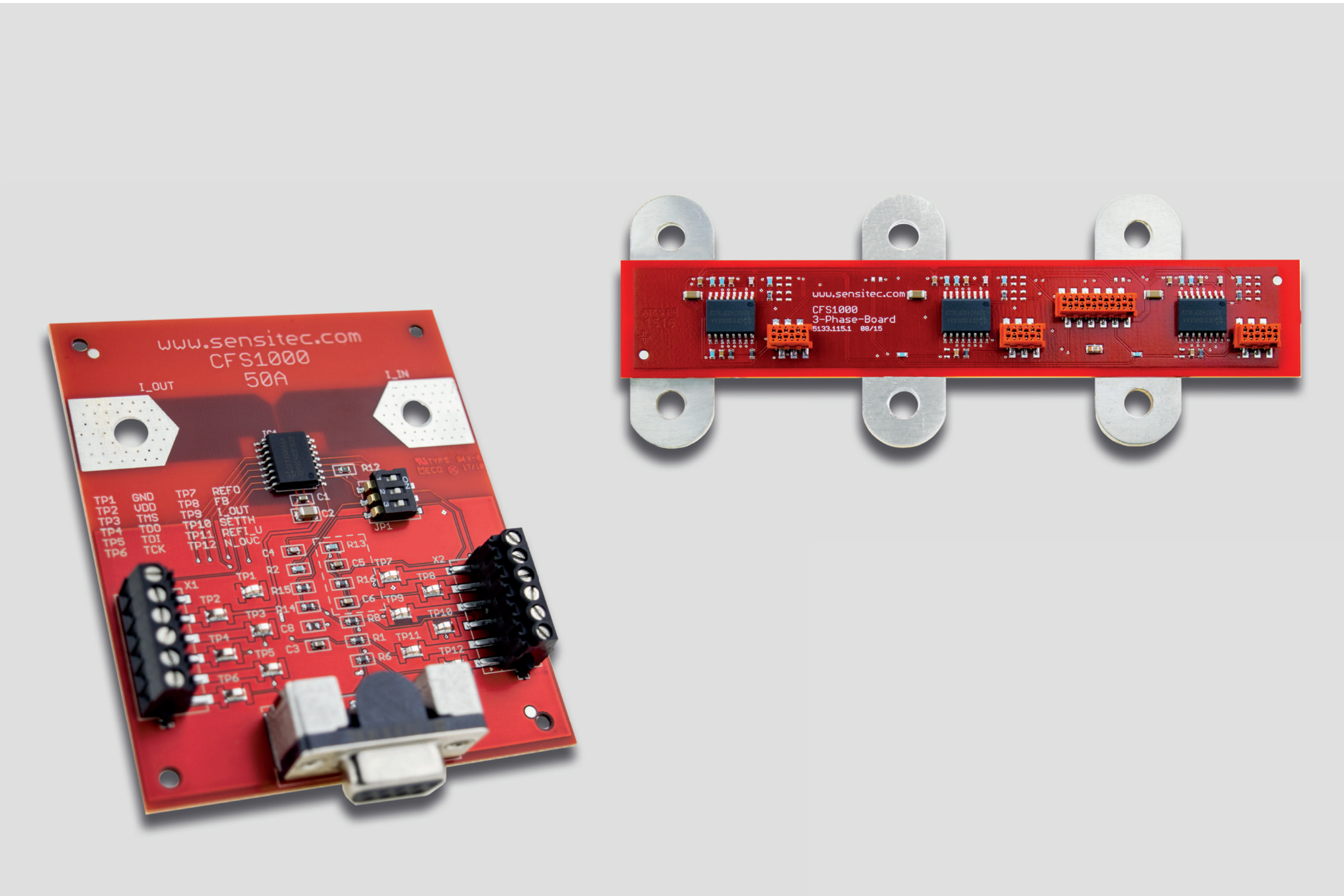
SENSITEC
KÖRBER SOLUTIONS

APPLICATION NOTE

CFK1xxxAAA
CFK1xxxABA
CFK1xxxACA

MagnetoResistive Current Sensor Evaluation Boards



Content

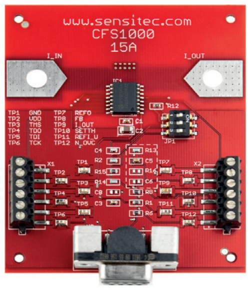
1. Introduction

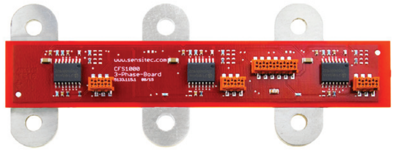
The CFK1000 evaluation board offers the opportunity to experience the features and benefits of the CFS1000 current sensors in a quick and simple manner.

The primary current to be measured can be directly connected via screwed connections to a busbar or a cable connector. On the secondary side all signal pins of the CFS1000 sensor can easily be accessed via screw or additional test pin terminals.

A standard D-SUB connector is used to connect the evaluation board to the CFP1000 programming interface unit for recalibration. A DIP switch allows to easily change the circuit configuration in order to test the various functions of CFS1000 like the adjustable overcurrent detection, the usage of an external reference voltage or the possibility to scale the output current.

Various Single-Phase evaluation boards are available with different current ranges from 15 A up to 400 A nominal current, using either the PCB or an external busbar as primary current conductor. Additionally, one Triple-Phase evaluation board for 200 A current range is available.





Electrical Data

This document shall be used in combination with the data sheet of the CFS1000 current sensor, containing further detailed information. The latest data sheet is available on the internet at www.sensitec.com.

Symbol	Parameter	Min.	Typ.	Max.	Unit
V_{DD}	Supply voltage	4.75	5	5.25	V
d_{Cl}	Clearance distance	5.5	-	-	mm

Absolute Maximum Ratings

In accordance with the absolute maximum rating system (IEC60134).

Symbol	Parameter	Min.	Max.	Unit
V_{DD}	Supply voltage	-0.3	+7	V
T_J	Junction temperature [1]	-40	+150	°C
T_{stg}	Storage temperature	-40	+85	°C

[1] Restrictions on thermal testing with CFK1000 see also chapter 5.

Handling Instructions

– The CFS1000 evaluation board is exclusively designed for evaluating and analyzing the functions of CFS1000 current sensors and only for utilization under laboratory conditions.

– Ensure a good thermal connection of primary current conductor. This has a direct influence on the heat generation in the PCB and thereby, the operating life of the demoboard and the accuracy of the sensor.

Features

– Internal or external reference voltage
– Adjustable overcurrent detection
– On-board filter for frequency response optimization
– On-board programming interface for calibration

Advantages

– No additional engineering effort necessary for test and evaluation
– Simple handling due to common test points and PCB connectors
– Easy switching between current and voltage output signal

Applications

– Test and evaluation of CFS1000 current sensors under laboratory conditions

Applicable Documents

– CFS1000 Datasheet
– CFP1000 Programming Manual
– Calc-U-Bar Software Manual

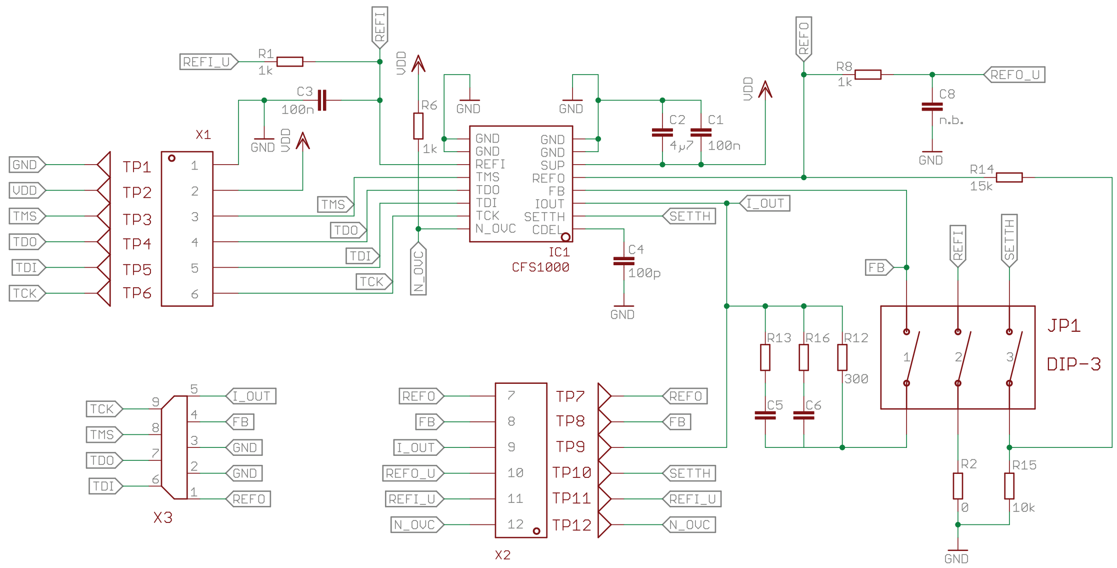
ESD

RoHS-Compliant www.sensitec.com

2. Single-Phase

For this board, the primary current I_{PN} can be fed in easily via large contact points. All sensor signals can be easily reached using screw or measurement terminals. These pre-calibrated boards are perfectly suited for evaluating the sensor performance in the user's application in laboratory scale.

2.1 Circuit Diagram



RC-Filter Parameter				
Sensor	**R13 (kΩ)**	**C5 (nF)**	**R16 (kΩ)**	**C6 (nF)**
CFK1015AAA	0	0.33	-	-
CFK1025AAA	0	0.33	-	-
CFK1050AAA	0	0.68	3.3	2.2
CFK1100ABA	0	0.82	-	-
CFK1250ABA	0.62	3.3	1.8	68
CFK1400ABA	0.82	4.7	1.5	100

Fig. 1: Circuit diagram and filter configuration of single-phase CFK1000 evaluation boards.

2.2 Pinning of Terminals and Test Points

The evaluation boards offers multiple possibilities to access the sensor signals. Two screw connectors with 6 pins each (X1, X2) and one D-Sub socket with 9 pins (X3).

Pin		Signal	Function
X1.1	TP1	GND	Ground
X1.2	TP2	V_{DD}	Supply voltage (5 V)
X1.3	TP3	TMS/rsv1	Programming interface (JTAG)
X1.4	TP4	TDO/rsv2	Programming interface (JTAG)
X1.5	TP5	TDI/rsv3	Programming interface (JTAG)
X1.6	TP6	TCK/rsv4	Programming interface (JTAG)
X2.7	TP7	REFO	Reference output voltage (2.5 V or REFI_U)
X2.8	TP8	FB	Feedback input for I_OUT
X2.9	TP9	I_OUT	Sensor current output
X2.10	-	REFO_U	Optional filtered reference output
-	TP10	SETTH	Overcurrent detection threshold
X2.11	TP11	REFI_U	Input external reference voltage
X2.12	TP12	N_OVC	Overcurrent detection output
		I_{PN_IN}	Primary current input
		I_{PN_OUT}	Primary current output

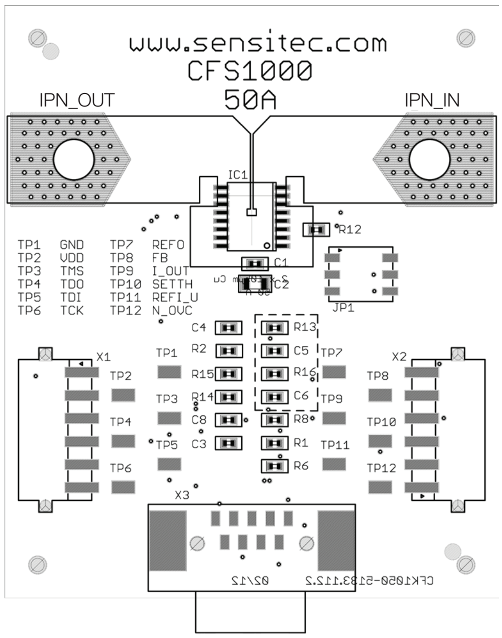


Fig. 2: Overview of a CFK1000 evaluation board (exemplary CFK1050AAA).

2.3. Description – Single-Phase

Power Supply

The evaluation board provides two terminals for power supply. TP1 (GND) and TP2 (V_{DD}) are used for supply with 5 V (± 5%). The sensor is buffered by a 100 nF (C1) and 4.7 µF (C2) capacitor to ensure fast compensation in situations of sudden primary current change. Connecting the power supply is also required if the programming interface (CFP1000) is connected to the evaluation board.

Initial Operation

In the initial default configuration of the demoboard, all switches JP1.1 to JP1.3 on JP1 DIP-3 (comp. Fig. 1) are closed (on-position). The sensor output current is converted to a voltage by means of R12 (300 Ω), flowing from I_OUT across R12 and JP1.1 back to FB. In parallel to R12, filter impedances (R13 and C5 as well as R16 and C6) are connected in order to improve the frequency behavior. If JP1.2 is closed, the CFS1000 uses its internal reference voltage of 2.5 V. The overcurrent detection threshold is set to 2.5 times nominal current by the voltage divider R14 and R15 if JP1.3 is closed.

In this default configuration the differential sensor signal is available across TP9 and TP8. For single-ended A/D-conversion TP9 (I_OUT) and TP1 (GND) should be used. The overcurrent alarm output is available on TP12. The reference voltage is available on TP7.

Scaled Output Signal (JP1.1)

If switch JP1.1 is opened, the current output is enabled. R12 has no effect anymore and a different burden resistance can be connected between TP8 and TP9 in order to enable scaling of the output signal. Please refer to the datasheet of the CFS1000 for the permitted range of the burden resistance. Placing the burden resistor close to the signal conditioning location (e.g. ADC inputs) helps to reduce EMC influences on the sensor signal as a robust current output signal is used. In this case (JP1.1 opened) also the RC filters need to be replaced as the on-board filters have no effect if JP1.1 is opened. Moving the filters out of the EMC polluted area near the busbar to the signal conditioning location will also reduce inductive and capacitive coupled noise peaks on the output signal. If the burden resistance is changed significantly, also the impedance of the filters R13 and C5 as well as R16 and C6 need to be adapted.

As the burden resistor changes the voltage gain, also the voltage on SETTH needs to be adapted as the overcurrent threshold depends on the voltage gain.

External Reference (JP1.2)

JP1.2 enables the use of an external reference voltage. If switched on, the internal reference of 2.5 V (±0.01 V) is used as the REFI pin of the IC is forced to GND.

If JP1.2 is opened, an external reference voltage in the range between 1.2 V and 2.6 V can be connected to the reference voltage input REFI_U (TP11). A 1.5 kHz low pass filter (R1; C3) is used for noise reduction. The external reference voltage provides a new reference level for the output stage and thus, is also available on TP7 (REFO).

Note:

- If REFI is floating (no voltages signal connected), the CFS1000 may not operate properly.
- Optional low pass filtering of the reference voltage output REFO_U (available only at PCB connector) is possible by adding a capacitor C8.

Overcurrent Detection (OVC)

The CFS1000 current sensor provides a digital comparator output (N_OVC) to report primary current overloads. The N_OVC output on TP12 is pulled low if the voltage between TP9 (I_OUT) and TP8 (FB) exceeds the threshold that is set between TP7 (REFO) and TP10 (SETTH). If JP1.3 is opened a user defined threshold voltage can be applied to TP10. To avoid unwanted triggering of the overcurrent detection in the event of short spikes or other transient effects on the primary current line, a delay time can be adjusted via the capacitor C4.

3. Triple-Phase

For this board, the primary currents I_{PN} (1, 2 and 3) can be fed in easily via large contact points at the external busbars. All sensor signals can be easily reached using measurement sockets. This pre-calibrated board is perfectly suited for evaluating the sensor performance in the user's application in laboratory scale. For example when connecting it to a three-phase power inverter (Six-Pack).

3.1 Circuit Diagram

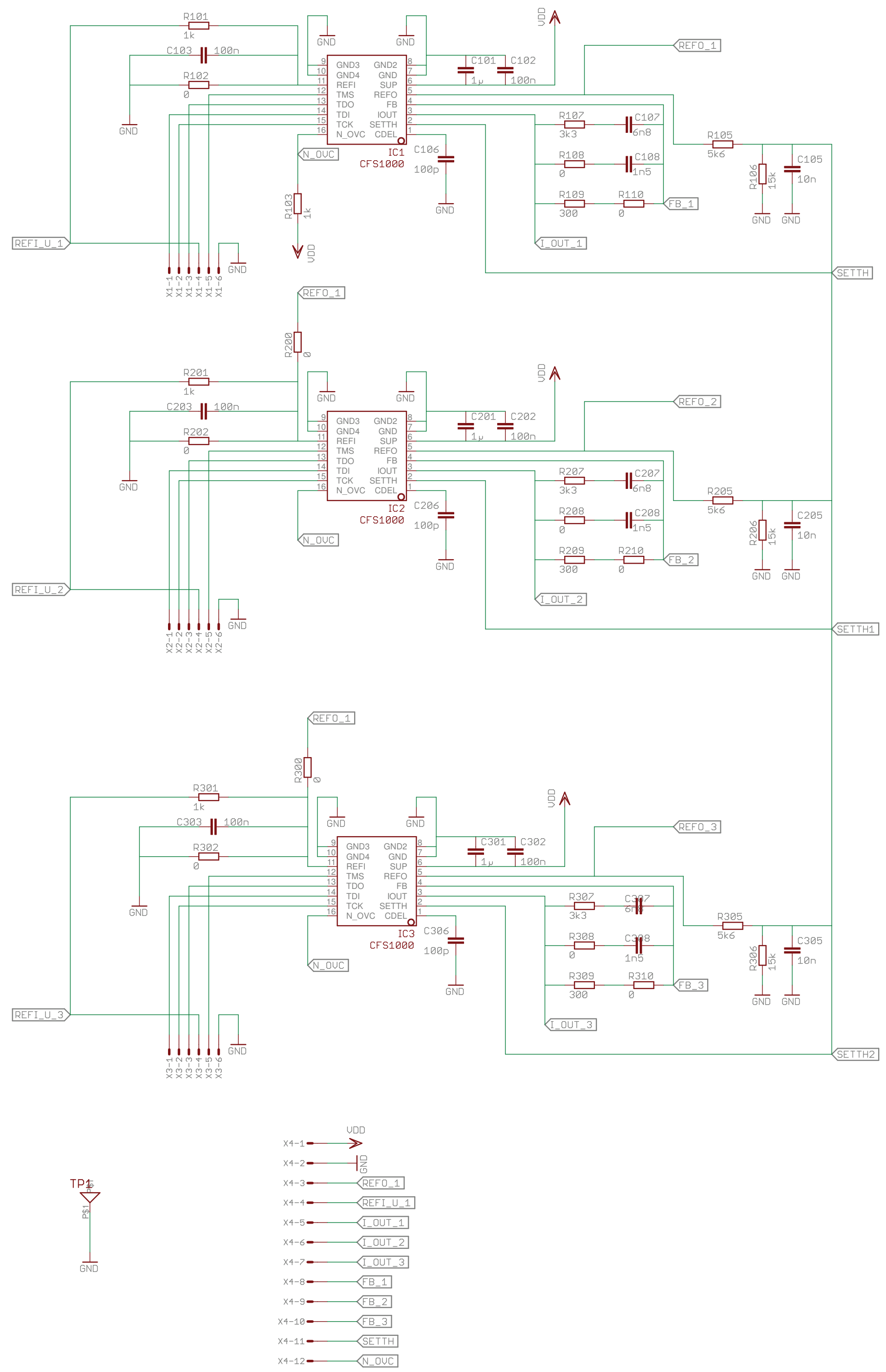


Fig. 3: Circuit diagram and filter configuration of triple-phase CFK1000 evaluation board.

3.2 Pinning of Terminals and Test Points

The evaluation board offers one socket with 6 pins for each CFS1000 (X1, X2, X3) and a 12 pin socket (X4) to access the sensor signals.

Pin	Signal	Function
X1-1	TDI/rsv3	Programming interface (JTAG)
X1-2	TCK/rsv4	Programming interface (JTAG)
X1-3	TDO/rsv2	Programming interface (JTAG)
X1-4	REFI_U_1	Input external reference voltage
X1-5	TMS/rsv1	Programming interface (JTAG)
X1-6	GND	Ground
X2-1	TDI/rsv3	Programming interface (JTAG)
X2-2	TCK/rsv4	Programming interface (JTAG)
X2-3	TDO/rsv2	Programming interface (JTAG)
X2-4	REFI_U_2	Input external reference voltage
X2-5	TMS/rsv1	Programming interface (JTAG)
X2-6	GND	Ground
X3-1	TDI/rsv3	Programming interface (JTAG)
X3-2	TCK/rsv4	Programming interface (JTAG)
X3-3	TDO/rsv2	Programming interface (JTAG)
X3-4	REFI_U_3	Input external reference voltage
X3-5	TMS/rsv1	Programming interface (JTAG)
X3-6	GND	Ground
X4-1	V_{DD}	Supply voltage (5 V)
X4-2	GND	Ground
X4-3	REFO_1	Reference output voltage (2.5 V or REFI_U)
X4-4	REFI_U_1	Input external reference voltage
X4-5	I_OUT_1	Sensor current output (IC1)
X4-6	I_OUT_2	Sensor current output (IC2)
X4-7	I_OUT_3	Sensor current output (IC3)
X4-8	FB_1	Feedback input for I_OUT_1
X4-9	FB_2	Feedback input for I_OUT_2
X4-10	FB_3	Feedback input for I_OUT_3
X4-11	SETTH	Overcurrent detection threshold
X4-12	N_OVC	Overcurrent detection output

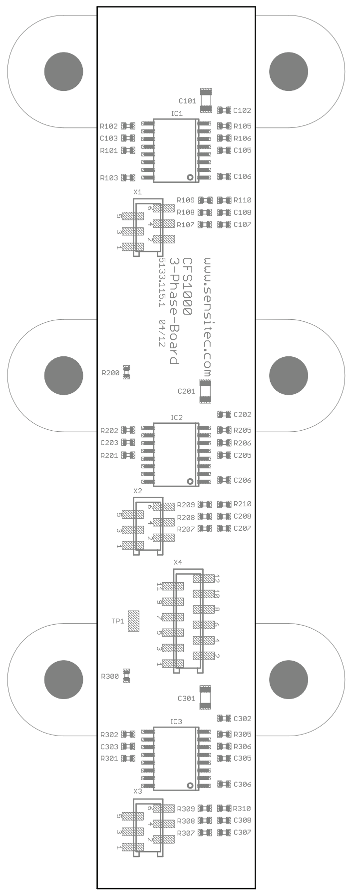


Fig. 4: Overview of evaluation board CFK1200.

3.3 Description – Triple-Phase

Power Supply

The evaluation board provides two terminals for power supply. X4-1 (V_{DD}) and X4-2 (GND) are used for supply with 5 V (± 5%). Each sensor element is buffered by a 1 µF (Cx01) and 100 nF (Cx02) capacitor to ensure fast compensation in situations of sudden primary current change (whereby Cx01 means C101, C201, C301 and so on). Connecting the power supply is also required if the programming interface (CFP1000) is connected to the evaluation board.

Initial Operation

The sensor output current is converted to a voltage by means of Rx09 (300 Ω), flowing from I_OUT across Rx09 back to FB. In parallel to R12, filter impedances (Rx07 and Cx07 as well Rx08 and Cx08) are connected in order to improve the frequency behavior. The CFS1000 uses its internal reference voltage of 2.5 V (±0.01 V). The overcurrent detection threshold is set to nominal current (200 A) plus about 10% safety margin by the voltage divider Rx05 (5.6 kΩ) and Rx06 (15 kΩ).

In this default configuration, the differential sensor signals are available across X4-5 and X4-8 for IC1, X4-6 and X4-9 for IC2 as well as X4-7 and X4-10 for IC3. For single-ended A/D-conversion I_OUT and GND should be used. The overcurrent alarm output is available on X4-12. The reference voltage is available on X4-3.

Overcurrent Detection (OVC)

The CFS1000 current sensor provides a digital comparator output (N_OVC) to report primary current overloads. The N_OVC output on X4-12 is pulled low if the voltage between I_OUT and FB of the corresponding IC exceeds the threshold that is set between their REFO and SETTH. To avoid unwanted triggering of the overcurrent detection in the event of short spikes or other transient effects on the primary current line, a delay time can be adjusted via the capacitor Cx06.

4. Usage of CFS1000 Pins

CDEL (Pin 1)

CDEL defines the delay time for the overcurrent detection. The intrinsic delay time (minimum delay) of the overcurrent detection is valid for an open pin CDEL and is ≤ 500 ns. This delay time $t_{ovc(D)}$ can be adjusted by a capacitor at CDEL to ground according to the formula:

$$T_{OVC(D)} = 500\,\text{ns} + 20\,\frac{\text{ns}}{\text{pF}} \cdot C_{DEL}$$

The maximum delay is typically 15 µs if pin 1 is connected to ground or to a capacitor of sufficient size according to the formula above. On the CFK1xxx single-phase evaluation boards, C4 is set to 100 pF resulting in a total delay time of 2.5 µs (500 ns + (20 ns/pF) x 100 pF = 2500 ns = 2.5 µs).

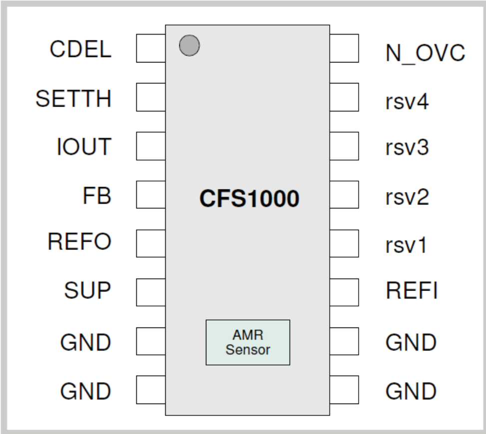


Fig. 5: Pinout of CFS1000.

SETTH (Pin 2)

SETTH is used to define the threshold for the overcurrent detection (alarm output N_OVC). V_{SETTH} is defined by the resistor divider R14 and R15 in Fig. 1, (exemplary for single-phase) connected to the reference voltage at REFO (nominal 2.5 V). V_{SETTH} can be set in the range from 0.5 V to (V_{REFO} – 0.2 V) on TP10 after JP1.3 is opened. (Please note that TP10 is the only test point that is not connected to the PCB connectors). In order to calculate V_{SETTH} the following equation (comp. datasheet CFS1000) needs to be solved.

$$|\,I_{OUT}\,| = I_{OUT\,max} > \frac{V_{REFO}}{R_M} \cdot \left(1 - \frac{V_{SETTH}}{V_{REFO}}\right)$$

$$V_{SETTH} = V_{REFO} - R_M \cdot I_{OUT\,max} \quad \text{with} \quad I_{OUT\,max} = I_{PRIM\,max} \cdot \frac{I_{OUTnom}}{I_{PRIMnom}}$$

As the initial configuration (JP1.1 closed) sets the threshold for the OVC to 2.5 times nominal primary current, V_{SETTH} is calculated to 1 V (with V_{REF} = 2.5 V, RM = 300 Ω, $I_{PRIMmax}$ = 2.5 · $I_{PRIMnom}$, I_{OUTnom} = 2 mA). With R15 set to 10 kΩ, R14 is calculated to R15 · (V_{REF} - V_{SET}) / V_{SET}) = 15 kΩ.

N_OVC will be driven LOW as soon as (I_OUT · RM) is larger than (V_{REFO} - V_{SET}). This happens for the initial configuration of the evaluation board if I_{OUT} > 2.5 · I_{OUTnom} > 2.5 · 2 mA > 5 mA, as 5 mA · 300 Ω = 1.5 V and V_{REFO} - V_{SET} = 2.5 V – 1 V = 1.5 V.

IOUT (Pin 3)

I_OUT represents the output signal of the device, which delivers an output current proportional to the measured primary current. This output current is bidirectional with a target amplitude trimmed to ±2 mA for nominal primary current. The output current has to be fed back into FB pin via the burden resistance RM.

FB (Pin 4)

FB is the input for the feedback loop. It is connected via RM to I_OUT.

REFO (Pin 5)

REFO is the reference voltage output of typ. 2.5 V with REFI connected to GND. In case of single-phase evaluation board, if J1.2 is opened, an external reference voltage can be applied (see also comment on Pin 11). It is not recommended to open J1.2 without connecting a voltage source to TP11. In that case; the reference voltage is undefined and the CFS1000 may show problems to enter operating mode after power on.

SUP (Pin 6)

SUP is the CFS1000 supply voltage. Connect to 5 V.

GND (Pins 7, 8, 9, 10)

Make sure to connect the GND line of the measurement device that is used to measure the sensor output voltage (e.g. a multimeter) as close to the sensor as possible, as the sensor supply current results in a voltage drop on the GND line that varies with the primary current.

REFI (Pin 11)

REFI is used to choose between the internal and external reference voltage. If $0\ V \leq V_{REFI} \leq 0.5\ V$, the internal reference voltage of typ. 2.5 V is used. In case of single-phase evaluation board, if JP1.2 is open, a voltage $1.2\ V \geq V_{REFI} \geq 2.6\ V$ can be applied to TP11 (REFI_U). This external reference voltage is also available at REFO, using an internal buffer. An external reference < 2.5 V is used for example if the ADC is using 3.3 V.

If more than one sensor is used in the application, e.g. in a Triple-Phase inverter, the internal reference of the first sensor can be fed to the external references of the other sensors. This way, all three sensors use the same reference voltage which improves the overall accuracy of the whole system.

rsv1 (TMS), rsv2 (TDO), rsv3 (TDI), rsv4 (TCK) (Pins 12, 13, 14, 15)

Programming interface, available on DSUB connector for programming the CFS1000 sensor in combination with CFP1000 programming interface. Please refer to the programming manual for the different programming modes.

N_OVC (Pin 16)

N_OVC is the active-low overcurrent alarm output. Please refer to the detailed explanations on **SETTH** for further information.

5. Additional Notes for the Designer

Electric Testing

– In order to evaluate the sensor's **accuracy in the temperature range** it is allowed to do thermal testing in the range from -40 °C to 125 °C ambient, including the temperature of the PCB in direct proximity of the sensor. For biased testing with primary current it is recommended to monitor the temperature of the sensor by using non-magnetic temperature sensor elements, as the heat generated by the primary conductor (either inside the PCB or external busbar) additionally increases the sensor temperature above ambient temperature and thus, causes additional drift.

  For the evaluation boards standard FR4 material is used. Due to the thermal expansion of the PCB the distance between the primary current line and the sensor element increases resulting in an increased sensitivity (gain) error in the temperature range.

  It is not recommended to apply PCB temperature above 125 °C for an extended period of time due to the known aging effects of FR4.

– **Signal dynamics** are easily tested by applying a current step to the primary current bar. This can for example be realized by disrupting a capacitor discharge using an IGBT and an inductor in order to generate fast current steps. Be sure to use a reference measurement equipment with sufficient bandwidth in your test setup like a Rogowski coil, a CT-transducer, a lab current probe or a coaxial shunt. The frequency response may be calculated by performing a Fast Fourier Transform (FFT) of the pulse.

  If the primary current increases fast, like in switched power applications, overshoots in the step response of the CFS1000 may occur which are caused by the skin effect in the current bar. In order to reduce the overshoot in the step response as well as the equivalent amplitude rise in the frequency response, the skin effect can be easily compensated by using a lowpass (RC) filter impedance in parallel to the burden resistance. For a given current bar geometry the impedance value has normally to be dimensioned only once. Adapting the filter values is only necessary if the burden resistance is changed significantly as thus the overall impedance is changed.

– For the accurate setup of the **overcurrent detection**, it is recommended to use a sensor environment that matches closely the final application in terms of current signal shape and EMC, as the overcurrent detection might react on short peaks or glitches on the output current signal if the overcurrent detection is not delayed properly. By means of the delay capacitor C4 a time duration is specified in which an overcurrent condition must be present until the overcurrent alarm is triggered. The delay time can be modified to up to 15 µs. On the evaluation boards the delay time is initially set to 2.5 µs and can be adjusted by 50 pF/µs.

  The **overcurrent detection thresholds** can either be modified by R14 and R15, or by applying an external voltage on TP10 (SETTH) after opening JP1.3 (single-phase). Regarding the triple-phase evaluation board the overcurrent detection threshold can be modified by Rx05 and Rx06.

  The overcurrent detector is also triggered and thus pulls N_OVC to low if the sensor's junction temperature exceeds the temperature threshold T_{OFF}.

– If **multiple CFS1000** are used in one application, e.g. for Triple-Phase current measurement, the N_OVC open-drain output of each CFS1000 can be combined in order to connect just one signal to a subsequent circuitry, e.g. a microcontroller. In this case redundant pull-up resistances may have to be removed to prevent the LOW-level potential (N_OVC) higher than specified (comp. CFS1000 datasheet) in the case of overcurrent detection.

– **Programming and calibration** testing of the CFS1000 under laboratory conditions can be realized by using the CFP1000 programming unit. The programming unit can be easily connected to the evaluation board with a 9 pin serial extension. The CFP1000 unit consists of the programming module and a software with a basic user interface.

Please refer to the CFP1000 programming manual and the datasheet of the CFS1000 for further information. The programming manual contains all basic information for implementing the programming interface, e.g. for the customer's end-of-line calibration. There are two different programming modes available. The first possibility is a one-wire circuit, entering the programming mode by a fast power-on reset. A second-wire interface is used to enable the programming mode via pins rsv1 and rsv3. This method is used by the programming interface unit as it is the faster programming method.

Please visit out website to get the latest CFS1000 programming manual.

- For **accuracy testing** be aware of influences due to self heating of the sensor, a correct grounding of the demoboard and measurement equipment and a sufficient accuracy of the used reference sensor.

Magnetic Properties

- Due to its magnetic gradiometer working principle the CFS1000 has good immunity to **homogenous magnetic stray fields**. Nevertheless, the sensor might be influenced if inhomogeneous stray fields, e.g. caused by relays, motors, current conductors or permanent magnets, create **field gradients** across the sensor surface.

  Example: The nominal field gradient of the CFS1000 is typical B_X = 2.0 mT/mm. If an inhomogenous stray field causes a field gradient of 20 µT/mm at the location of the sensor chip, the influence on the sensor signal will be around 1%. If the magnetic field strength of a field source in the CFS1000 application is not known, its impact can easily be tested by approaching the evaluation board slowly to the magnetic field source while monitoring the offset of the CFS1000 output signal. In the initial configuration of the evaluation board, an offset change of approximately 6 mV is equal to a 20 µT/mm field gradient.

- Especially in high current setups with **strong magnetic stray fields** it is also possible that homogenous fields with no gradient may have an impact on the sensor performance. Fields larger than 1.25 mT may have an impact on the sensor's accuracy. Fields above 3.75 mT may cause a temporary flipping of the magnetization of the magnetoresistive sensor elements, if the stray field is orientated in longitudinal direction of the CFS1000 package.

- Also the magnetic fields generated from the busbar **current feed** may influence the calibrated current gain or linearity if arranged asymmetrically. For the CFK1000 evaluation boards the influences of the current feed are minimized as the connection terminals are located in a certain distance from the sensor. Especially for high current measuring applications ($I_P \gg I_{PN}$) it is recommended to **test the overload capability** of the current bar and the current feed design in order to evaluate the behavior of the sensor in such overcurrent situations.

- **Ferromagnetic materials** in close distance like screws or nickel coated busbars (often used as a barrier for tin coating) may influence the sensor after overcurrent situations. Even short pulses of strong currents may magnetize these components causing offset change to the sensor (hysteresis). The influence on the sensor depends on the size, material, orientation and distance of the ferromagnetic components in combination with the actual current peak value. An easy test to secure a nonmagnetic environment is to magnetize relevant parts near the CFS1000 by means of a permanent magnet, using different orientations of the magnet, and measure the remaining offset change after removing the magnet.

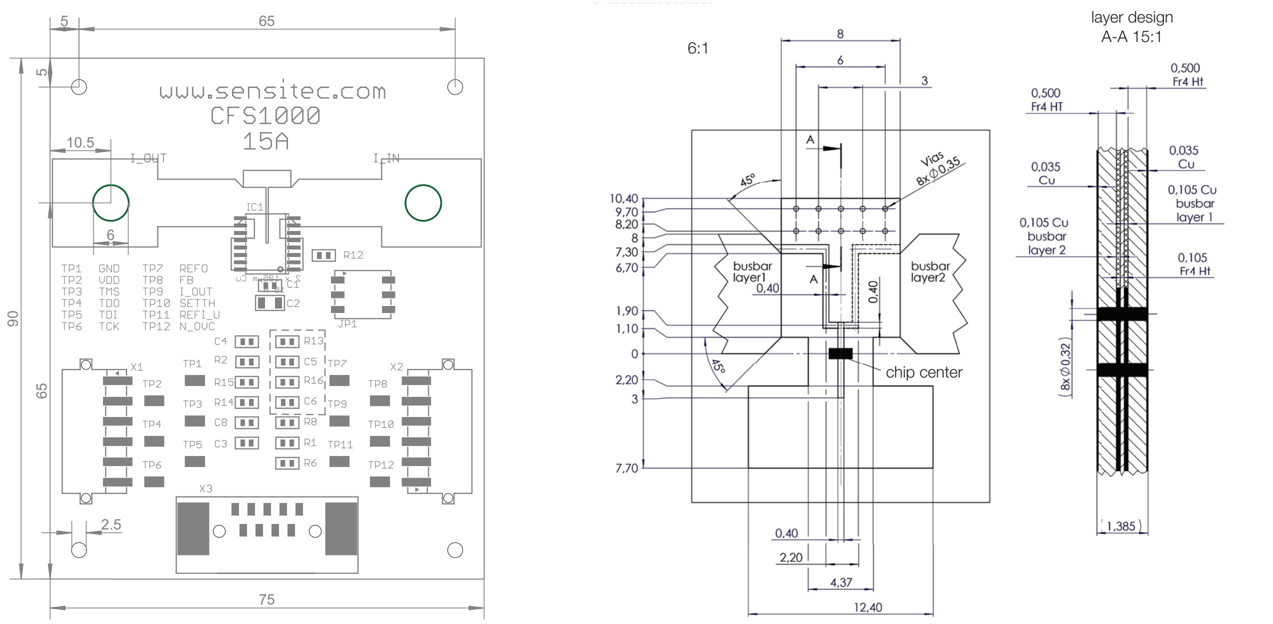
- **Crosstalk** of adjacent current paths can be estimated either by using the available **analytical simulation tool Calc-U-Bar** from Sensitec or for a first approximation by use of Biot-Savart's law taking into account distance and angle of the arrangement. For more complex design space situations also a FEM-simulation can be done by Sensitec.

- Parts made of electrically conductive material (e.g. housing parts made of aluminium) placed in close proximity to the sensor may affect the dynamic sensor behavior due to the induced **eddy currents** in these parts.

6. Dimensions

6.1. Single-Phase

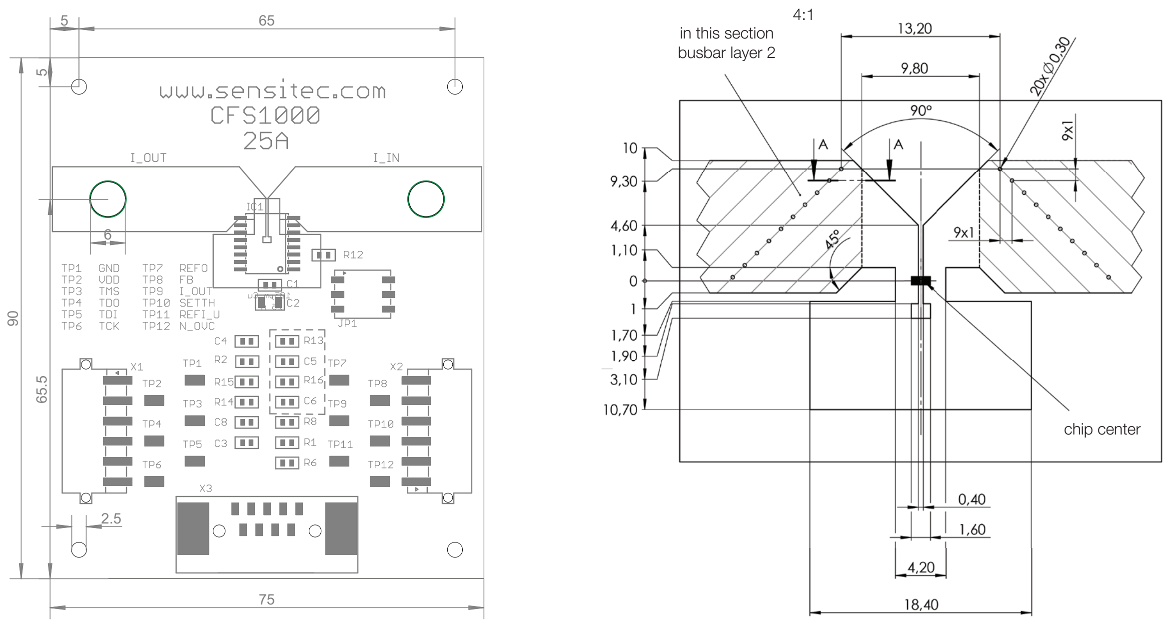
15 A



all dimensions in mm

Fig. 6: Dimensions of the 15 A evaluation board and busbar (material tin coated copper). Tolerance ± 0.2 mm unless otherwise specified.

25 A



all dimensions in mm

Fig. 7: Dimensions of the 25 A evaluation board and busbar (material tin coated copper). Tolerance ± 0.2 mm unless otherwise specified.

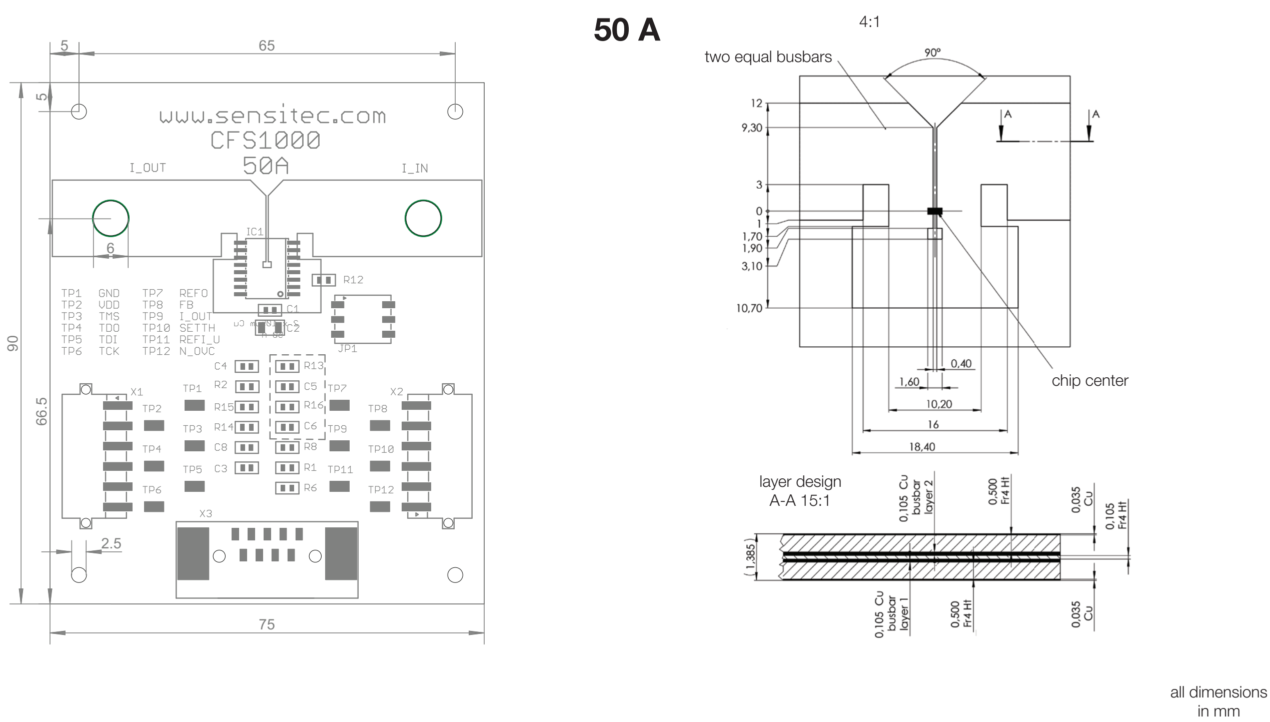
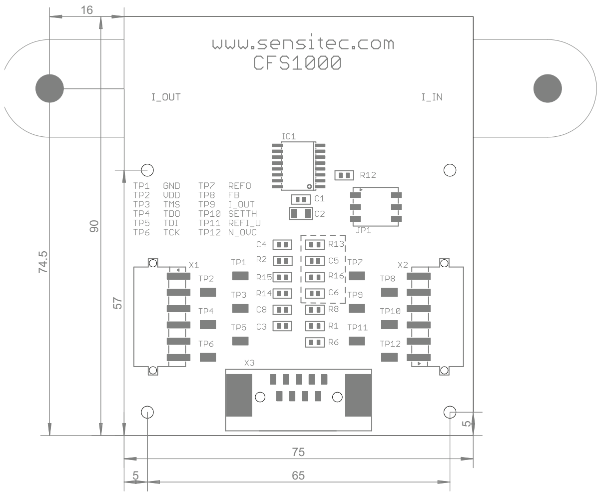
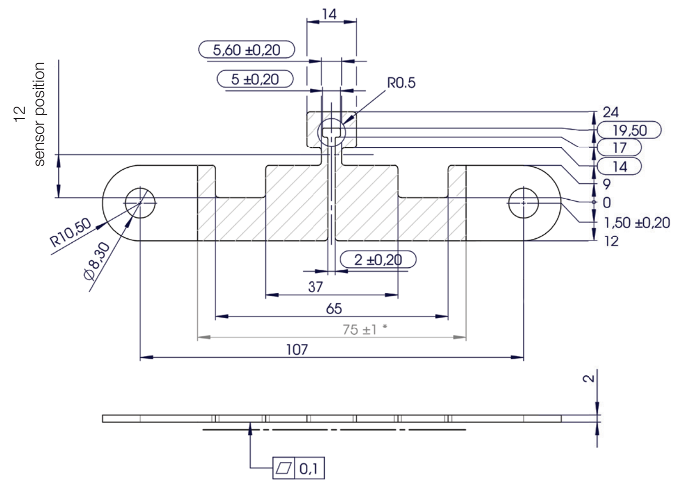


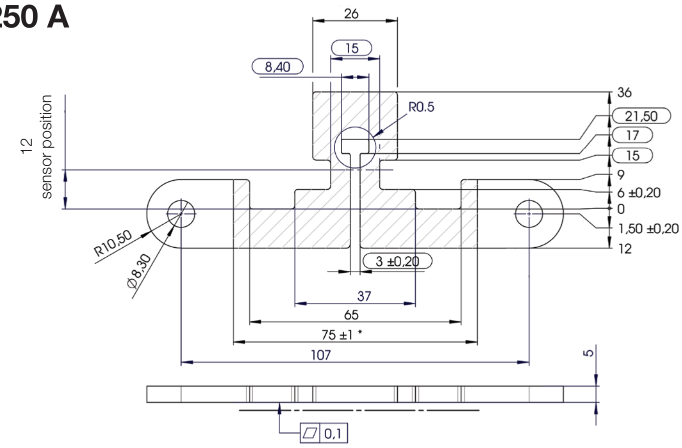
Fig. 8: Dimensions of the 50 A evaluation board and busbar (material tin coated copper). Tolerance ± 0.2 mm unless otherwise specified.



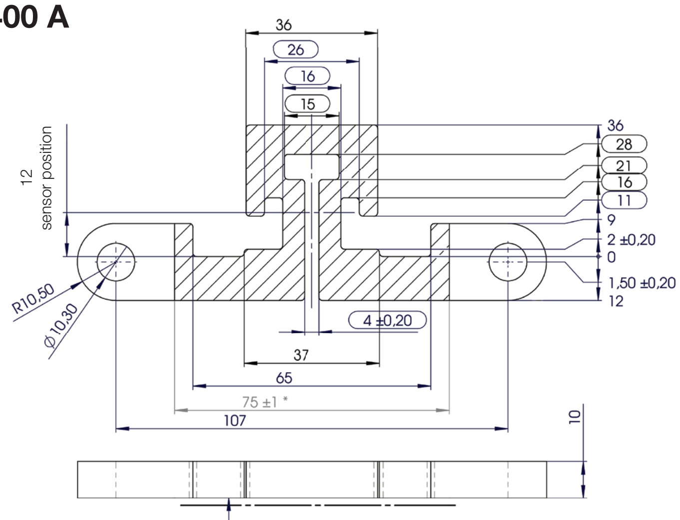
100 A



250 A



400 A



all dimensions in mm

Fig. 9: Dimensions of the 100 A, 200 A and 400 A evaluation board and busbar (material tin coated copper). Tolerance ± 0.2 mm unless otherwise specified.

6.2. Triple-Phase

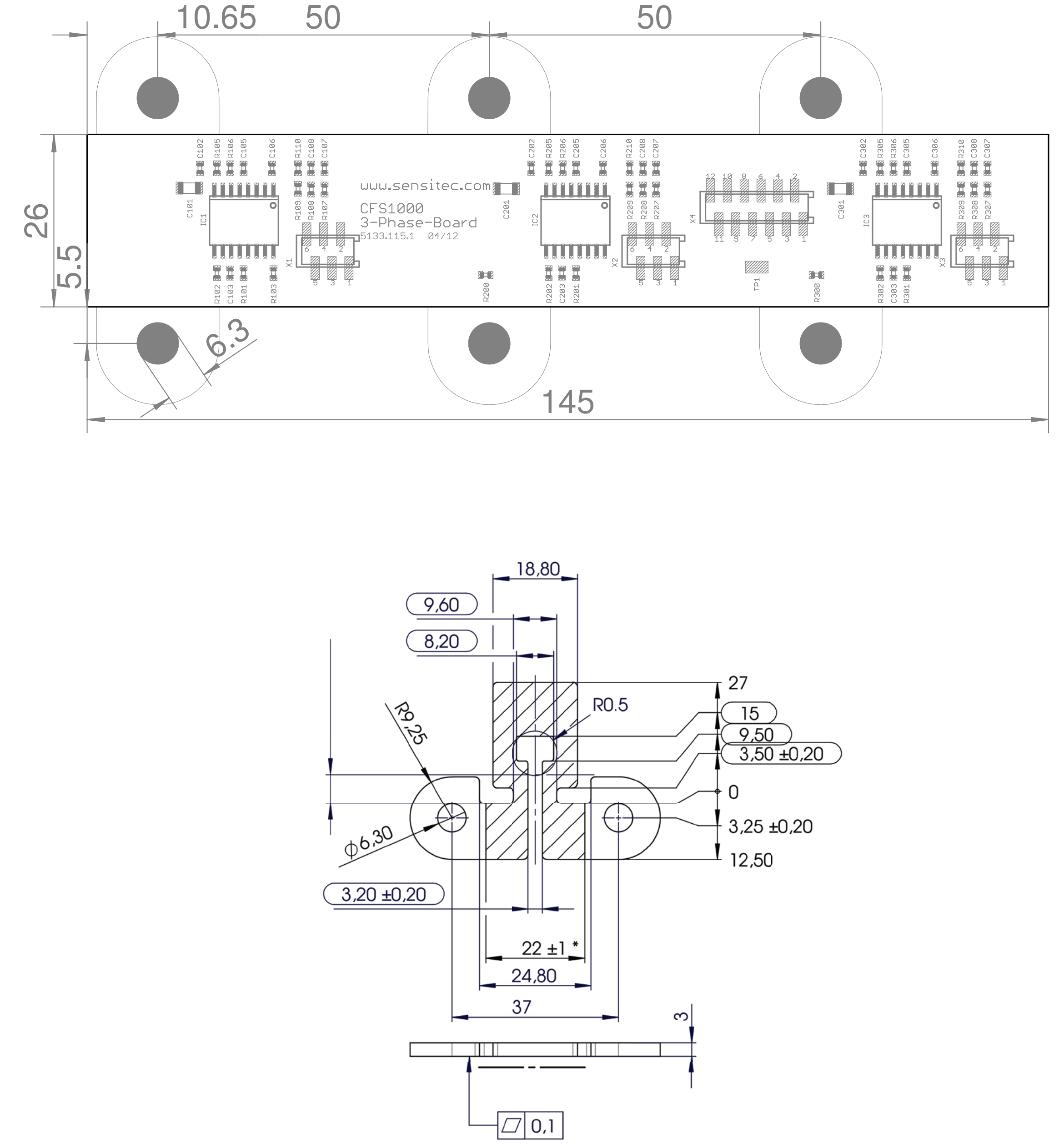
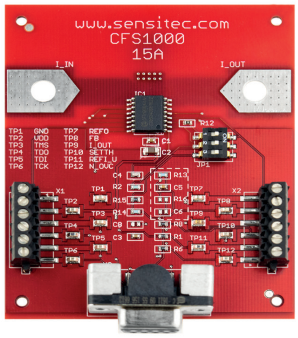
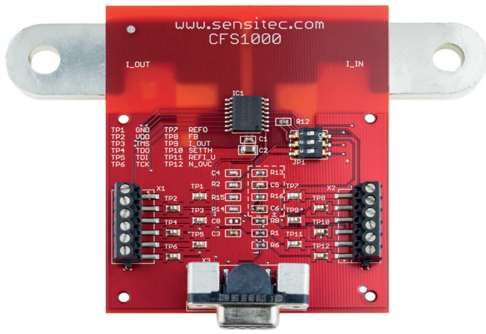
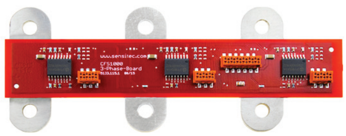


Fig. 8: Dimensions of the 200 A evaluation board and busbar (material tin coated copper). Tolerance ± 0.2 mm unless otherwise specified.

7. CFK1000 Product Family

The CFK1000 evaluation board family is suited for various applications from 15 A up to 400 A nominal current.

Product	I_{PN} (A)	I_{PR} (A)	Illustration
CFK1015AAA-AA	15	45	
CFK1025AAA-AA	25	75	
CFK1050AAA-AA	50	150	
CFK1100ABA-AA	100	300	
CFK1250ABA-AA	250	750	
CFK1400ABA-AA	400	1000	
CFK1200ACA-AA	200	600	

I_{PN}: Nominal primary current (RMS).

I_{PR}: Measurement range (for 1 s in a 60 s interval; RM = 300 Ω).

Safety Notes

Warning!
This sensor shall be used in electric and electronic devices according to applicable standards and safety requirements.
Sensitec's datasheet and handling instructions must be complied with.
Handling instructions for current sensors are available at www.sensitec.com.

Caution! Risk of electric shock!
When operating the sensor, certain parts, e. g. the primary busbar or the power supply, may carry hazardous voltage.
Ignoring this warning may lead to serious injuries!
Conducting parts of the sensor shall not be accessible after installation.

8. General Information

Product Status

Article	Status
CFK1xxxAAA | CFK1xxxABA | CFK1xxxACA	The product is in series production.
Note	The status of the product may have changed since this data sheet was published. The latest information is available on the internet at www.sensitec.com.

Disclaimer

Application Information

Applications that are described herein for any of these products are for illustrative purposes only. Sensitec GmbH makes no representation or warranty – whether expressed or implied – that such applications will be suitable for the specified use without further testing or modification.

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Sensitec GmbH does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Sensitec products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s).

Sensitec does not accept any liability in this respect.

Life Critical Applications

These products are not qualified for use in life support appliances, aeronautical applications or devices or systems where malfunction of these products can reasonably be expected to result in personal injury.

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