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## **Subject to technical changes**

Owing to our policy of continuous product development, the illustrations and technical data contained in this document may differ slightly from the current version of the device.

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- Read these operating instructions carefully before starting up the system! See the SonoTT™ SkyLark series manual for full details. This document is intended for the SonoTT™ SkyLark silver with the ID13145.
- The user (=the person who integrates the SonoTT™ SkyLark silver into a host system) is responsible for any risk if the SonoTT™ SkyLark silver is not integrated correctly.
- Inspect your board for completeness and damage when unpacking it for the first time.
- The customer must ensure that the persons involved in the integration of the SonoTT™ SkyLark silver are adequately certified. In addition, the information in this manual and the SonoTT™ SkyLark series manual must be followed.
- The SonoTT™ SkyLark silver consists of components sensitive to electrostatic discharge. Handle only in ESD-protected areas according to *IEC 61340-5-2!*
- Before every measurement, a zero adjustment must be carried out to avoid possible offsets of measured values. When doing so, the SonoTT™ Clamp-On Transducer must be clamped at the right location on the tube. The tube must be filled with liquid and the liquid must not move. Ensure that there are no air bubbles in the tube. Also allow for sufficient time to adjust for a stable temperature profile. Only then is the system ready for measurements.
- The SonoTT™ SkyLark silver and the SonoTT™ Clamp-On Transducer are components which must be tested (integration tests) and approved in combination with the host system by the customer.

This instruction and the SonoTT™ SkyLark series manual contain important information concerning the safe handling of the SonoTT™ SkyLark silver and its accessories. They concern the software version 2.0.0.0. and the hardware version 6.0 as well as all subsequent ones. Read this operating instruction and the SonoTT™ SkyLark series manual carefully before using the product and its accessories, and keep them in an easily accessible location. Familiarize yourself with all warning and safety information and observe them. It is the responsibility of the operator to ensure that the SonoTT™ SkyLark silver is used, inspected and maintained in accordance with the operating instructions. This also applies for all subsequent revisions or instructions from the manufacturer. The manufacturer reserves the right to modify technical data without prior notice. Upon request, em-tec GmbH will provide additional information in regard to installation and integration of the SonoTT™ SkyLark silver into a host system.

## 1 Intended Purpose, Restrictions and Limitations

### 1.1 Intended Purpose

The SonoTT™ SkyLark silver and SonoTT™ Clamp-On Transducer are designed for the integration as OEM part into a host system. The SonoTT™ SkyLark silver, in combination with a SonoTT™ Clamp-On Transducer, is intended for measuring the volumetric flow of liquids through tubing systems (SonoTT™ Clamp-On Transducer), vessels (Vascular Probe) or customized SonoTT™ Clamp-On Transducers by em-tec GmbH. The measurement principle is the ultrasonic transit-time method. The products of the SonoTT™ SkyLark series provide an analysis of drops in the acoustic coupling, which can be used for bubble detection. The detection of bubbles depends on the parameter setting and the sensor/tube combination.

The medical application of the host system is mainly based in hospitals, intensive care and operating theatres. The industrial application of the host system is usually in laboratory and industrial processes as well as in bioprocessing.

### 1.2 Usage Restrictions and Limitations

The SonoTT™ SkyLark silver is constructed and sold for the above-mentioned intended purpose only.

The SonoTT™ SkyLark silver is not intended to be used:

- for legal metrology
- for measuring gaseous media
- for measurements in explosive areas

Due to its single channel structure, the SonoTT™ SkyLark silver is not a fail-safe system. If applied in safety-critical systems, the user has to consider a partial or complete system failure and is responsible for the introduction of additional risk measures in their system (e.g. air trap if the bubble detection feature will be used).

## 2 Specific Board Configuration

-CAN interface only.

-Flow output fast (200Hz).

-Power supply voltage  $3.3V \pm 2.5\%$  DC (also refer to chapter 4.2 in the SonoTT™ SkyLark series manual).

-Connections:

- direct PCB mounting over 40-pin Samtec connector (for pinning refer to connector 2 in chapter 4.2 in the SonoTT™ SkyLark series manual)
- over 9-pin JST connector (for pinning refer to connector 3 in chapter 4.2 in the SonoTT™ SkyLark series manual)

### 3 Communication



- The entire communication from SonoTT™ SkyLark silver is CRC 16 protected. The host system shall check the CRC protection to detect data corruption on the data transmission path. For CRC information, refer to the corresponding chapter in the SonoTT™ SkyLark series manual.
- For the CAN communication, the host system shall check the message counter to detect a frozen communication.

The SonoTT™ SkyLark silver with the ID 13145 is configured as follows:

- Measurement starts automatically after sensor load.
- Measurement period of 500 microseconds.
- External trigger (IN/OUT) disabled.
- UART communication disabled.

#### 3.1 CAN Communication

For more general information about the CAN communication, refer to the SonoTT™ SkyLark series manual.

##### 3.1.1 CAN baud rate

The UART baud rate configured for the SonoTT™ SkyLark silver is 1000kBit.

##### 3.1.2 Message period for the CAN message set 1

The message period for the CAN message set 1 of the SonoTT™ SkyLark silver is set to 1s.

##### 3.1.3 Message period for the CAN message set 2

The message period for the CAN message set 2 of the SonoTT™ SkyLark silver is set to 1ms.

##### 3.1.4 CAN ID

The CAN ID of the SonoTT™ SkyLark silver is set to ID 48(=0x30).

### 3.1.5 CAN output parameters of message set 1

The output message is transmitted to the host system without any request message from the host system. The output message is as follows.

Register Value: {0xF3, 0x02, 0x17, 0x1A, 0x22}

Output messages:

3008EAF3xxxxyyyy	<b>Parameter 1:</b> Combination of <b>error (2 Bytes)</b> and <b>status (2 Bytes)</b> in little-endian format <b>Note:</b> for error and status information refer to the SonoTT™ SkyLark series manual
3018EA02 ...	<b>Parameter 2:</b> Coupling value in little-endian format
3028EA17 ...	<b>Parameter 3:</b> Fast flow value (averaged over 100 values, 50ms) as signed in little-endian format
3038EA1A ...	<b>Parameter 4:</b> Moderate flow value (averaged over 1000 values, 500ms) as signed in little-endian format
3048EA22 ...	<b>Parameter 5:</b> Board temperature as signed in little-endian format multiplied with factor 10

### 3.1.6 CAN output parameters of message set 2

The output message is transmitted to the host system without any request message from the host system. The output message is as follows.

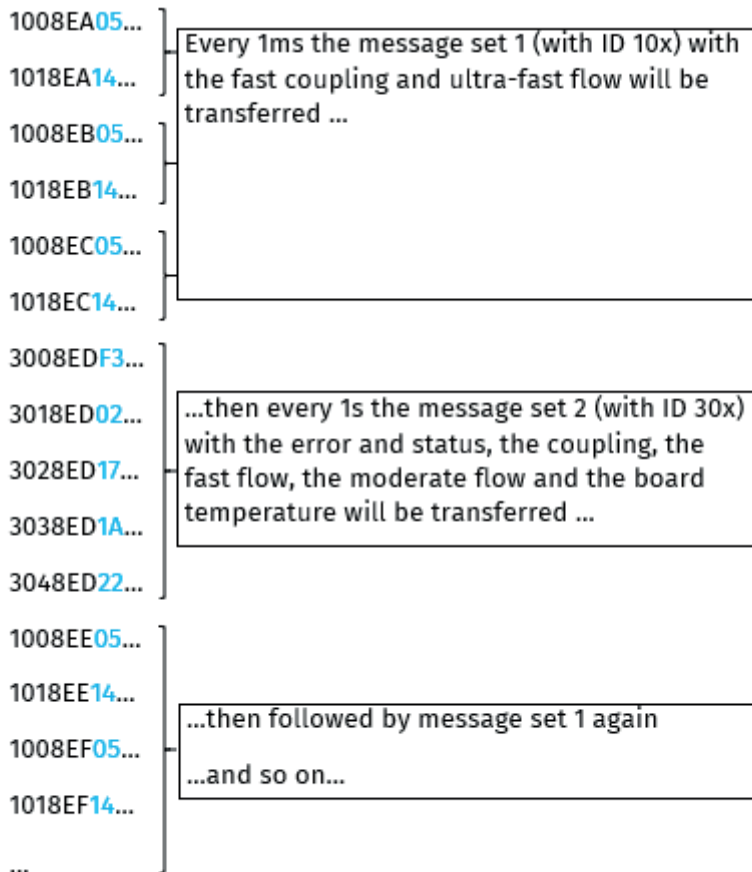
Register Value: {0x05, 0x14}

Output messages

1008EA05 ...	<b>Parameter 1:</b> Fast coupling value in little-endian format.
3018EA14 ...	<b>Parameter 2:</b> Ultra-fast flow value (averaged over 10 values, 5ms) as signed in little-endian format.

### 3.1.7 Combination of the two message sets described in chapter 2.1.5 and 2.1.6

The message sets are combined and transferred as follows:



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