Slide-in compact drives

Aggregate data sheet

Version: **1.16 (November 2020)**
Order no.: **5AC901.CSSD-0x**

1 General information

5AC901.CSSD-0x slide-in compact solid-state drives (SSD) are based on multi-level cell (MLC) technology and compatible with SATA 3.1. They can be used in APC910 and PPC900 system units.

Corresponding mounting brackets and a removal strip are included in delivery.

- 60, 128, 256, 512 or 1024 GB solid-state drive
- MLC flash memory
- S.M.A.R.T. support
- Slide-in compact
- SATA 3.1 compatible

This data sheet contains descriptions of multiple revisions. See the adhesive device label for the revision. The following table shows the respective revisions of the drives.

Order number	Revision	Page
5AC901.CSSD-03	G0	"Technical data for Rev. G0 and later" on page 7
	Up to F0	"Technical data up to Rev. F0" on page 9
5AC901.CSSD-04	H0	"Technical data for Rev. H0 and later" on page 12
	Up to G0	"Technical data up to Rev. G0" on page 14
5AC901.CSSD-05	F0	"Technical data for Rev. F0 and later" on page 17
	Up to E0	"Technical data up to Rev. E0" on page 19
5AC901.CSSD-06	D0	"Technical data for Rev. D0 and later" on page 21
	C0	"Technical data up to Rev. C0" on page 23
5AC901.CSSD-07	C0	"Technical data" on page 25

1.1 Basic information

Solid-state drives (SSD) used in industrial automation must be extremely reliable. To achieve this, the following points are important:

- The flash technology used
- An efficient algorithm to maximize service life
- Mechanisms for detecting and correcting flash memory errors

1.1.1 Flash technology

SSDs are currently available with multi-level cell (MLC) flash blocks.

Due to increasing cost pressure, improved wear level algorithms and enhanced monitoring features (S.M.A.R.T.), MLC technology has established itself in industrial automation, especially for applications with increased memory requirements.

1.1.2 Wear leveling

Wear leveling refers to an algorithm that can be used to maximize the service life of a CFast card. A distinction is made between the following algorithms:

- Dynamic wear leveling
- Static wear leveling

The basic idea of wear leveling is that data is distributed over a wide range of blocks or cells on the data storage medium so that the same areas do not always have to be erased and reprogrammed. This ensures uniform wear across all blocks.

1.1.2.1 Dynamic wear leveling

Dynamic wear leveling offers the possibility to use unused flash blocks when writing to a file.
If the data storage medium is already 80% full of files, only 20% can be used for wear leveling.
The service life of the CFast card therefore depends on the unused flash blocks.

1.1.2.2 Static wear leveling

Static wear leveling additionally monitors which data is rarely modified. From time to time, the controller moves this data to blocks that have already been programmed frequently to avoid further wear and tear of the cells.

1.1.3 ECC error correction

Inactivity or operation of a particular cell can cause bit errors. Error-correcting code (ECC) implemented by the hardware or software allows many such errors to be detected and corrected.

1.1.4 S.M.A.R.T. support

Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) is an industry standard for mass storage devices that has been introduced to monitor key parameters and detect imminent failures at an early stage. Monitoring and storing critical performance and calibration data attempts to predict the probability of error states.

A wear indicator, which is part of the S.M.A.R.T. parameters, makes it possible to calculate the expected service life and monitor the condition of the data storage medium on a daily basis.

1.1.5 Calculating the expected service life for an existing application

The following procedure is recommended to better evaluate the capacity that should be used for an existing application:

- Read the *Average erase count* of the data storage medium via S.M.A.R.T.
- Fully operate the system with the relevant data storage medium over a defined period of time (e.g. 1 week).
- Determine the used erase cycles via *Average erase count*.
- Determine the expected service life based on the maximum guaranteed write/erase cycles (MLC: 3000).

Calculation		
$t_1 = \frac{n * t_2}{x}$	t_1	Expected service life
	n	Max. guaranteed write/erase cycles of the CFast card
	t_2	Assessment period (e.g. 1 week)
	x	Used erase cycles according to *Average erase count*

Depending on the revision of the data storage medium used, the current wear can also be specified as a percentage value in the S.M.A.R.T. parameters. This is an alternative to calculating *Average erase count*.

2 Information about this document

This document is not intended for end customers! The safety guidelines required for end customers must be incorporated into the operating instructions for end customers in the respective national language by the machine manufacturer or system provider.

2.1 Organization of notices

Safety notices

Contain **only** information that warns of dangerous functions or situations.

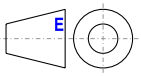
Signal word	Description
Danger!	Failure to observe these safety guidelines and notices will result in death, severe injury or substantial damage to property.
Warning!	Failure to observe these safety guidelines and notices can result in death, severe injury or substantial damage to property.
Caution!	Failure to observe these safety guidelines and notices can result in minor injury or damage to property.
Notice!	Failure to observe these safety guidelines and notices can result in damage to property.

General notices

Contain **useful** information for users and instructions for avoiding malfunctions.

Signal word	Description
Information:	Useful information, application tips and instructions for avoiding malfunctions.

2.2 Guidelines



European dimension standards apply to all dimension diagrams.

All dimensions in millimeters.

Unless otherwise specified, the following general tolerances apply:

Nominal dimension range	General tolerance per DIN ISO 2768 medium
Up to 6 mm	±0.1 mm
Over 6 to 30 mm	±0.2 mm
Over 30 to 120 mm	±0.3 mm
Over 120 to 400 mm	±0.5 mm
Over 400 to 1000 mm	±0.8 mm

3 Safety notices

Information:

B&R makes every effort to keep this technical description as current as possible. The latest version of this technical description is available in PDF format on the B&R website (www.br-automation.com). For specifications that are not listed here, see the user's manual for the complete device being used.

Information:

The following specified characteristic data, features and limit values are only valid for these individual components and may differ from those of the complete system. The data specified for the complete system applies to the complete system in which this individual component is used, for example.

Caution!

A sudden power failure can result in data loss! In very rare cases, the mass storage device may also be damaged!

The preventive use of a UPS is therefore recommended.

Use with third-party devices

If third-party devices are used, refer to the corresponding manufacturer's documentation.

4 Order data

Order number	Short description	Figure
	Drives	
5AC901.CSSD-03	60 GB SSD MLC - Slide-in compact - Innodisk - SATA	
5AC901.CSSD-04	128 GB SSD MLC - Slide-in compact - Innodisk - SATA	
5AC901.CSSD-05	256 GB SSD MLC - Slide-in compact - Innodisk - SATA	
5AC901.CSSD-06	512 GB SSD MLC - Slide-in compact - Innodisk - SATA	
5AC901.CSSD-07	1 TB SSD MLC - Slide-in compact - Innodisk - SATA	
	Optional accessories	
	Drives	
5MMSSD.0060-01	60 GB SSD MLC - Innodisk - SATA	
5MMSSD.0128-01	128 GB SSD MLC - Innodisk - SATA	
5MMSSD.0256-00	256 GB SSD MLC - Innodisk - SATA	
5MMSSD.0512-00	512 GB SSD MLC - Innodisk - SATA	
5MMSSD.1024-00	1 TB SSD MLC - Innodisk - SATA	

5 5AC901.CSSD-03

5.1 Technical data for Rev. G0 and later

Product ID	5AC901.CSSD-03
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C [1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck) [2)]
EAC	Product family certification
Solid-state drive	
Capacity	60 GB
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read
MTBF	Min. 3,000,000 h (at 25°C)
S.M.A.R.T. support	Yes
Interface	SATA
Servicing	None
Continuous reading	Max. 520 MB/s
Continuous writing	Max. 180 MB/s
IOPS [3)]	
4k read	Max. 75,000 (random)
4k write	Max. 46,000 (random)
Endurance	
MLC flash memory	Yes
Data volume	
Theoretical	192 TBW[4)]
Client workload	75 TBW[5)]
Compatibility	SATA 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Ambient conditions	
Temperature	
Operation	-40 to 85°C
Storage	-55 to 85°C
Transport	-55 to 85°C
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Mechanical properties	
Installation	Permanent [6)]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Vendor information	
Manufacturer	Innodisk
Manufacturer's product ID	2.5" SATA SSD 3MV2-P 60 GB

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.

3) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

5.1.1 Temperature/Humidity diagram

5AC901.CSSD-03 ≥ Rev. G0

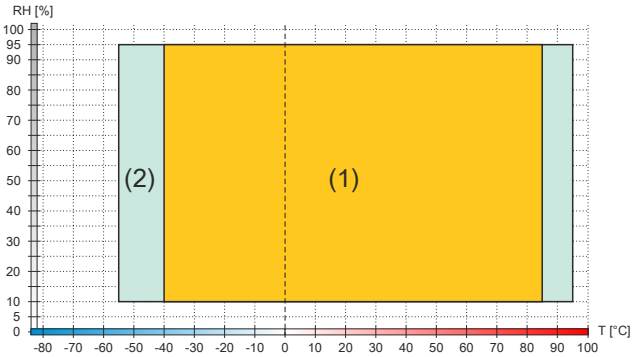


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5.2 Technical data up to Rev. F0

Product ID	5AC901.CSSD-03		
Revision	**C0**	**D0**	**F0**
General information			
Certifications			
CE	Yes		
UL	cULus E115267 Industrial control equipment		
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C[1)]		
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]		
EAC	Product family certification		
Solid-state drive			
Capacity	60 GB		
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read		
MTBF	Min. 1,500,000 h		
S.M.A.R.T. support	Yes		
Interface	SATA		
Servicing	None		
Continuous reading	Max. 510 MB/s		
Continuous writing	Max. 430 MB/s		
IOPS[3)]			
4k read	Max. 50,000 (random)		
4k write	Max. 25,000 (random)		
Endurance			
MLC flash memory	Yes		
Data volume			
Theoretical	192 TBW[4)]		
Client workload	35 TBW[5)]		47 TBW[5)]
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)		
Operating conditions			
Pollution degree per EN 61131-2	Pollution degree 2		
Ambient conditions			
Temperature			
Operation	0 to 70°C	-30 to 85°C	-40 to 85°C
Storage	-40 to 85°C		
Transport	-40 to 85°C		
Relative humidity			
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing	
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing	
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing	
Vibration			
Operation	10 to 2000 Hz: 20 g		
Storage	10 to 2000 Hz: 20 g		
Transport	10 to 2000 Hz: 20 g		
Shock			
Operation	1500 g, 0.5 ms		
Storage	1500 g, 0.5 ms		
Transport	1500 g, 0.5 ms		
Elevation			
Operation	-300 to 12,192 m		
Storage	-300 to 12,192 m		
Transport	-300 to 12,192 m		
Mechanical properties			
Installation	Permanent[6)]		
Dimensions			
Width	13 mm		
Height	98 mm		
Depth	105 mm		
Weight	118 g		
Vendor information			
Manufacturer	Toshiba		
Manufacturer's product ID	THNSNH060GBST	THNSNJ060WCST	THNSNJ060WCSU

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second

4) TBW = Terabytes written
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

5.2.1 Temperature/Humidity diagram

5AC901.CSSD-03 Rev. F0

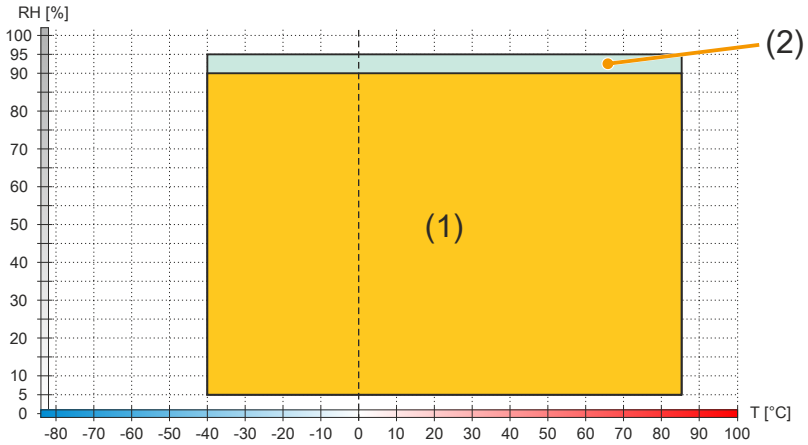


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AC901.CSSD-03 ≤ Rev. D0

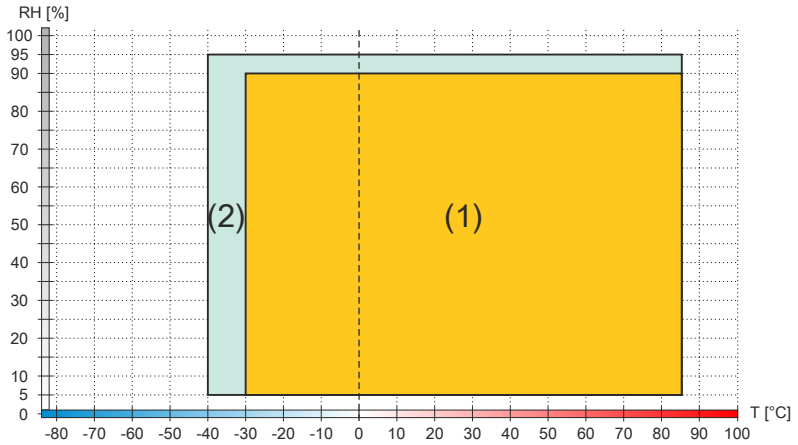


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AC901.CSSD-03 ≤ Rev. C0

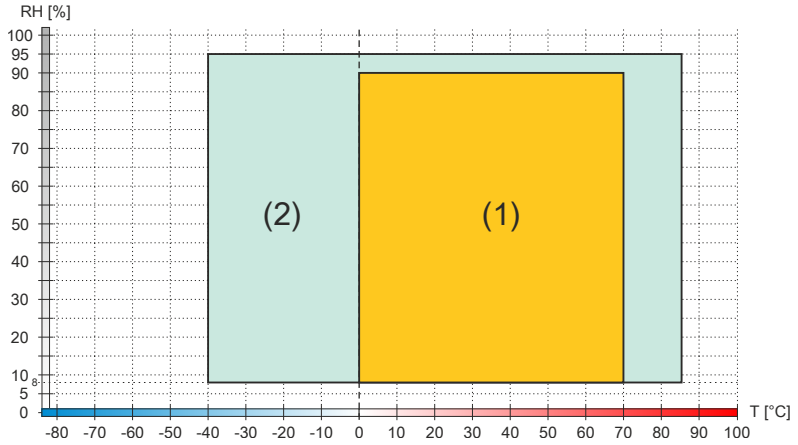


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

6 5AC901.CSSD-04

6.1 Technical data for Rev. H0 and later

Product ID	5AC901.CSSD-04
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C [1]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck) [2]
EAC	Product family certification
Solid-state drive	
Capacity	128 GB
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read
MTBF	Min. 3,000,000 h (at 25°C)
S.M.A.R.T. support	Yes
Interface	SATA
Servicing	None
Continuous reading	Max. 520 MB/s
Continuous writing	Max. 350 MB/s
IOPS [3]	
4k read	Max. 75,000 (random)
4k write	Max. 80,000 (random)
Endurance	
MLC flash memory	Yes
Data volume	
Theoretical	384 TBW [4]
Client workload	150 TBW [5]
Compatibility	SATA 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Ambient conditions	
Temperature	
Operation	-40 to 85°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Mechanical properties	
Installation	Permanent [6]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm

Product ID	5AC901.CSSD-04
Weight	118 g
Vendor information	
Manufacturer	Innodisk
Manufacturer's product ID	2.5" SATA SSD 3MV2-P 128 GB

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written.
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

6.1.1 Temperature/Humidity diagram

5AC901.CSSD-04 ≥ Rev. H0

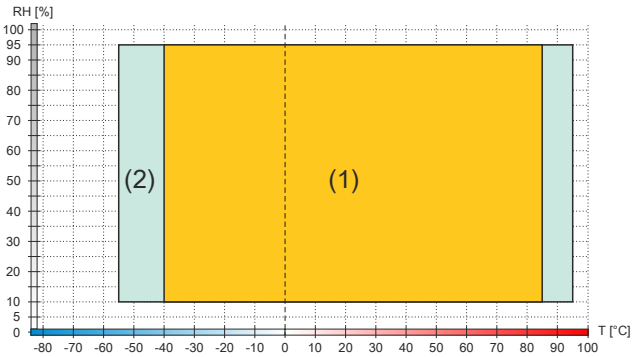


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

6.2 Technical data up to Rev. G0

Product ID	5AC901.CSSD-04			
Revision	**C0**	**D0**	**E0**	**G0**
General information				
Certifications				
CE	Yes			
UL	cULus E115267 Industrial control equipment			
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C[1)]			
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]			
EAC	Product family certification			
Solid-state drive				
Capacity	128 GB			
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read			
MTBF	Min. 1,500,000 h			
S.M.A.R.T. support	Yes			
Interface	SATA			
Servicing	None			
Continuous reading	Max. 510 MB/s			
Continuous writing	Max. 450 MB/s			
IOPS[3)]				
4k read	Max. 80,000 (random)	Max. 85,000 (random)		
4k write	Max. 35,000 (random)			
Endurance				
MLC flash memory	Yes			
Data volume				
Theoretical	384 TBW[4)]			
Client workload	74 TBW[5)]			100 TBW[5)]
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)			
Operating conditions				
Pollution degree per EN 61131-2	Pollution degree 2			
Ambient conditions				
Temperature				
Operation	0 to 70°C	-30 to 85°C		-40 to 85°C
Storage	-40 to 85°C			
Transport	-40 to 85°C			
Relative humidity				
Operation	8 to 90%, non-condensing	5 to 90%, non-condensing		
Storage	8 to 95%, non-condensing	5 to 95%, non-condensing		
Transport	8 to 95%, non-condensing	5 to 95%, non-condensing		
Vibration				
Operation	10 to 2000 Hz: 20 g			
Storage	10 to 2000 Hz: 20 g			
Transport	10 to 2000 Hz: 20 g			
Shock				
Operation	1500 g, 0.5 ms			
Storage	1500 g, 0.5 ms			
Transport	1500 g, 0.5 ms			
Elevation				
Operation	-300 to 12,192 m			
Storage	-300 to 12,192 m			
Transport	-300 to 12,192 m			
Mechanical properties				
Installation	Permanent[6)]			
Dimensions				
Width	13 mm			
Height	98 mm			
Depth	105 mm			
Weight	118 g			
Vendor information				
Manufacturer	Toshiba			
Manufacturer's product ID	THNSNH128GBST	THNSNJ128WBST	THNSNJ128WCST	THNSNJ128WCSU

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second

4) TBW: Terabytes written
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

6.2.1 Temperature/Humidity diagram

5AC901.CSSD-04 Rev. G0

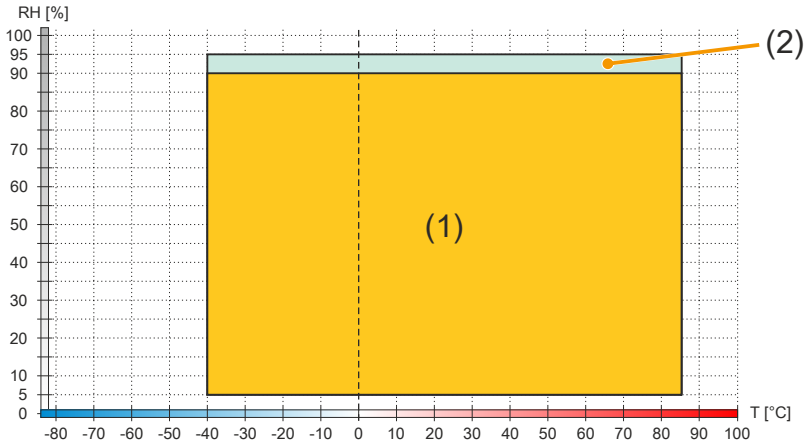


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AC901.CSSD-04 ≤ Rev. D0

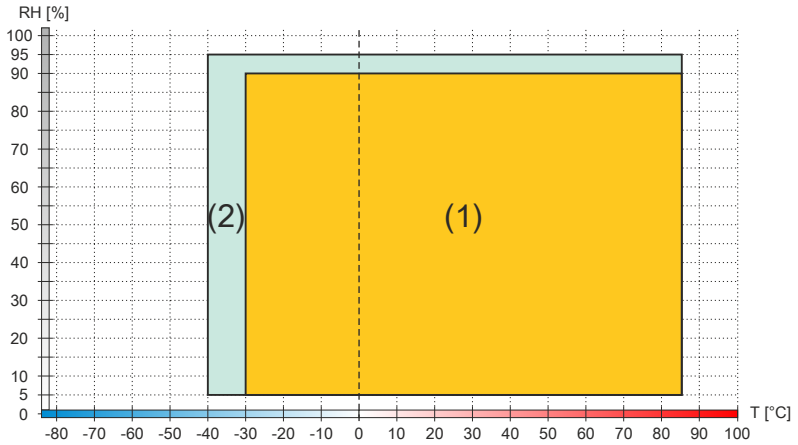


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AC901.CSSD-04 ≤ Rev. C0

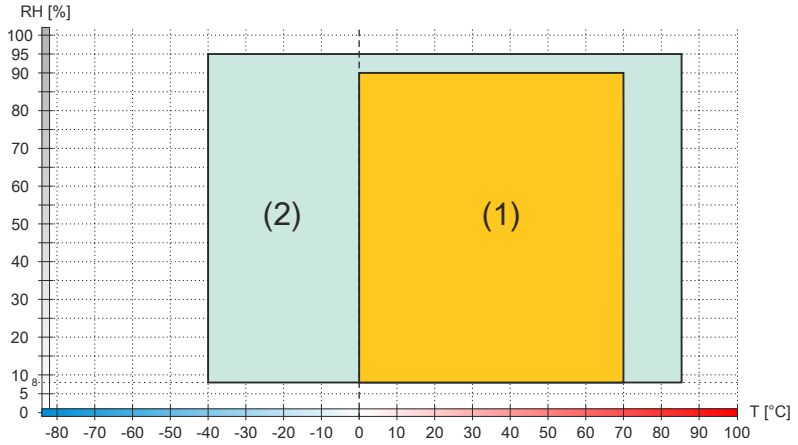


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

7 5AC901.CSSD-05

7.1 Technical data for Rev. F0 and later

Model number	5AC901.CSSD-05
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]
EAC	Product family certification
Solid-state drive	
Capacity	256 GB
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read
MTBF	Min. 3,000,000 h (at 25°C)
S.M.A.R.T. support	Yes
Interface	SATA
Servicing	None
Continuous reading	Max. 520 MB/s
Continuous writing	Max. 350 MB/s
IOPS [3)]	
4k read	Max. 75,000 (random)
4k write	Max. 83,000 (random)
Endurance	
MLC flash memory	Yes
Data volume	
Theoretical	768 TBW [4)]
Client workload	300 TBW [5)]
Compatibility	SATA 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Ambient conditions	
Temperature	
Operation	-40 to 85°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Mechanical properties	
Installation	Permanent [6)]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm

Model number	5AC901.CSSD-05
Weight	Approx. 130 g
Vendor information	
Manufacturer	Innodisk
Manufacturer's product ID	2.5" SATA SSD 3MV2-P 256 GB

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

7.1.1 Temperature/Humidity diagram

5AC901.CSSD-05 ≥ Rev. F0

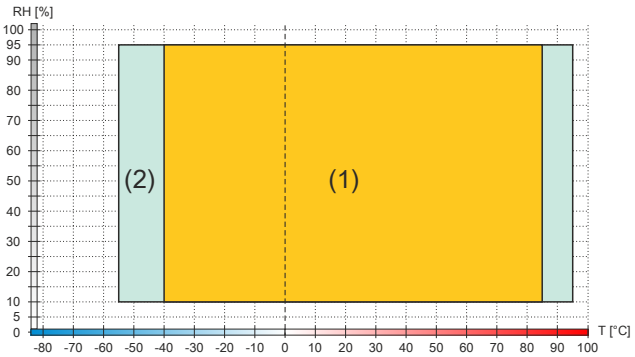


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

7.2 Technical data up to Rev. E0

Model number	5AC901.CSSD-05	
Revision	**E0**	**C0**
General information		
Certifications		
CE	Yes	
UL	cULus E115267 Industrial control equipment	
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C[1)]	
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]	
EAC	Product family certification	
Solid-state drive		
Capacity	256 GB	
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read	
MTBF	Min. 1,500,000 h	
S.M.A.R.T. support	Yes	
Interface	SATA	
Servicing	None	
Continuous reading	Max. 510 MB/s	
Continuous writing	Max. 460 MB/s	
IOPS [3)]		
4k read	Max. 90,000 (random)	
4k write	Max. 35,000 (random)	
Endurance		
MLC flash memory	Yes	
Data volume		
Theoretical	768 TBW [4)]	
Client workload	200 TBW [5)]	148 TBW [5)]
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)	
Operating conditions		
Pollution degree per EN 61131-2	Pollution degree 2	
Ambient conditions		
Temperature		
Operation	-40 to 85°C	-30 to 85°C
Storage	-40 to 85°C	
Transport	-40 to 85°C	
Relative humidity		
Operation	5 to 90%, non-condensing	
Storage	5 to 95%, non-condensing	
Transport	5 to 95%, non-condensing	
Vibration		
Operation	10 to 2000 Hz: 20 g	
Storage	10 to 2000 Hz: 20 g	
Transport	10 to 2000 Hz: 20 g	
Shock		
Operation	1500 g, 0.5 ms	
Storage	1500 g, 0.5 ms	
Transport	1500 g, 0.5 ms	
Mechanical properties		
Installation	Permanent [6)]	
Dimensions		
Width	13 mm	
Height	98 mm	
Depth	105 mm	
Weight	118 g	
Vendor information		
Manufacturer	Toshiba	
Manufacturer's product ID	THNSNJ256WCSU	THNSNJ256WCST

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

7.2.1 Temperature/Humidity diagram

5AC901.CSSD-05 ≥ Rev. E0

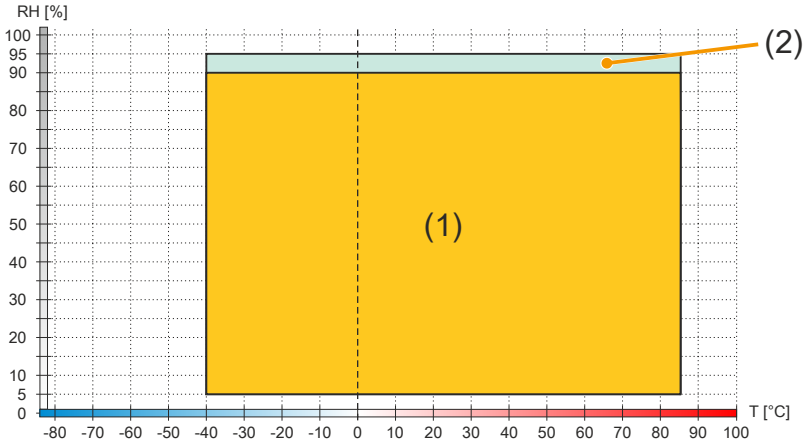


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

5AC901.CSSD-05 ≤ Rev. D0

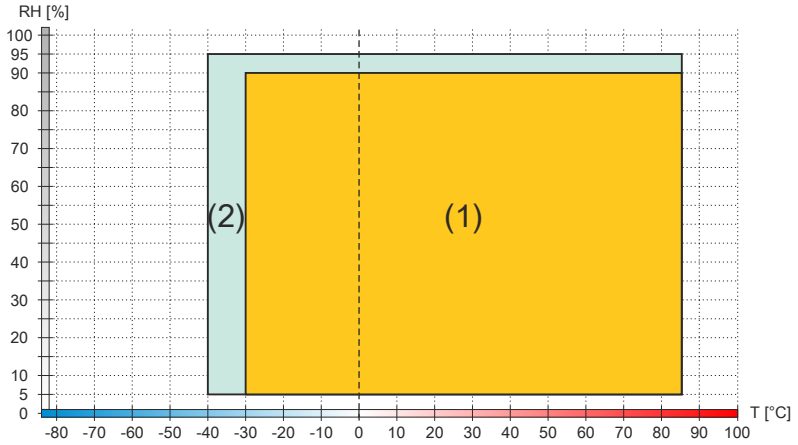


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

8 5AC901.CSSD-06

8.1 Technical data for Rev. D0 and later

Model number	5AC901.CSSD-06
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]
EAC	Product family certification
Solid-state drive	
Capacity	512 GB
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read
MTBF	Min. 3,000,000 h (at 25°C)
S.M.A.R.T. support	Yes
Interface	SATA
Servicing	None
Continuous reading	Max. 520 MB/s
Continuous writing	Max. 450 MB/s
IOPS [3)]	
4k read	Max. 75,000 (random)
4k write	Max. 76,000 (random)
Endurance	
MLC flash memory	Yes
Data volume	
Theoretical	1536 TBW [4)]
Client workload	600 TBW [5)]
Compatibility	SATA 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Ambient conditions	
Temperature	
Operation	-40 to 85°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Mechanical properties	
Installation	Permanent [6)]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm

Model number	5AC901.CSSD-06
Weight	Approx. 130 g
Vendor information	
Manufacturer	Innodisk
Manufacturer's product ID	2.5" SATA SSD 3MV2-P 512 GB

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client Workload laut JEDEC JESD219 Standard.
6) Slide-in compact installation.

8.1.1 Temperature/Humidity diagram

5AC901.CSSD-06 ≤ Rev. D0

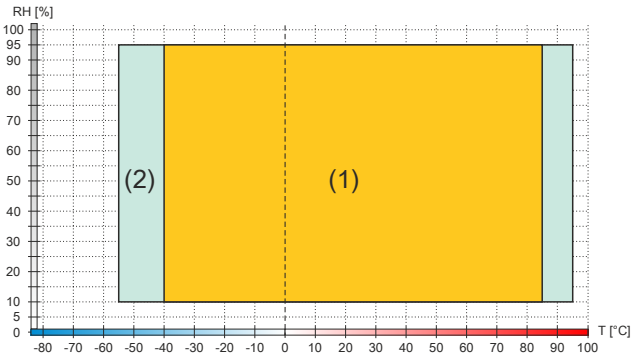


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

8.2 Technical data up to Rev. C0

Model number	5AC901.CSSD-06
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C[1)]
DNV GL	Temperature: **B** (0 - 55°C) Humidity: **B** (up to 100%) Vibration: **A** (0.7 g) EMC: **B** (bridge and open deck)[2)]
EAC	Product family certification
Solid-state drive	
Capacity	512 GB
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read
MTBF	Min. 1,500,000 h
S.M.A.R.T. support	Yes
Interface	SATA
Servicing	None
Continuous reading	Max. 510 MB/s
Continuous writing	Max. 460 MB/s
IOPS [3)]	
4k read	Max. 90,000 (random)
4k write	Max. 35,000 (random)
Endurance	
MLC flash memory	Yes
Data volume	
Theoretical	1536 TBW [4)]
Client workload	400 TBW [5)]
Compatibility	SATA 3.0 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Ambient conditions	
Temperature	
Operation	-40 to 85°C
Storage	-40 to 85°C
Transport	-40 to 85°C
Relative humidity	
Operation	5 to 90%, non-condensing
Storage	5 to 95%, non-condensing
Transport	5 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Mechanical properties	
Installation	Permanent [6)]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm
Weight	118 g
Vendor information	
Manufacturer	Toshiba
Manufacturer's product ID	THNSNJ512WCSU

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client Workload laut JEDEC JESD219 Standard.
6) Slide-in compact installation.

8.2.1 Temperature/Humidity diagram

5AC901.CSSD-06 ≤ Rev. C0

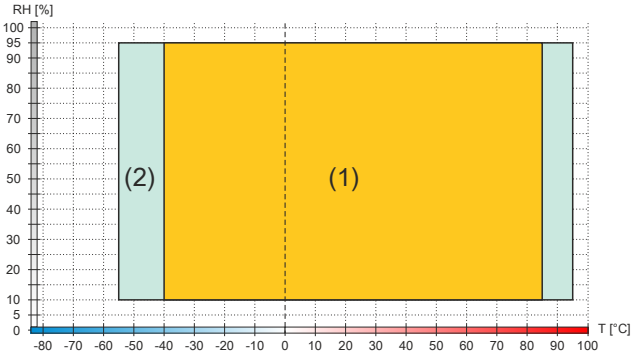


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

9 5AC901.CSSD-07

9.1 5AC901.CSSD-07 - Technical data

Model number	5AC901.CSSD-07
General information	
Certifications	
CE	Yes
UL	cULus E115267 Industrial control equipment
HazLoc	cULus HazLoc E180196 Industrial control equipment for hazardous locations Class I, Division 2, Groups ABCD, T3C[1)]
DNV GL	Temperature: **A** (0 - 45°C) Humidity: **B** (up to 100%) Vibration: **B** (4 g) EMC: **B** (bridge and open deck)[2)]
EAC	Product family certification
Solid-state drive	
Capacity	1024 GB
Data reliability	Max. 1 unrecoverable error per 10^{15} bits read
MTBF	Min. 3,000,000 h (at 25°C)
S.M.A.R.T. support	Yes
Interface	SATA
Servicing	None
Continuous reading	Max. 520 MB/s
Continuous writing	Max. 450 MB/s
IOPS [3)]	
4k read	Max. 75,000 (random)
4k write	Max. 78,000 (random)
Endurance	
MLC flash memory	Yes
Data volume	
Theoretical	3072 TBW [4)]
Client workload	1172 TBW [5)]
Compatibility	SATA 3.1 compliant ACS-2 SSD Enhanced SMART ATA feature set Native Command Queuing (NCQ)
Operating conditions	
Pollution degree per EN 61131-2	Pollution degree 2
Ambient conditions	
Temperature	
Operation	-40 to 85°C
Storage	-55 to 95°C
Transport	-55 to 95°C
Relative humidity	
Operation	10 to 95%, non-condensing
Storage	10 to 95%, non-condensing
Transport	10 to 95%, non-condensing
Vibration	
Operation	10 to 2000 Hz: 20 g
Storage	10 to 2000 Hz: 20 g
Transport	10 to 2000 Hz: 20 g
Shock	
Operation	1500 g, 0.5 ms
Storage	1500 g, 0.5 ms
Transport	1500 g, 0.5 ms
Mechanical properties	
Installation	Permanent [6)]
Dimensions	
Width	13 mm
Height	98 mm
Depth	105 mm

Model number	5AC901.CSSD-07
Weight	Approx. 130 g
Vendor information	
Manufacturer	Innodisk
Manufacturer's product ID	2.5" SATA SSD 3MV2-P 1 TB

1) Yes, but applies only if all components installed in the complete system have this certification and the complete system bears the corresponding mark.
2) Yes, but applies only if all components installed in the complete system have this certification and are listed on the associated DNV GL certificate for the product family.
3) IOPS: Random read and write input/output operations per second
4) TBW = Terabytes written
5) Client workload per JEDEC JESD219 standard.
6) Slide-in compact installation.

9.1.1 Temperature/Humidity diagram

5AC901.CSSD-07 ≤ Rev. C0

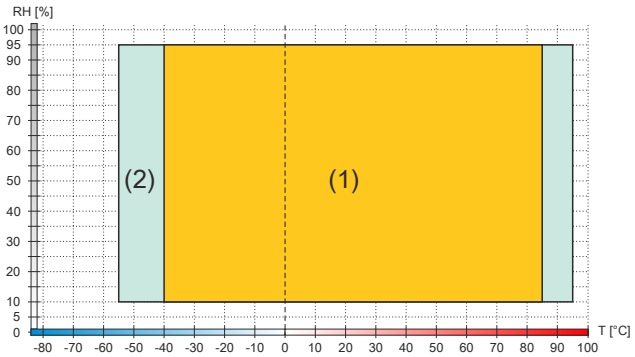


Diagram legend			
(1)	Operation	T [°C]	Temperature in °C
(2)	Storage and transport	RH [%]	Relative humidity (RH) in percent and **non-condensing**

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