persons assigned to install and operate cynapse® have read and understood these instructions in full.
Store these instructions within reach of cynapse®.
The original was prepared in German, all other language versions are translations of the original instructions.

1.1 Signal words

The following signal words are used to indicate hazards, things that are forbidden and important information:

	**NOTICE** **This signal word indicates a potential hazard that could lead to property damage.**

	A note without a signal word indicates application hints or especially important information for working with cynapse®

1.2 Safety symbols

The following safety symbols are used to indicate hazards, things that are forbidden and important information:

	
General danger	Information

1.3 Structure of the safety information

Safety information in this manual has been structured according to the following template:

	**⚠ CAUTION** **Explanatory text shows the consequences of disregarding this information.** • Instructive text uses direct address to indicate what to do.

1.4 Information symbols

The following information symbols are used:

- Indicates an action to be performed

➲ Indicates the results of an action

ⓘ Provides additional handling information

2 General information

2.1 EC/EU Directives

cynapse® has been designed in accordance with Directive 2011/65/EU. The individual parts used are RoHS compliant.

2.2 Guarantee and liability

Guarantee and liability claims are excluded for personal injury or material damage in case of

- Incorrect assembly / disassembly or incorrect operation
- Operation with an open connection socket if no IO-Link cable has been connected and no protective cover has been unscrewed
  Operation outside of the specified environmental conditions, see chapter 3 “Safety information and environmental conditions“

2.3 Additional documents

[1] http://www.io-link.com/de/Download/Download.php.
Especially interesting here are:

- [2] https://io-link.com/share/Downloads/At-a-glance/IO-Link_Systembeschreibung_dt_2018.pdf for a complete overview of IO-Link.
- [3] https://io-link.com/share/Downloads/Spec-Interface/IOL-Interface-Spec_10002_V112_Jul13.pdf
  as specifications together with the associated corrigendum and addendum

For additional information, please contact our sales department. Always state the serial number when doing so. You can find this

- on the electronic name plate
- on the gearbox name plate

3 Safety information and environmental conditions

3.1 Safety-critical applications

The device may not be used for safety-critical applications

3.2 Protection class and temperature

Protection class	Temperature	Humidity
IP65	-40°C … 90°C	20 – 80% without condensation

Table 1: Threshold values for humidity / temperature

Protection class IP65 only if the IO-Link cable has been screwed in tight by hand, or if the protective cover has been screwed tightly onto the connection socket by hand. Tightening torque is about 50 cNm

NOTICE

If the temperature falls below the lower threshold or exceeds the upper threshold, cynapse® will be damaged.

- Make sure that the permissible operating temperature range for cynapse® is not exceeded.

3.3 Acceleration

Measuring range
+/-16g in all three spatial axes

Table 2: Acceleration

3.4 Material resistance

The plastic used, as well as the plug, must not come into contact with agents containing alcohol or disinfectants.

4 Intended use

4.1 Overview

cynapse® is a mechanically integrated component of the gearbox. This means that different measurement variables can be determined, recorded and evaluated.
The IO-Link connector is an interface that can be connected with an IO-Link master.
Cyclical process data can be read via IO-Link. Furthermore, it is possible to parameterize cynapse®, retrieve permanently stored data and perform firmware updates via this connection.

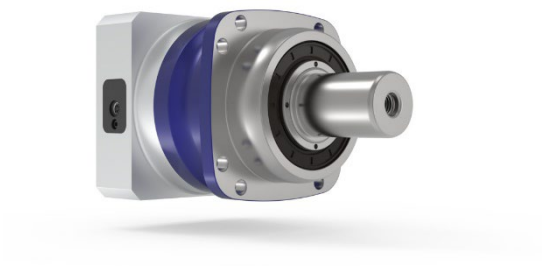
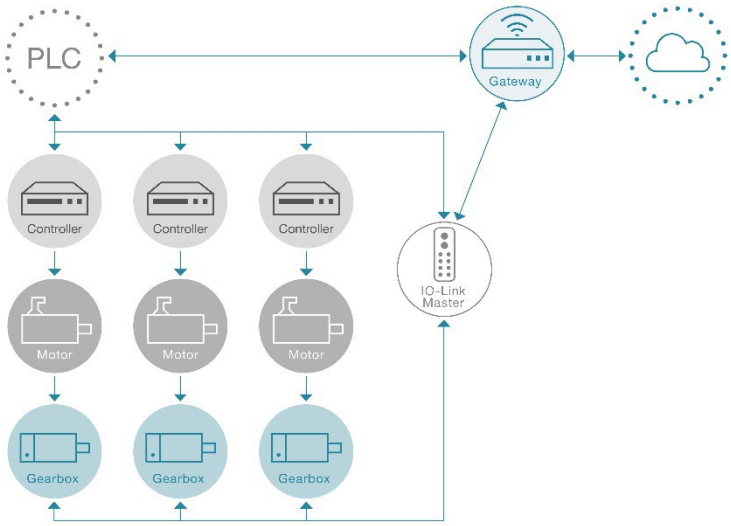


Image1.1: Gearbox with cynapse®



IO-Link cynapse® connector and IO-Link master connection

Image1.2: IO-Link connector / master connection

4.2 Power supply

The circuitry is supplied with power via the IO-Link connection.

4.3 Delivery condition

cynapse® is only delivered in assembled condition, as a unit with the associated gearbox.

5 Range of functions

5.1 Measurement variables

Accelerations in the three spatial axes and the temperature in the surrounding gearbox are determined.

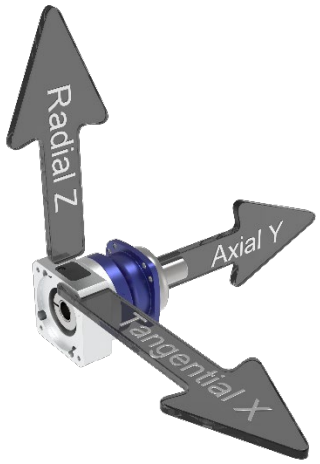


Image 1.3: cynapse® orientation of spatial axes

5.2 Events

cynapse® can generate IO-Link events in selected operating conditions, e.g. if set accelerations, temperatures, vibrations, etc. are exceeded. This can be evaluated by the higher-level control system.

5.3 Data storage

Some readings may be retained following a loss of operating voltage and can be read by both the client and WITTENSTEIN SE via the IO-Link connection using the IO-Link log.
These readings are described in chapter 7.6.2: “Historical data“.

6 Electrical installation

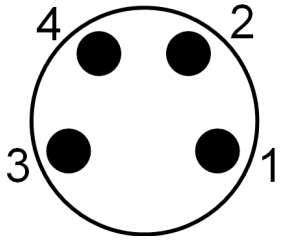
ⓘ Power is supplied and data is transferred to cynapse® via the IO-Link connection to the IO-Link master supplied by the client.

NOTICE

- The device may only be supplied by an electrician.
- The unit is to be disconnected from the power supply during assembly.

cynapse® has a 4-pin M8 socket (female) with an internal thread.
A 4-pin M85 connector (male) with an external thread is required on the connector cable.

6.1 Pin assignment



Pin	Assignment
1	L+
2	-
3	L-
4	C/Q

Table 3: Connector assignment – view of cynapse®

6.2 Electrical connectors

Connect your IO-Link master to cynapse® using an IO-Link cable with the IO-Link connector

Cables need to be laid in such a way that a minimum bend radius of 10 times the outside diameter is observed. The cable may be twisted at a length of 1 m by a maximum of ±30°.

NOTICE

If a cable connection is not used, the IO-Link connector socket is exposed to contaminants and moisture, which may lead to short-circuiting and other defects.

- In this case, screw the protective cover on to the IO-Link connector to protect the electronic components from contaminants and moisture in accordance with the indicated protection class (see chapter 3.2, “Protection class and temperature“).
- To lock the cable connector into the cynapse® device connector, the threaded ring must be tightened by hand (approx. 50 cNm).

7 Software

The following descriptions refer to a cynapse® firmware version 2.x with the io-link device id 3.

7.1 IODD file

The IODD file needed to connect to the control system can be found at https://ioddfinder.io-link.com/ by entering “WITTENSTEIN”. The corresponding IODD file contains the product name “cynapse” with the corresponding firmware version and device id (see chapter 7). Alternatively, please contact our sales team.

7.2 Process data

cynapse® sends the current temperature and acceleration metrics as process data. The data direction specifications listed below are to be interpreted from the **perspective of the IO-Link master**.

7.2.1 Input data

The process data of cynapse® can be configured to have the same process data length but also to be able to provide different sets of data. The selection of the process data format is done by the paramter “Settings”. Following values can be configured:

- RMS: Averaged vibration (exponentially weighted standard deviation with time constant of one second)
- Acceleration: Last measured acceleration
- Peak to Peak: Difference between maximum and minimum acceleration in the last second

Standard process data profil RMS, Peak to Peak, Temperature

Byte	Description	Unit	Conversion factor
0	reserved	-	-
1	Process data profil	-	-
2 … 3	RMS radial	m/s^2	0,01
4 … 5	RMS axial	m/s^2	0,01
6 … 7	RMS tangential	m/s^2	0,01
8 … 9	Peak to Peak radial	m/s^2	0,01
10 … 11	Peak to Peak axial	m/s^2	0,01
12 … 13	Peak to Peak tangential	m/s^2	0,01
14… 15	Temperature	°C	0,01

Table 4: Input data of process data profile RMS, Peak to Peak, Temperature

Process data profil Acceleration, Peak to Peak, Temperature

Byte	Description	Unit	Conversion factor
0	reserved	-	-
1	Process data profil	-	-
2 … 3	Acceleration radial	m/s^2	0,01
4 … 5	Acceleration axial	m/s^2	0,01
6 … 7	Acceleration tangential	m/s^2	0,01
8 … 9	Peak to Peak radial	m/s^2	0,01
10 … 11	Peak to Peak axial	m/s^2	0,01
12 … 13	Peak to Peak tangential	m/s^2	0,01
14… 15	Temperature	°C	0,01

Table 5: Input data of process data profile Acceleration, Peak to Peak, Temperature

Standard process data profil RMS, Acceleration, Temperature

Byte	Description	Unit	Conversion factor
0	reserved	-	-
1	Process data profil	-	-
2 … 3	RMS radial	m/s^2	0,01
4 … 5	RMS axial	m/s^2	0,01
6 … 7	RMS tangential	m/s^2	0,01
8 … 9	Acceleration radial	m/s^2	0,01
10 … 11	Acceleration axial	m/s^2	0,01
12 … 13	Acceleration tangential	m/s^2	0,01
14… 15	Temperature	°C	0,01

Table 6: Input data of process data profile RMS, Acceleration, Temperature

7.2.2 Output data

cynapse® does not use outgoing process data

7.3 Device parameters

The cynpase parameter overview is shown in follwing table.
A detailed description of the device parameters are in chapter 10.3 “Device Parameters”.

Parameter	Access	Index	Subindex	Description
Manufacturing Date	r	94	1	of the Electronic
			2	of the Produkt
Material Number	r	92	0	
Ordering Code	r	91	0	
Asset Id	r	93	1	Short Asset Id
			2	Asset Id
Operating Temperature Threshold	r/w	82	0	
Operating Vibration Threshold	r/w	83	0	
Operation Time	r	89	0	
Lifetime	r	86	0	
Temperature Operation Time	r	87	0	
Vibration Operation Time	r	88	0	
Minimal and Maximal Temperature	r	71	1	Minimum Temperature
			2	Maximum Temperature
Minimal and Maximal Lifetime Temperature	r	70	1	Minimum Temperature
			2	Maximum Temperature
Upper Product Temperature Threshold	r	69	0	
Lower Product Temperature Threshold	r	107	0	
Upper Application Temperature Threshold	r/w	97	0	
Lower Application Temperature Threshold	r/w	108	0	
Position	r	75	0	
Installation Position Histogram	r	74	0	
Application Shock Threshold	r/w	98	0	
Application Vibration Threshold	r/w	103	0	
Minimum and Maximum Acceleration	r	105	1	Minimum Tangential Acceleration
			2	Minimum Axial Acceleration
			3	Minimum Radial Acceleration
			4	Maximum Tangential Acceleration
			5	Maximum Axial Acceleration
			6	Maximum Radial Acceleration
			7	Tangential Component of max. Amount (Sub.Index 10)
			8	Axial Component of max. Amount (Sub.Index 10)
			9	Radial Component of max. Amount (Sub.Index 10)
			10	Maximum Amount of Acceleration

Parameter	Access	Index	Subindex	Description
Minimum and Maximum Vibration	r	106	1	Minimum Tangential Vibration
			2	Minimum Axial Vibration
			3	Minimum Radial Vibration
			4	Maximum Tangential Vibration
			5	Maximum Axial Vibration
			6	Maximum Radial Vibration
			7	Tangential Component of max. Amount (Sub.Index 10)
			8	Axial Component of max. Amount (Sub.Index 10)
			9	Radial Component of max. Amount (Sub.Index 10)
			10	Maximum Amount of Vibration
Settings	r/w	96	1	Event Configuration
			2	Product Temperature Threshold Event Enable
			3	Application Temperature Threshold Event Enable
			5	Application Shock Threshold Event Enable
			7	User Vibration Threshold Event Enable
			9	Prozess Data Profile

Table 7: cynapse® Parameter Overview

7.4 Commands

The following devices specific system commands are supported. The commands are send to the IO link index 2.

Name	Value	Description
Restore minimal and maximal temperature	0xA0	Minimum and maximum temperatures are reset, see 10.3.7
Restore minimal and maximal acceleration	0xA1	Minimum and maximum acceleration are reset, see 10.3.17
Restore minimal and maximal vibration	0xA5	Minimum and maximum vibration are reset, see 10.3.18
Request acceleration data package	0xA8	A new data acceleration package is recorded, see 7.6.3
Device Reset	0x80	Exution of a power cycle. For details see IO-Link standard [3]
Application Reset	0x81	All technology specific parameters* are reset. For details see IO-Link standard [3]
Restore Factory Settings	0x82	Additional to the technology specific parameters*, all configurable identification tags and error counter are reset. For details see IO-Link standard [3]

Table 8: Commands

* technology specific parameters: All parameters that affect the cynapse specific functions. These are in principle all parameters that can be reset or changed by the user and are not standard IO-Link parameters. Not resettable parameters such as for example maximal temperature over lifetime or the histories are not affected.

7.5 Events

Name	Code	Type	Description
Device Error	0x5010	Error	See IO-Link standard [3]
Data Storage Upload Request	0xFF91	Notification	See IO-Link standard [3]
Upper product temperature threshold exceeded	0x1852	Warning	The upper product's temperature threshold has been exceeded
Temperature below product lower temperature threshold	0x1855	Warning	Temperatur is fallen below product's lower temperature threshold
Upper application temperature threshold exceeded	0x185A	Warning	The upper application's temperature threshold has been exceeded
Temperature below lower appli temperature threshold	0x1856	Warning	Temperatur is fallen below application's lower temperature threshold
Application shock threshold exceeded	0x185B	Warning	The user's shock threshold has been exceeded
Application vibration threshold exceeded	0x185D	Warning	The user's vibration threshold has been exceeded.
Temperature Sensor Defect	0x1850	Warning	The temperature sensor is faulty
Acceleration Sensor Defect	0x1851	Warning	The acceleration sensor is faulty
Memory Defect	0x1858	Warning	The memory is faulty
Invalid Memory Content	0x1859	Error	The memory contains invalid data

Table 9: Events

More information about how events are read can be found in the documentation for the IO-Link master or the control system.

7.6 Blob data

IO-Link defines the transfer of larger quantities of data (**B**inary **l**arge **ob**ject) by the BLOB transfer profil. The device uses this to send the collected data.

7.6.1 Histogram data

The following values are recorded and entered into a relevant histogram throughout the service life of the device:

- Temperature
- Maximum vibration (RMS across 3 axes)
- Mid-level vibration (RMS across 3 axes)
- Maximum deviation of the acceleration vector from the mid-level value
- Crest factor

The temperature histogram is divided into 100 classes (linear progression):

Class	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**...**	**98**	**99**
Temperature (°C)	<-48	-48	-46	-44	-42	-40	-38	...	146	>=148

Table 10: Temperature histogram

The vibration histograms are divided into 40 (logarithmic) classes (values in g):

Class	**_0**	**_1**	**_2**	**_3**	**_4**	**_5**	**_6**	**_7**	**_8**	**_9**
0_	0.0100	0.0126	0.0158	0.0200	0.0251	0.0316	0.0398	0.0501	0.0631	0.0794
1_	0.100	0.126	0.158	0.200	0.251	0.316	0.398	0.501	0.631	0.794
2_	1.00	1.26	1.58	2.00	2.51	3.16	3.98	5.01	6.31	7.94
3_	10.0	12.6	15.8	20.0	25.1	31.6	39.8	50.1	63.1	inf

Table 11: Vibration histogram

The maximum value for each class is displayed in the table. The minimum value for a class is the maximum value for the previous class. Class 00: 0….0.01; Class 01: 0.01…0.0126; …; Class 38: 50.1…63.1; Class 39: 63.1…inf where inf: infinity, i.e. unlimited.

The crest factor histogram is divided into 40 (logarithmic) classes:

Class	_0	_1	_2	_3	_4	_5	_6	_7	_8	_9
0_	1.122	1.259	1.413	1.585	1.778	1.995	2.239	2.512	2.818	3.162
1_	3.548	3.981	4.467	5.012	5.623	6.310	7.079	7.943	8.912	10.00
2_	11.22	12.59	14.13	15.85	17.78	19.95	22.39	25.12	28.18	31.62
3_	35.48	39.81	44.67	50.12	56.23	63.10	70.79	79.43	89.12	inf

Table 12: Crest factor histogram

The histograms are decoded as binary (32 bits per channel) and transferred from the device via blob transfer:

Name	ID	Value length	Number (channels)
Temperature histogram	-4115	32 bits	100
Maximal RMS histogram	-4110	32 bits	40
Average RMS histogram	-4111	32 bits	40
Peak to peak histogram	-4112	32 bits	40
Crest factor histogram	-4113	32 bits	40

Table 13: Transfer via blob transfer

7.6.2 Historical data

Over the service life of the device, the maximum temperature and maximum acceleration will be permanently recorded every 15 minutes. Each maximum temperature value is coded as an 8-bit signed integer (unit in °C). Each maximum acceleration value is coded in 32 bits and the acceleration vector with the highest value is stored. The format used is the format of the raw sensor data with 10 bits per direction in space at a resolution of 0.307 m/s, meaning the last 2 bits are empty: |xxxxxxxx|xxyyyyyy|yyyyzzzz|zzzzzz00|
Each blob data set contains an array of these values, where the oldest value is transferred first:

Name	ID	Value length	Number
Maximum temperature history	-4098	8 bits	variable
Maximum acceleration history	-4096	32 bits	variable

Table 14: Historical data

7.6.3 Data package

The data package recorded by the “Request acceleration data package” command can only be read per blob with ID -4097. In addition to the raw data from the acceleration sensor, the package contains the status of the four operating time counters and the temperature when the measurements
were recorded. The data format is as follows:

Item [byte]	Data type	Meaning	Unit
0	uint32	Service life counter	s
4	uint32	Temperature timer	s
8	uint32	Vibration timer	s
12	uint32	Operating time counter	s
16	int16	Temperature	0.01 °C
18	uint16	Maximum acceleration (magnitude)	0.01 m/s²
20	uint8[3840]	Acceleration data	-

Table 15: Data package

The acceleration data of byte 20 contains the raw acceleration sensor data of 1,024 successive measurements (with 3.2 kHz sampling frequency) in a packaged format. Each measurement accounts for exactly 30 bits in the sequence of X, Y and Z accelerations value per 10 bits (signed int10). The scaling is 0.307m/s², following example values with conversion:

Bit value	Acceleration
00 0000 0000	0.00 m/s²
00 0000 0001	0.307 m/s²
00 0010 0000	9.81 m/s²
01 1111 1111	≥ 157 m/s²
10 0000 0000	≤ -157 m/s²
11 1110 0000	-9.81 m/s²
11 1111 1111	-0.307 m/s²

Table 16: Example values with conversion

7.7 Firmware update

The device uses the path standardized by the IO-Link specifications to carry out firmware updates. The user requires the appropriate firmware data file (*.iolfw) from WITTENSTEIN to do this. The firmware file can be downloaded from the WITTENSTEIN website from the WITTENSTEIN service portal. If you have questions about carrying out updates via IO-Link master, please contact the appropriate manufacturer.
If the connection is disrupted during the transmission of the firmware, the process will be reset and the device restarted with the old firmware. In this case, the firmware update process may need to be re-initiated via the IO-Link master.

8 Disposal

You can get additional information about decommissioning, disassembly and disposal of cynapse® from our customer service team.

- Dispose of cynapse® at the disposal centers intended for this purpose.

ⓘ Please observe the valid national regulations for waste disposal.

9 Malfunctions

NOTICE

A change in performance may be an indication of existing damage to cynapse® or cause damage to cynapse®.

- Only put cynapse® back into use after eliminating the cause of the fault.

Fault	Possible cause	Remedy
No connection to cynapse® possible	Connected incorrectly	Check the connection using the list of signals
	No IODD or incorrect IODD loaded	Import the appropriate IODD from WITTENSTEIN

Table 17: Malfunctions

10 Annex

10.1 Technical data

10.1.1 Bus data

Bus data	
Type of transmission	COM3 (230.4 kbits/s)
IO-Link revision	1.1
SDCI standard	IEC 61131-9
IO-Link device ID	2
SIO mode	Yes
Required master port type	Class A and B
Process data	IN: 16 bytes, OUT: 0 bytes

Table 18: Bus data

10.1.2 Power consumption

The power consumption of the circuitry via the IO-Link is about 15 mA.

10.1.3 Operating voltage

Power is supplied to the circuitry via the IO-Link connection to the IO-Link master. In accordance with IO-Link specification [3], this must typically be 24 V DC with threshold values of 18 V DC and 30 V DC.

For NRTL-compliant use, a voltage source corresponding to NEC class 2 must be used. A voltage source corresponding to NEC class 2 must not be connected in series or parallel with another NEC class 2 voltage source.

Alternatively, a SELV voltage source of 24 V DC in combination with a 0.5 A fuse can be used.

10.2 Identification Plate

Properties (table column 1) defined in accordance with IO-Link specification, see www.io-link.com.
(*): These values relate to the individual gearbox with which the cynapse® was supplied.

Property	Access	IO-Link Index	IO-Link Sub Index	Description
Vendor ID	r	0x07	0x0	1073
	r	0x08	0x0	
Vendor Name	r	0x10	0x0	WITTENSTEIN
Vendor Text	r	0x11	0x0	www.wittenstein.de
Device ID	r	0x09	0x0	3
	r	0x0A	0x0	
	r	0x0B	0x0	
Product ID	r	0x13	0x0	cynapse
Product Name	r	0x12	0x0	cynapse
Product Text	r	0x14	0x0	cynapse
Serial Number	r	0x15	0x0	Serial number (*)
Hardware Revision	r	0x16	0x0	Hardware Revision
Firmware Revision	r	0x17	0x0	Software Revision

Table 19: Identification Plate

10.2.1 Manufacturing Date

Manufacturing date of the gearbox.

Parameter		
Index		94
Authorization		r
Data type		RecordT
Subindex	1	Byte 8..15 manufacturing date of the electronic TimeT
	2	Byte 0..7 manufacturing date of the gearbox TimeT

Tabelle 20: Manufacturing Date

10.2.2 Material Number

WITTENSTEIN material number of the gearbox.

Parameter	
Index	92
Authorization	r
Data type	StringT

Tabelle 21: Material Number

10.2.3 Ordering Code

WITTENSTEIN ordering code of the gearbox.

Parameter	
Index	91
Authorization	r
Data type	StringT

Tabelle 22: Ordering Code

10.2.4 Asset Id

WITTENSTEIN assset Id of the gearbox. Unique key for identificaton of the individual gearbox. Used e.g. by the WITTENSTEIN service portal.

Parameter		
Index		93
Authorization		r
Data type		RecordT
Subindex	1	Byte 0..31 short industry 4.0 asset ID StringT
	2	Byte 32..63 unique industry 4.0 asset ID according to RAMI4.0 (URI format) StringT

Tabelle 23: Asset Id

10.3 Device Parameters

10.3.1 Operating Temperature Threshold

Temperature threshold which will, if exceeded, cause the temperature time to increase (index 87)

Parameter	
Index	82
Authorization	rw
Data type	Float32T
Unit	°C
Conversion factor	1
Minimum value	-50.0f
Maximum value	150.0f

Table 24: Operating Temperature Threshold

10.3.2 Operating Vibration Threshold

Acceleration threshold which will, if exceeded, cause the acceleration time to increase (index 88)

Parameter	
Index	83
Authorization	rw
Data type	Float32T
Unit	m/s²
Conversion factor	1
Minimum value	0.0f
Maximum value	544.0f

Table 25: Operating Vibration Threshold

10.3.3 Operation Time

Time in which both the temperature and acceleration thresholds were simultaneously exceeded (cumulative)

Parameter	
Index	89
Authorization	r
Data type	UIntegerT (4 bytes)
Unit	h
Conversion factor	1/3600

Table 26: Operation Time

10.3.4 Lifetime

Total operating time of the circuitry

Parameter	
Index	86
Authorization	r
Data type	UIntegerT (4 bytes)
Unit	h
Conversion factor	1/3600

Table 27: Lifetime

10.3.5 Temperature Operation Time

Time in which the temperature threshold was exceeded (cumulative)

Parameter	
Index	87
Authorization	r
Data type	UIntegerT (4 bytes)
Unit	h
Conversion factor	1/3600

Table 28: Temperature Operation Time

10.3.6 Vibration Operation Time

Time in which the vibration threshold was exceeded (cumulative)

Parameter	
Index	88
Authorization	r
Data type	UIntegerT (4 bytes)
Unit	h
Conversion factor	1/3600

Table 29: Acceleration Operation Time

10.3.7 Minimal and Maximal Temperature

Minimum and maximum temperature value since the last reset (command 0xA0).

Parameter		
Index		71
Authorization		r
Data type		RecordT
Subindex	1	Byte 4 … 7 Minimum temperature Float32T
	2	Byte 0 … 3 Maximum temperature Float32T
Unit		°C
Conversion factor		1

Table 30: Minimal and Maximal Temperature

10.3.8 Minimal and Maximal Lifetime Temperature

Minimum and maximum temperature value over the entire operating.

Parameter		
Index		70
Authorization		r
Data type		RecordT
Subindex	1	Byte 4 … 7 Minimum temperature Float32T
	2	Byte 0 … 3 Maximum temperature Float32T
Unit		°C
Conversion factor		1

Table 31: Minimal and Maximal Lifetime Temperature

10.3.9 Upper Product Temperature Threshold

Upper temperature threshold defined by WITTENSTEIN. If this value is exceeded and the event is enabled (index 96, subindex 2) the event 0x1852 is generated.

Parameter	
Index	69
Authorization	r
Data type	Float32T
Unit	°C
Conversion factor	1

Table 32: Manufacturer Upper Temperature Threshold

10.3.10 Lower Product Temperature Threshold

Lower temperature threshold defined by WITTENSTEIN. If the measured value is below this threshold and the event is enabled (index 96, subindex 2) the event 0x1855 is generated.

Parameter	
Index	107
Authorization	r
Data type	Float32T
Unit	°C
Conversion factor	1

Table 33: Manufacturer Lower Temperature Threshold

10.3.11 Upper Application Temperature Threshold

Upper temperature threshold defined by user. If this value is exceeded and the event is enabled (index 96, subindex 3) the event 0x185A is generated.

Parameter	
Index	97
Authorization	rw
Data type	Float32T
Unit	°C
Conversion factor	1

Table 34: User Upper Temperature Threshold

10.3.12 Lower Application Temperature Threshold

Lower temperature threshold defined by user. If the measured value is below this threshold and the event is enabled (index 96, subindex 3) the event 0x1856 is generated.

Parameter	
Index	108
Authorization	rw
Data type	Float32T
Unit	°C
Conversion factor	1

Table 35: User Lower Temperature Threshold

10.3.13 Position

Spatial position (pitch and roll, 2 values)

Parameter			
Index	75		
Authorization	r		
Data type	RecordT		
Unit	° (Degree)		
	Byte 3 … 4	Pitch	IntegerT (2 byte)
	Byte 1 … 2	Roll	IntegerT (2 byte)
	Byte 0	Installation Position	0 - V1 1 - V3 2 - B5

Table 36: Position

Image 1.4: cynapse® orientation of rotation axes

10.3.14 Installation Position Histogram

Cumulative histogram for installation position B5, V1, V3 across the whole operating time. It is updated every minute.

Parameter			
Index	74		
Authorization	r		
Data type	RecordT		
	Byte 8 … 11	Installation position B5	UIntegerT (4 bytes)
	Byte 4 … 7	Installation position V1	UIntegerT (4 bytes)
	Byte 0 … 3	Installation position V3	UIntegerT (4 bytes)

Table 37: Installation Position Histogram

10.3.15 Application Shock Threshold

User defined acceleration threshold. If this value is exceeded and the event is enabled (index 96, subindex 5) the event 0x185B is generated.

Parameter	
Index	98
Authorization	rw
Data type	Float32T
Unit	m/s²
Conversion factor	1
Minimum value	0.0f
Maximum value	544.0f

Table 38: User Shock Threshold

10.3.16 Application Vibration Threshold

User defined vibration threshold (amount of the RMS value over 3 axes). If this value is exceeded and the event is enabled (index 96, subindex 7) the event 0x185D is generated.

Parameter	
Index	103
Authorization	rw
Data type	Float32T
Unit	m/s²
Conversion factor	1
Minimum value	0.0f
Maximum value	544.0f

Table 39: User Shock Threshold

10.3.17 Minimum and Maximum Acceleration

Minimum and maximum measured acceleration since last reset (command 0xA1 or “device reset”).

Parameter				
Index		105		
Authorization		r		
Data type		RecordT		
Unit		m/s²		
Subindex	1	Byte 36 … 40	Minimum Tangential Acceleration	Float32T
	2	Byte 32 … 35	Minimum Axial Acceleration	Float32T
	3	Byte 28 … 31	Minimum Radial Acceleration	Float32T
	4	Byte 24 … 27	Maximum Tangential Acceleration	Float32T
	5	Byte 20 … 23	Maximum Axial Acceleration	Float32T
	6	Byte 16 … 19	Maximum Radial Acceleration	Float32T
	7	Byte 12 … 15	Tangential Component of max. Amount (Sub.Index 10)	Float32T
	8	Byte 8 … 11	Axial Component of max. Amount (Sub.Index 10)	Float32T
	9	Byte 4 … 7	Radial Component of max. Amount (Sub.Index 10)	Float32T
	10	Byte 0 … 3	Maximum Amount of Acceleration	Float32T

Table 40: Minimum and Maximum Acceleration

10.3.18 Minimum and Maximum Vibration

Minimum and maximum vibration (RMS of acceleration) since last reset (command 0xA5 or “device reset”).

Parameter				
Index		106		
Authorization		r		
Data type		RecordT		
Unit		m/s²		
Subindex	1	Byte 36 … 40	Minimum Tangential Vibration	Float32T
	2	Byte 32 … 35	Minimum Axial Vibration	Float32T
	3	Byte 28 … 31	Minimum Radial Vibration	Float32T
	4	Byte 24 … 27	Maximum Tangential Vibration	Float32T
	5	Byte 20 … 23	Maximum Axiale Vibration	Float32T
	6	Byte 16 … 19	Maximum Radial Vibration	Float32T
	7	Byte 12 … 15	Tangential Component of max. Amount (Sub.Index 10)	Float32T
	8	Byte 8 … 11	Axial Component of max. Amount (Sub.Index 10)	Float32T
	9	Byte 4 … 7	Radial Component of max. Amount (Sub.Index 10)	Float32T
	10	Byte 0 … 3	Maximum Amount of Vibration	Float32T

Table 41: Minimum and maximum vibration

10.3.19 Settings

Approval for generating events and selection of the process data profil. The combination of index and subindex is relevant

	Subindex 1-8 each have the data type BooleanT Subindex 0: Bit 0, see subindex 1 Subindex 0: Bit 1, see subindex 2, etc. Subindex 9: see Process Data Profil

Parameter			
Index		96	
Authorization		rw	
Data type		UIntegerT (4 bytes)	
Subindex	1	Byte 0 Bit 0	General event approval
	2	Byte 0 Bit 1	Event for breaking the product temperature threshold value “Upper Product Temperature Threshold” or “Lower Product Temperature Threshold”
	3	Byte 0 Bit 2	Event for breaking the user defined application threshold value “Upper Application Temperature Threshold” or “Lower Application Temperature Threshold”
	4	Byte 0 Bit 3	Not used
	5	Byte 0 Bit 4	Event for exceeding threshold value “Application Shock Threshold”
	7	Byte 0 Bit 6	Event for exceeding threshold value “Application Vibration Threshold”
	8	Byte 0 Bit 7	Not used
	9	Byte 1	Process Data Profil, see table

Table 42: Settings

Process Daten Profile		
Data type	UIntegerT8	
Authorization	rw	
Profile	RMS, Peak to Peak, Temperature	1
	Acceleration, Peak to Peak, Temperature	2
	RMS, Acceleration, Temperature	3

Table 43: Process Data Profile

10.4 Standard Parameters

The following optional IO-Link parameters are supported by cynapse®, see [3]:

Parameter	IO-Link Index
System command	0x02
Data storage index	0x03
Device Access Locks	0x0C
Profile Characteristics	0x0D
PDInputDescriptor	0x0E
PDOutputDescriptor	0x0F
Vendor Text	0x11
Product ID	0x13
Product Text	0x14
Serial Number	0x15
Hardware Revision	0x16
Firmware Revision	0x17
Application specific tag	0x18
Function tag	0x19
Location tag	0x1A
Error count	0x20
Device status	0x24
Detailed device status	0x25
Process Data Input	0x28
Process Data Output	0x29
Blob ID	0x31
Blob CH	0x32
Firmware Update Password	0x43BD
Firmware Update Hardware ID Key	0x43BE
Bootmode Status	0x43BF

Table 44: Standard Parameters

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