DCDT series: Automotive Residual Current Monitoring type B sensors
DCDT 0.3-S2, DCDT-SF 0.3-S2, DCDT 0.3-S4, DCDT-SF 0.3-S4

Product description:

The DCDT series is the LEM RCM type B current sensor family designed to measure and protect from AC and DC fault current (leakage current), dedicated to automotive applications. Our proprietary fluxgate architecture allows the sensor to have best in class accuracy hence protection from potential fire hazards and electrical shocks. The package is configurable up to 4 conductors 48Arms capable, allowing 1 and 3 phases systems and offering an optimized leakage measurement of configurations by design.

The DCDT series sensors provide a tripping fault current output and an SPI bus enabling fast response time and detailed fault information. For automotive applications, such as bidirectional On-Board Chargers, an ISO26262 ASIL B compliant version offers additional safety diagnostics.

Additionally, DCDT is integrating a current transformer (second sensor) for high frequency AC leakage compensation (measurement and injection capable) up to 100kHz.

Measurement principle:

In a stable system the sum of current (phase and neutral) flowing in conductors is null, when a fault occurs, a difference is measured between phase and neutral conductors. This difference represents the leakage current typically caused by a loss of insulation from a conductor to the earth.

Main Features & Advantages

- Automotive qualified (AEC-Q100 and 200 components)
- Up to 48 A RMS current per primary conductor
- Primary current measurement range: ±300 mA DC
- External test via dedicated pin
- SPI and digital tripping outputs
- Compact design for PCB mounting
- Excellent accuracy
- Fast Tripping
- Reinforced galvanic insulation.
- AC leakage reinjection up to 100kHz

5 YEAR WARRANTY by LEM · RoHS · ASIL B COMPLIANT LEM

Figure 1: DCDT-SF 0.3-S2
DCDT 0.3-S2

Figure 2: DCDT-SF 0.3-S4
DCDT 0.3-S4

Typical applications

Developed for, EV On Board Charger:

- Automotive OBC up to 22 kW (V2L, V2G, V2H)

Compatible with, Off board Charging:

- Mode 2: In Cord – Control and Protection Device (IC-CPD)
- Mode 3: Wall box chargers

Functional safety (SF version only)

- ISO26262 ASIL B: refer to safety manual.

EMC Compatible standards: *

- IEC 61851-21: 2017

Fault current tripping according to: *

- IEC 62752: 2016 and UL 2231: 2012

*Complete list of reference standards available in safety manual

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Sensor Selection Table

The following table summarizes the configuration of the product:

Reference	Item Number	HF Sensing 100 kHz (Y/N)	Safety Capable Sensor (Y/N)	Number of Primary Conductors	Primary Conductor 1 Pin 13/17	Primary Conductor 2 Pin 14/18	Primary Conductor 3 Pin 15/19	Primary Conductor 4 Pin 16/20
DCDT 0.3-S2	90.W4.A2.2xx.0*	N	N[1]	2	Mounted		Mounted	
DCDT-SF 0.3-S2	90.W6.A2.2xx.0*	N	Y[1]	2	Mounted		Mounted	
DCDT 0.3-S4	90.W4.A2.4xx.0*	N	N[1]	4	Mounted	Mounted	Mounted	Mounted
DCDT-SF 0.3-S4	90.W6.A2.4xx.0*	N	Y[1]	4	Mounted	Mounted	Mounted	Mounted

1) The SPI Interface is not required, the fault current tripping signal is available via the dedicated tripping pin, see Sensor Pin Out. SPI is only required for ASIL B ISO26262 metrics compliance.

Tripping configurations of the transducer:

Applicable Standard		Typ. Tripping threshold (mA @ 50 Hz or 60 Hz)	Typ. Recovery Level (mA @ 50 Hz or 60 Hz)	LEM tripping reference	xx item number
IEC62752 IΔn = 30 mA AC RMS / 6 mA DC	AC	22.2	16.6	xCDT-IEC30m	00
	DC	4.4	3.3		
IEC62752 IΔn = 20 mA RMS / 6 mA DC	AC	15	11.25	xCDT-IEC20m	01
	DC	4.4	3.3		
Below tripping configuration available upon request and qualification.					
IEC62752 IΔn = 6 mA RMS / 6 mA DC	AC	4.5	3.37	xCDT-IEC6m	04
	DC	4.4	3.3		
UL2231 CCID20 (IΔn = 20 mA RMS)	AC	16.8	12.6	xCDT-UL20m	05
	DC	4.4	3.3		
UL2231 CCID5 (IΔn = 5 mA RMS)	AC	5	3.75	xCDT-UL5m	06
	DC	4.4	3.3		
For customer system development support. Single time tripping level selection via SPI from the following: xCDT-IEC30m, xCDT-IEC20m, xCDT-UL20m.					07

LEM reserves the right to carry out modifications on its transducers to improve them.

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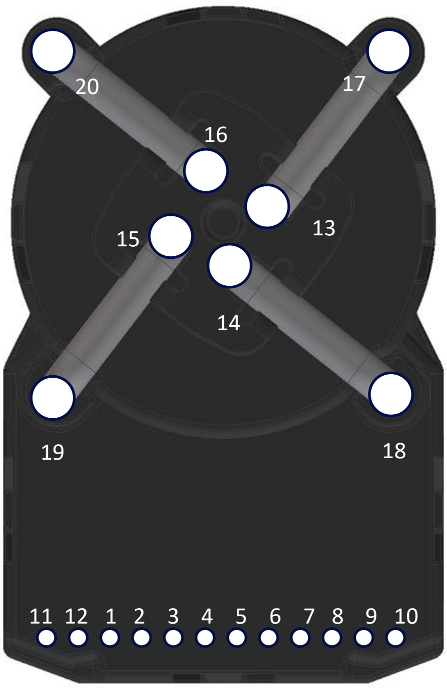
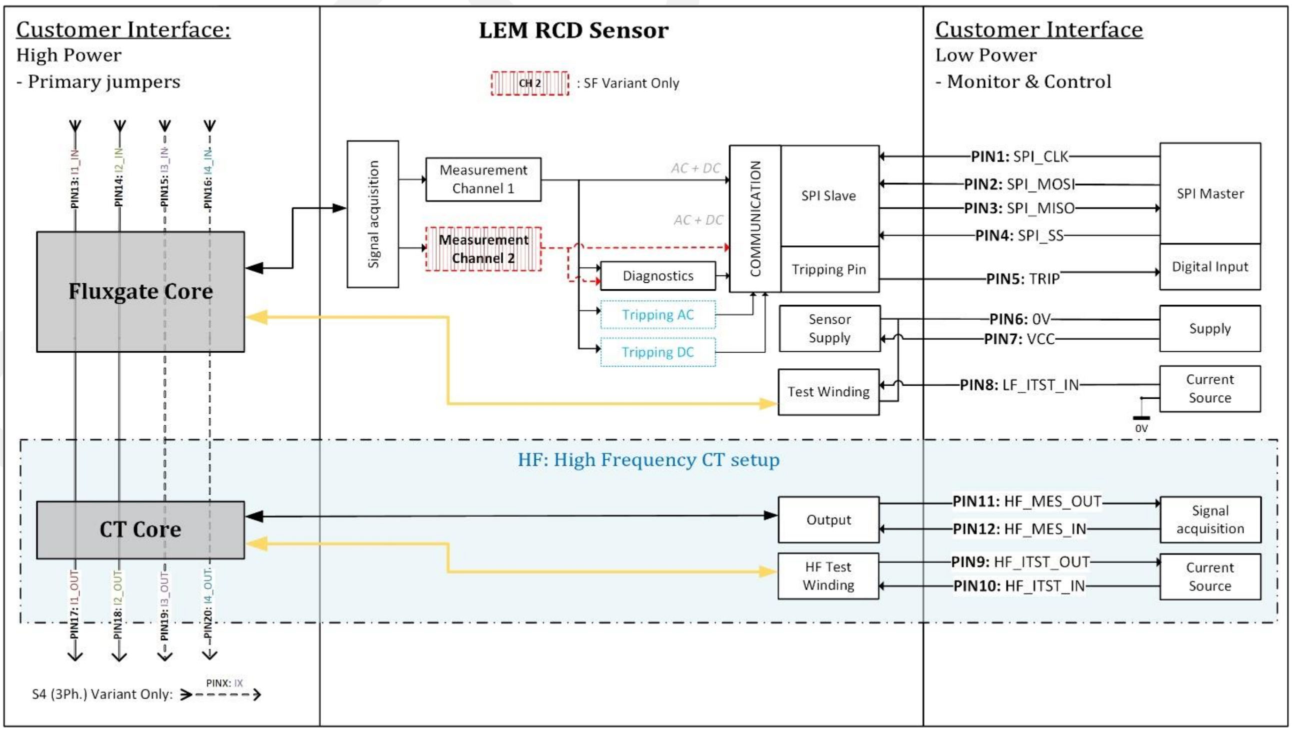
Sensor Pin Out (TOP VIEW)



Pin n°	Signal Type	Type	Signal Name	Description
1	Digital (SPI) [1)]	Input	SCLK	SPI Clock
2	Digital (SPI) [1)]	Input	MOSI	SPI Master Output Slave Input
3	Digital (SPI) [1)]	Output	MISO	SPI Master Input Slave Output
4	Digital (SPI) [1)]	Output	SS	SPI Slave Select
5	Digital [1)]	Output	TRIP	Tripping Signal
6	Power supply (0V)		0 V	Negative power supply rail
7	Power supply (5V)		VCC	Positive power supply rail
8	Analog	Input	LF_ITST_IN	LF test winding current input
9	Analog	Output	HF_ITST_OUT	HF test winding current output
10	Analog	Input	HF_ITST_IN	HF test winding current input
11	Analog	Output	HF_MES_OUT	HF measurement current output
12	Analog	Input	HF_MES_IN	HF measurement current input
13	Phase 1 Input		I1_IN	Primary Conductor 1 input current
14	Phase 2 Input		I2_IN	Primary Conductor 2 input current*
15	Phase 3 Input		I3_IN	Primary Conductor 3 input current
16	Phase 4 Input		I4_IN	Primary Conductor 4 input current*
17	Phase 1 Output		I1_OUT	Primary Conductor 1 output current
18	Phase 2 Output		I2_OUT	Primary Conductor 2 output current*
19	Phase 3 Output		I3_OUT	Primary Conductor 3 output current
20	Phase 4 Output		I4_OUT	Primary Conductor 4 output current*

1): Please refer to chapter: ***SPI and Tripping Pin characteristics (Digital)***

Sensor Internal Architecture



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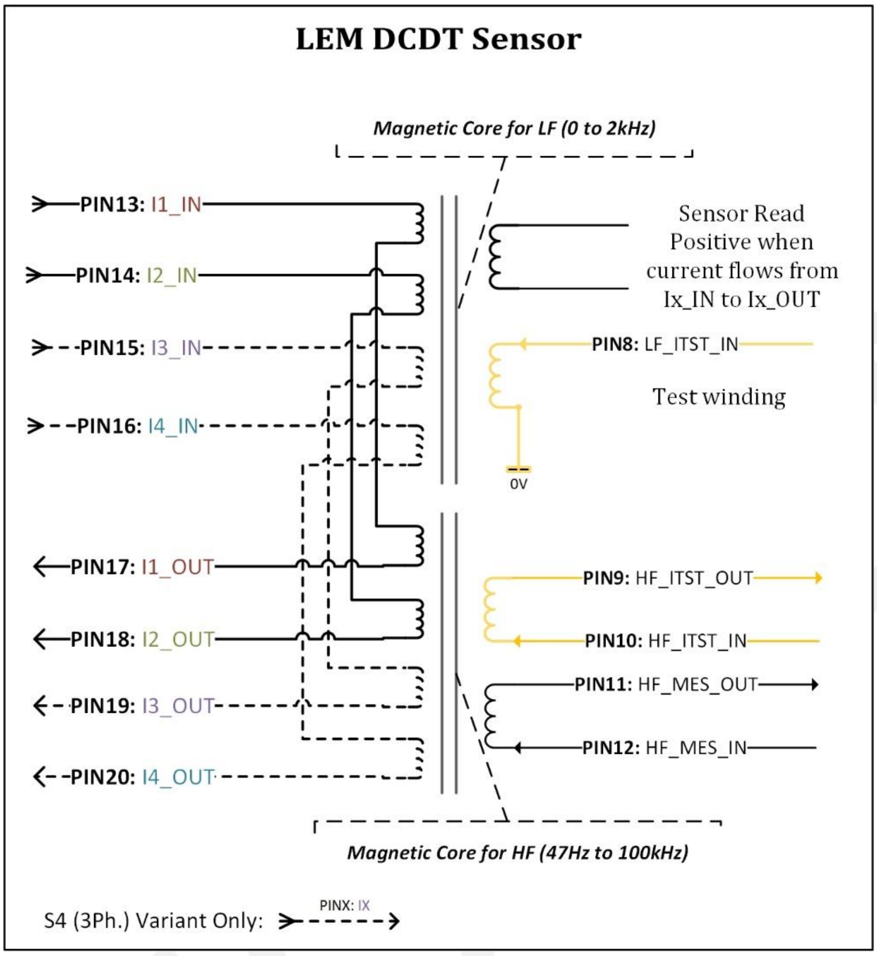
Sensor Magnetic Structure



Absolute maximum ratings [2) 3)]

Parameter	Symbol	Unit	Value
Maximum primary conductor temperature	T_B max	°C	150 °C (for short term period) [1)]
Primary peak current per primary conductor	$\hat{I}_{P\ max}$	A	125
Electrostatic discharge voltage (HBM – Human Body Model)	$U_{ESD\ HBM}$	kV	2
Supply voltage	U_C	V	6

Notes:

1) The design of customer PCB tracks (width & thickness) and the LEM transducer's primary jumpers can influence each other regarding thermal exchanges and self-heating. Customer remains responsible for thermal design.

2) Absolute maximum ratings apply at 25 °C unless otherwise noted.

3) Exposure to absolute maximum ratings for extended periods of time may affect reliability.

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General electrical ratings

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Primary nominal AC RMS voltage (continuous)	$U_{\text{P N AC}}$	V		400		
Primary current	$I_{\text{P N AC}}$	A			40 [1] 48 [2]	Under qualification tests
Resistance ~~of any~~ primary conductor	R_{P}	uΩ		166		@ 25 °C
Base FIT of xCDT-SF 0.3-Sx		FIT	428 [3]			

Notes: [1] Tripping variants xCDT-IEC6m xCDT-UL5m
[2] Tripping variants xCDT-IEC30m xCDT-IEC20m xCDT-UL20m
[3] This value is calculated using IEC 62380 Standard and sensor ambient temperature profile of 73 °C. It is a FIT value with no safety mechanism applied. ISO 26262 PMHF is lower and compatible with ASIL-B metrics.

Insulation coordination

Parameter	Symbol	Unit	Value	Comment
Primary/Primary RMS voltage for AC insulation test, 50 Hz, 1 min	U_{d}	kV	TBD	According to IEC60664-1
Primary/Secondary RMS voltage for AC insulation test, 50 Hz, 1 min	U_{d}	kV	TBD	According to IEC60664-1
Primary/Primary Impulse withstand voltage 1.2/50 µs	U_{Ni}	kV	TBD	According to IEC60664-1
Primary/Secondary Impulse withstand voltage 1.2/50 µs	U_{Ni}	kV	TBD	According to IEC60664-1
Primary/Primary Insulation Resistance	R_{INS}	MΩ	TBD	According to IEC62752
Primary/Secondary Insulation Resistance	R_{INS}	MΩ	TBD	According to IEC62752
Clearance (primary to primary) variant S2 & S4	d_{Cl}	mm	3.1	Shortest distance through air
Creepage distance (primary to primary) variant S4	d_{Cp}	mm	3.1	Shortest path along device body
Creepage distance (primary to primary) variant S2	d_{Cp}	mm	4	Shortest path along device body
Clearance (primary to secondary) variant S2 & S4	d_{Cl}	mm	9.6	Shortest distance through air
Creepage distance (primary to secondary) variant S2 & S4	d_{Cp}	mm	9.6	Shortest path along device body
Case material	-	-	V0	According to UL 94
Comparative tracking index	*CTI*		600	

Fluxgate RCM sensor performances

Environmental and mechanical characteristics

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Recommended ambient operating temperature (sensor external T°C)	T_{A}	°C	−40		105	Customer cooling related [1]
Operating temperature (sensor internal PCBA T°C)	T_{A}	°C	−40		120	Software temperature fault protection at 120°C
Ambient storage and transportation temperature	$T_{\text{A st}}$	°C	−40		125	Sensor not connected. (no power supply)
Relative humidity	*RH*	%		50		

Notes: [1] Sensor cooling is impacted by customer PCBA design. Adequate secondary routing (GND plane) may offer thermal improvement.

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General electrical ratings [1)]

Parameter	Symbol	Unit	Min	Typical	Max	Comment
DC primary residual current, measuring range	$I_{P R M DC}$	mA	−300		300	
AC RMS primary residual current, measuring range	$I_{P R M AC}$	mA	0		200	
Supply voltage	U_C	V	4.75	5	5.25	
Supply voltage rise rate	$SVCC$	V/ms	0.03			
Current consumption - Operating Mode	I_C	mA		70	100	**47 uF filtering capacitor required on sensor 5V supply.** Over full temperature and supply voltage range
Start-up time	t_{start}	ms		800		

1) Low voltage circuits are intended to be powered by a circuit derived from an isolating source (such as a transformer, optical isolator, limiting impedance or electro-mechanical relay) and having no direct connection back to the primary circuit (other than through the grounding means).

Primary referred measurement performances of SPI outputs

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Frequency bandwidth (−3 dB)	BW	kHz		2		
Total error CH1 referred to primary $I_{P R}$: −8.6 mA < $I_{P R}$ DC < 8.6 mA	ε_{tot}	mA	−1.3		1.3	Evaluated on 200 samples/400 ms
Total error CH1 referred to primary $I_{P R}$: −300 mA < $I_{P R DC}$ < −8.6 mA and 8.6 mA < $I_{P R DC}$ < 300 mA	ε_{tot}	mA		±15 % $I_{P R DC}$		
Total error CH2 referred to primary $I_{P R}$: −8.4 mA < $I_{P R}$ DC < 8.4 mA	ε_{tot}	mA	−1.6		1.6	Evaluated on 200 samples/400 ms. xCDT-SF version only
Total error CH2 referred to primary $I_{P R}$: −300 mA < $I_{P R DC}$ < −5.3 mA and 5.3 mA < $I_{P R DC}$ < 300 mA	ε_{tot}	mA		±19 % $I_{P R DC}$		xCDT-SF version only
50Hz mode rejection ratio	RR	dB	-200		-73	

Test winding characteristics

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Test winding peak voltage	$\hat{U}_T$	V	−10		10	@ U_C Typical
DC test winding current range	$I_{T DC}$	mA	−18.75		18.75	
AC RMS test winding current range	$I_{T AC}$	mA	0		12.5	
Turn ratio	N_P/N_S			1:16		
Resistance of test winding (at 2 kHz)	RT	Ω			3	

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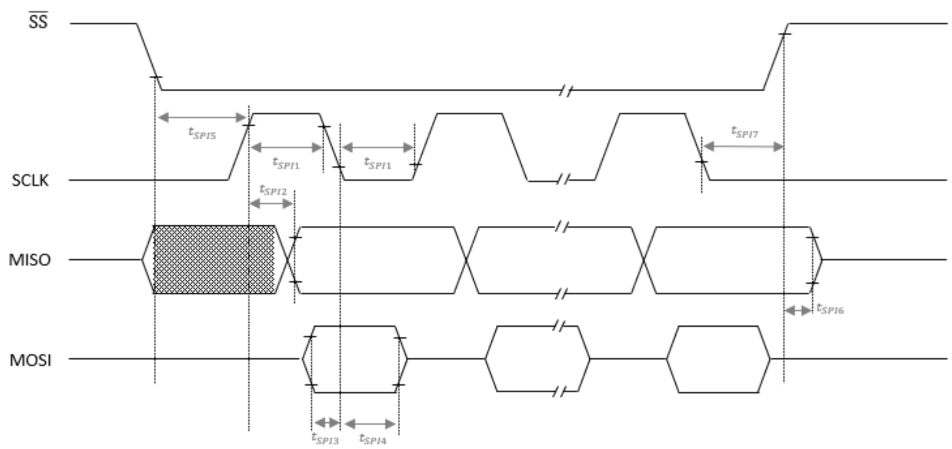
SPI and Tripping Pin characteristics (Digital)

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Output logic high		V	3.0/2.6	3.3	3.34	Isource=3mA / Isource=9mA. It is recommended to set a line resistor on SPI MISO to limit current due to 3V3 imbalance. See application note.
Output logic low		V	0	0	0.3/0.7	Isink=3mA / Isink=9mA.
Input logic high		V	2.7		3.43	It is recommended to set a line resistor on SPI SS, CLK and MOSI to limit current due to 3V3 imbalance. See application note.
Input logic low		V	0		0.6	
Sink / source output maximum current	$I_{out\ max}$	mA	−15		+15	
Input low injection current (in protection diod)	I_{ICL}	mA	0		-5	Input Voltage < 0V-0.3
Input high injection current (in protection diod)	I_{ICH}	mA	0		+5	Input Voltage > 3V3+0.3
Total Input Injection Current (sum of all I/O and control pins)	ΣI_{LICT}	mA	-20		+20	Absolute instantaneous sum of all ± input injection currents from all I/O pins.
Sensitivity of channel 1 and 2 (SPI)	S_N	LSB/mA		10		
Resolution of channel 1 and 2 (SPI)		mA/LSB		0.1		

SPI and tripping switching characteristics [1)]

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Clock input low or high time	$t_{SPI\ 1}$	ns	15			
Data output valid after clock edge	$t_{SPI\ 2}$	ns			20	
Setup time of input data to clock edge	$t_{SPI\ 3}$	ns	10			
Hold time of input data to clock edge	$t_{SPI\ 4}$	ns	15			
Slave Select falling edge to clock edge	$t_{SPI\ 5}$	ns	4000			Value imposed by SW design choice.
Slave Select rising edge to Output high impedance	$t_{SPI\ 6}$	ns	8		50	
Slave Select rising edge after clock edge	$t_{SPI\ 7}$	ns	TBD			

Notes: [1)] Refer to SPI specification document for protocol details. SW implementation supports a SPI clock at 1 MHz +/- 10 KHz.



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Current transformer performances

Measurement output characteristics (high frequency sensing element)

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Measurement winding peak voltage	$\hat{U}_S$	V			TBD	
AC RMS primary residual current, measuring range	$I_{P R M AC}$	mA	0		200	
Output current of measurement winding	I_{out}	mA	0		2.5	
Turn ratio	N_P/N_S			1:80		
Resistance of secondary winding	R_S	Ω			2	@ 20 kHz
Measuring Resistance	R_M	Ω			TBD	
Inductance of measurement winding (primary open)	L_S	mH		TBD		@ TBD Hz and TBD mA

Primary referred measurement performances (high frequency sensing element)

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Frequency bandwidth (−3 dB)	BW	Hz	47		100k	
Total error referred at primary $I_{P R}$: $I_{P R AC} < 3$ mA	ε_{tot}	mA			1	@ TBD Hz
Total error referred at primary $I_{P R}$: 3 mA < $I_{P R AC}$ < 200 mA	ε_{tot}	%		±5 % $I_{P R AC}$		@ TBD Hz

Test/Injection winding input characteristics (high frequency sensing element)

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Test winding peak voltage	$\hat{U}_S$				TBD	
AC RMS Test current range referred to primary		mA	0		200	
AC test current range	I_T	mA	0		2.5	
Turn ratio	N_P/N_S			1:80		
Resistance of test winding	R_T	Ω			2	@ 20 kHz

Primary referred Test/Injection winding input performances (high frequency sensing element)

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Frequency bandwidth (−3 dB)	BW	Hz	47		100k	
Total error referred at primary $I_{P R}$: $I_{P R AC} < 3$ mA	ε_{tot}	mA			1	@TBD Hz with one of the primary conductors short- circuited
Total error referred at primary $I_{P R}$: 3 mA < $I_{P R AC}$ < 200 mA	ε_{tot}	%		±5 % $I_{P R AC}$		@TBD Hz with one of the primary conductors short- circuited

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Performance Parameters Definition

Definition of typical, minimum and maximum values

Minimum and maximum values for specified limiting and safety conditions must be understood as such as well as values shown in "typical" graphs.

On the other hand, measured values are part of a statistical distribution that can be specified by an interval with upper and lower limits and a probability for measured values to lie within this interval.

Unless otherwise stated (e.g. "100 % tested"), the LEM definition for such intervals designated with "min" and "max" is that the probability for values of samples to lie in this interval is 99.73 %.

For a normal (Gaussian) distribution, this corresponds to an interval between −3 sigma and +3 sigma. If "typical" values are not obviously mean or average values, those values are defined to delimit intervals with a probability of 68.27 %, corresponding to an interval between −sigma and +sigma for a normal distribution.

Typical, maximal, and minimal values are determined during the initial characterization of the product.

Sensor Application Notes

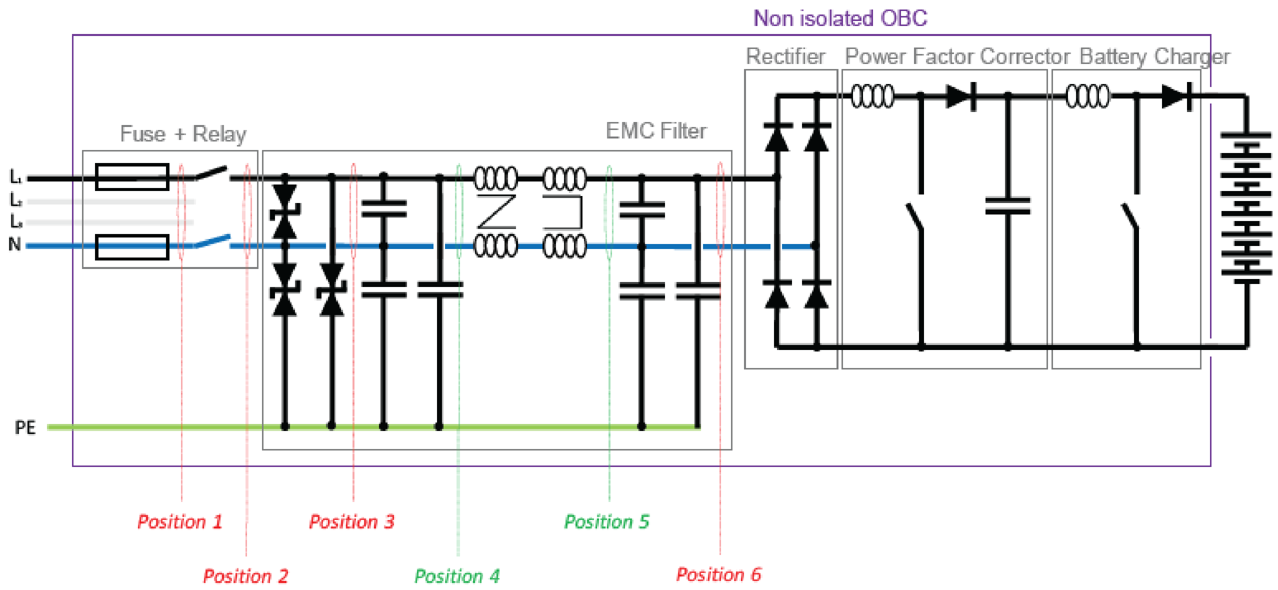
xCDT sensor Application note reference PDM number includes information that will ensure robust integration of the sensor in customer application (test set-up, magnetic environment...).
SPI Technical Specification reference PDM number detail the Serial Peripheral Interface protocol to be implemented by the customer to communicate with the sensor.
The latest version of these documents can be downloaded from LEM Website.

Correct Sensor Integration inside Power Converters regarding EMC constraints

The differential transducer placement inside client application, typically in a car onboard charger, must be chosen to minimize EMC interferences. It shall be located after surge absorbers at position 4 to 5.

Other positioning may degrade the performance of the sensor.

The sensor is sensitive to aliasing phenomena on high frequency content (>10 kHz) which shall be minimized on the customer side.



Test Winding Low Frequency Sensing Element Design rules

Customer test winding driving circuit for low frequency sensor element must be designed carefully to avoid interactions with the sensor. It must behave as a perfect current source while injecting current and shall be floating while unused.

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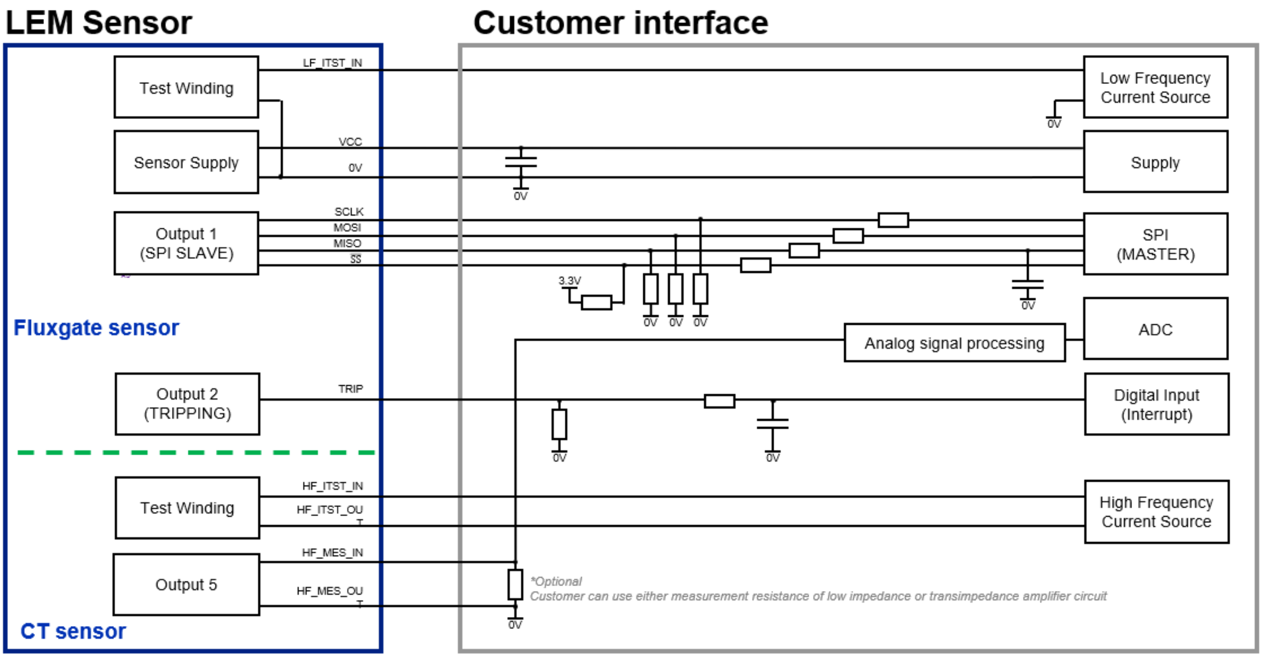
Test/Injection Winding High Frequency Sensing Element Design rules

Customer test/injection winding customer driving circuit for high frequency sensor element must be designed carefully to avoid interactions with the sensor. It must behave as a perfect current source while injecting current and shall be floating while unused.

Sensor typical interface

See Application Note for details on values of components.



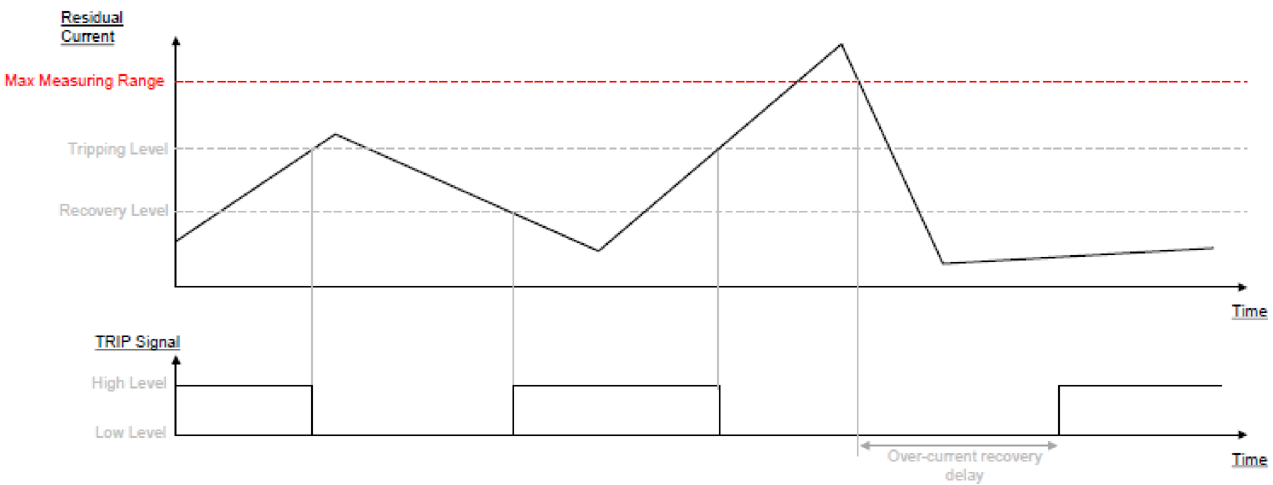
Tripping Pin and SPI TRIP Signal

The tripping pin and SPI TRIP signal are used to indicate that a fault current has been detected. In such condition, the pin goes to LOW and the SPI signal goes to high whether AC or DC tripping occurred, or in a situation when the sensor is not operational. During startup, the TRIP pin is set-up in high impedance and requires a pull-down resistor for safe operation.

Please refer to the safety manual for detailed description of “safe state” according to ISO26262.

Tripping timing diagram

The tripping signal will operate as follows:



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Note: The typical over-current recovery delay is 5ms.

The Fault tripping time of LEM sensor only includes the delay related to the measurement of leakage current but does not comprise additional delay related to customer electronic circuit (control circuit of relay, relay opening time...).

On following graphs, the red dashed curve shows the tripping characteristic required by the norm and the blue curve gives you the theorical tripping time programmed in the sensor software. To consider measurement tolerance, customer can include a maximum LEM actual tripping time variation of +/- 30 % compared to theorical blue curve on short tripping time.

Overcurrent specifications: For a primary peak current (I_{PRM}) above |300|mA the typical tripping time is 500us.

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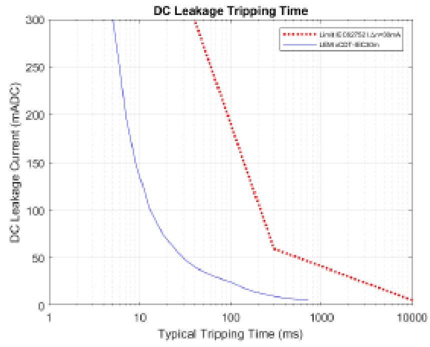
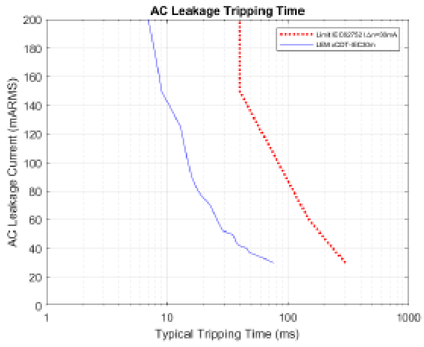
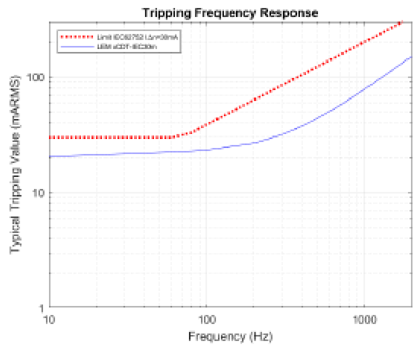
xCDT-IEC30m (to be confirmed after DV Test)



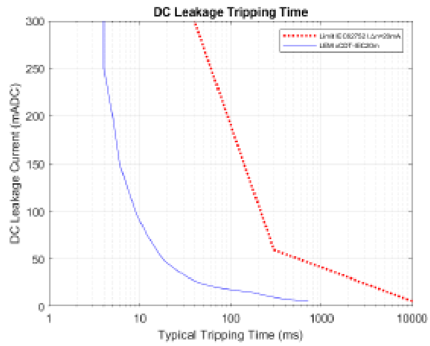


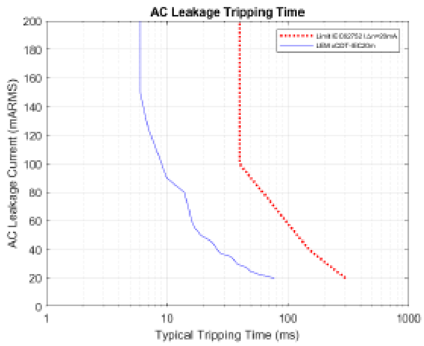


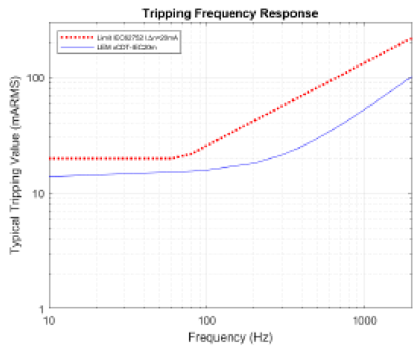
DC Tripping	
Current (mA DC)	Tripping Time (ms)
6	715
20	130
30	70.0
100	13.0
200	6.99
300	5.00

AC Tripping	
Current (mA RMS)	Tripping Time (ms)
30	76.0
70	23.0
100	15.0
200	6.99

xCDT-IEC20m (to be confirmed after DV Test)







DC Tripping	
Current (mA DC)	Tripping Time (ms)
6	715
20	73.0
30	35.0
100	9.01
200	5.01
300	3.99

AC Tripping	
Current (mA RMS)	Tripping Time (ms)
20	77.0
30	38.0
70	15.0
100	9.01
200	6.01

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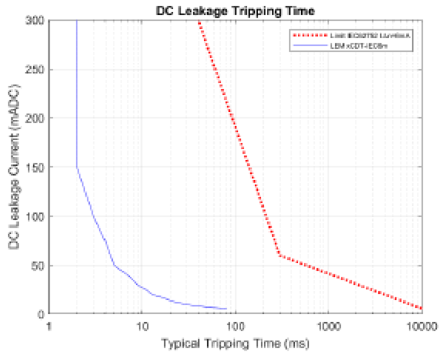
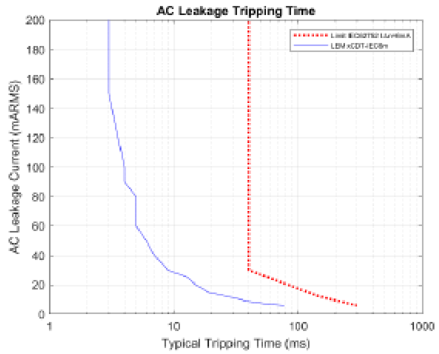
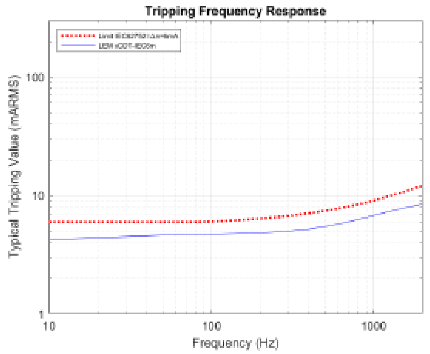
xCDT-IEC6m (to be confirmed after DV Test)



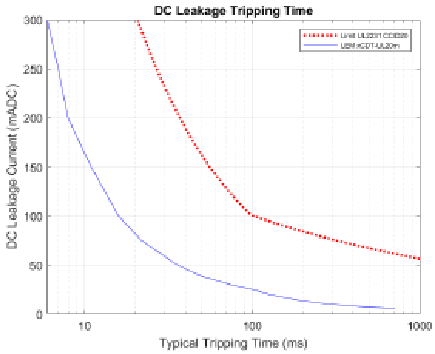


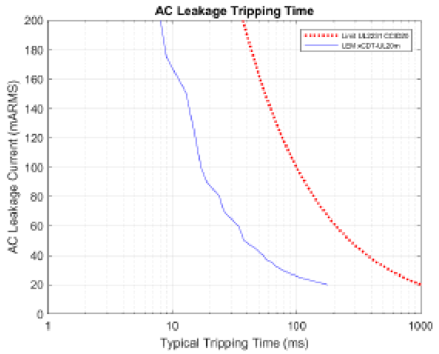


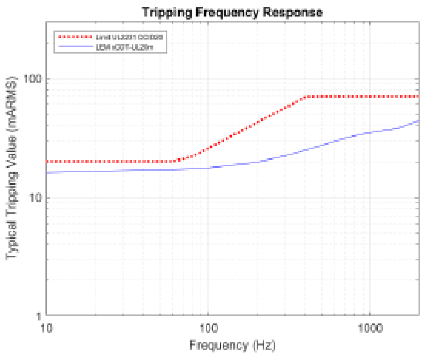
DC Tripping	
Current (mA DC)	Tripping Time (ms)
6	82
20	13.0
30	9.00
100	2.99
200	2.00
300	1.99

AC Tripping	
Current (mA RMS)	Tripping Time (ms)
6	78
20	15
30	9.00
70	5.01
100	4.00
200	3.00

xCDT-UL20m (to be confirmed after DV Test)







DC Tripping	
Current (mA DC)	Tripping Time (ms)
6	700
20	129
30	75.0
100	16.1
200	7.95
300	5.99

AC Tripping	
Current (mA RMS)	Tripping Time (ms)
20	180
30	77.1
70	26.0
100	17.0
200	8.00

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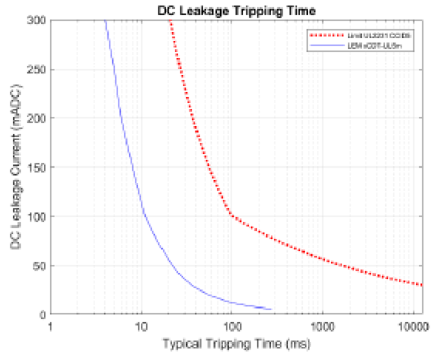
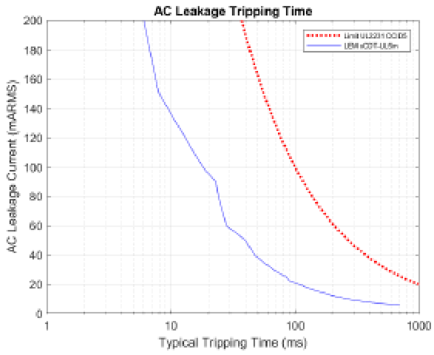
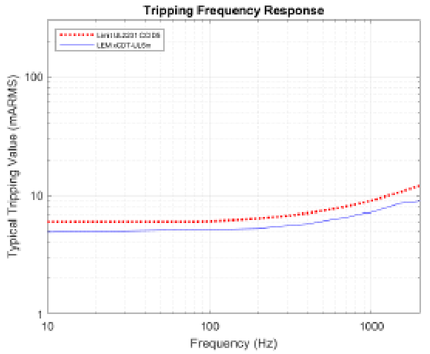
xCDT-UL5m (to be confirmed after DV Test)







DC Tripping	
Current (mA DC)	Tripping Time (ms)
6	182
20	56.1
30	36.1
100	11.0
200	6.02
300	3.98

AC Tripping	
Current (mA RMS)	Tripping Time (ms)
5	700
20	116
30	67.0
70	26.0
100	18.2
200	6.04

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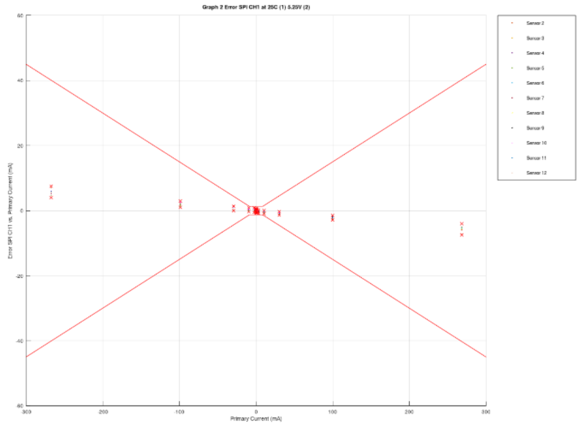
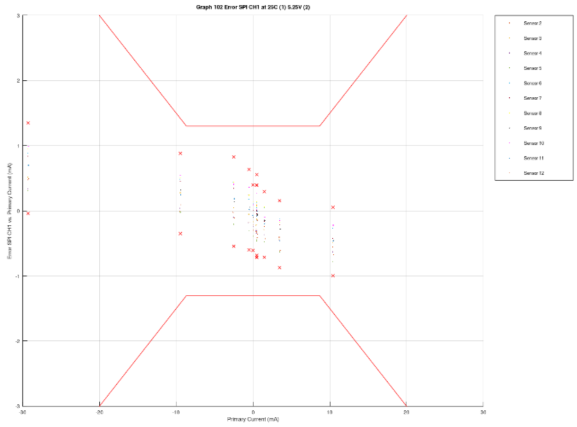
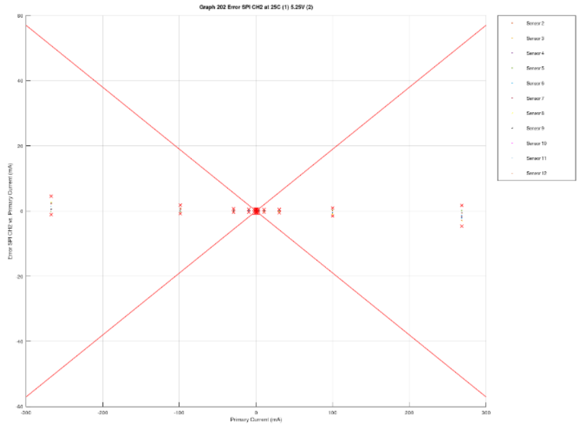
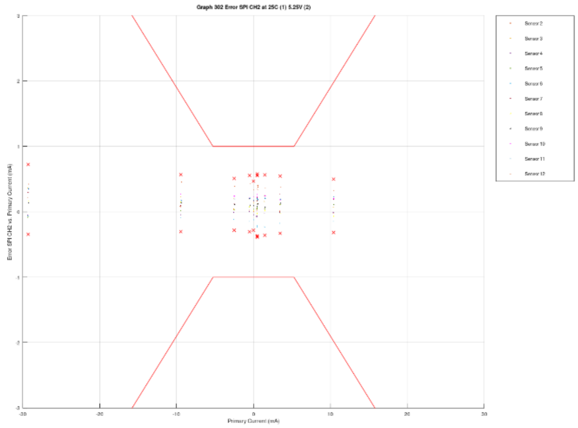
The absolute error of the sensor measurement channels versus voltage supply is given as follows (data extract DV test results 01/2023):









LEM reserves the right to carry out modifications on its transducers to improve them.

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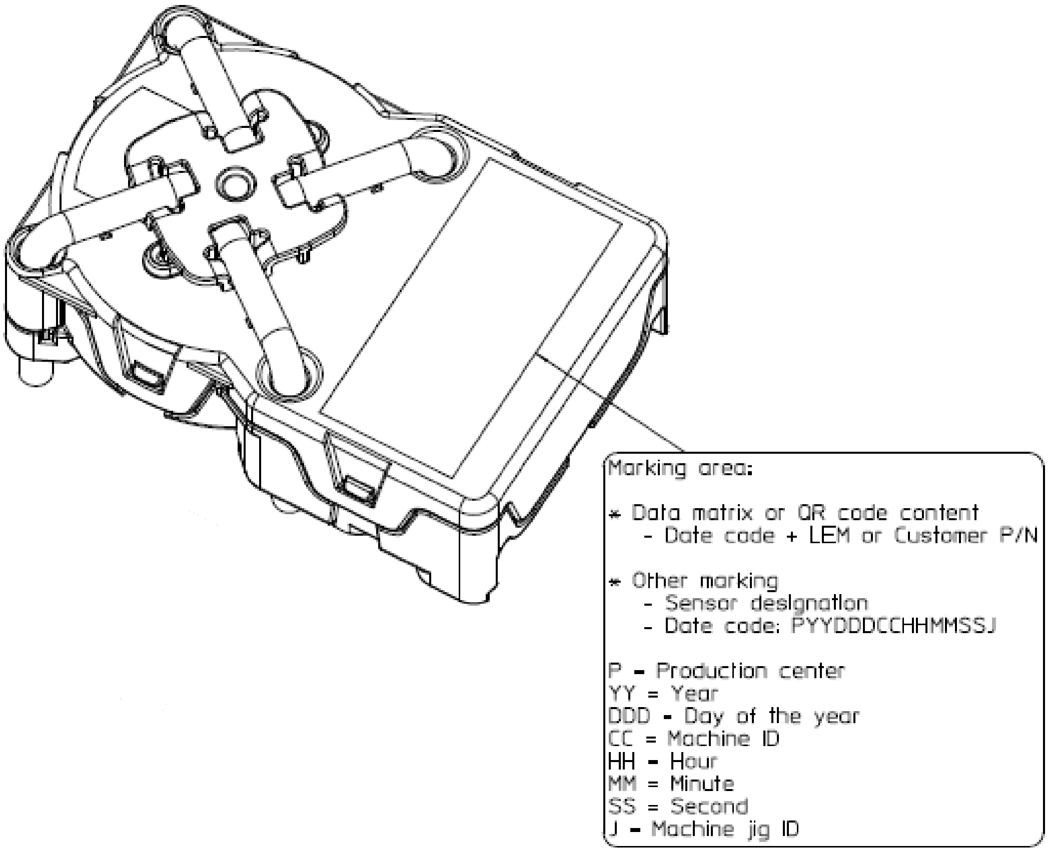
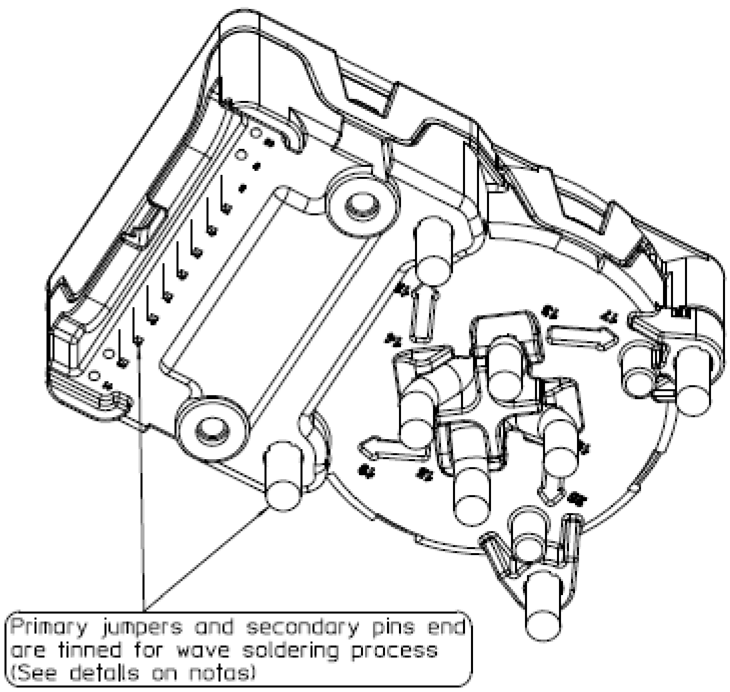
Dimensions DCDT 0.3-S2, DCDT-SF 0.3-S2, DCDT 0.3-S4, DCDT-SF 0.3-S4 (in mm)





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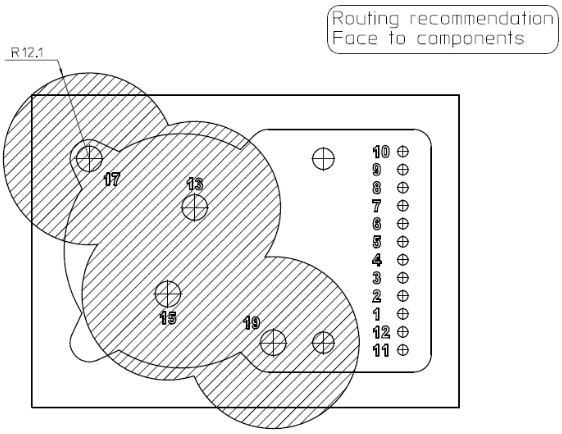
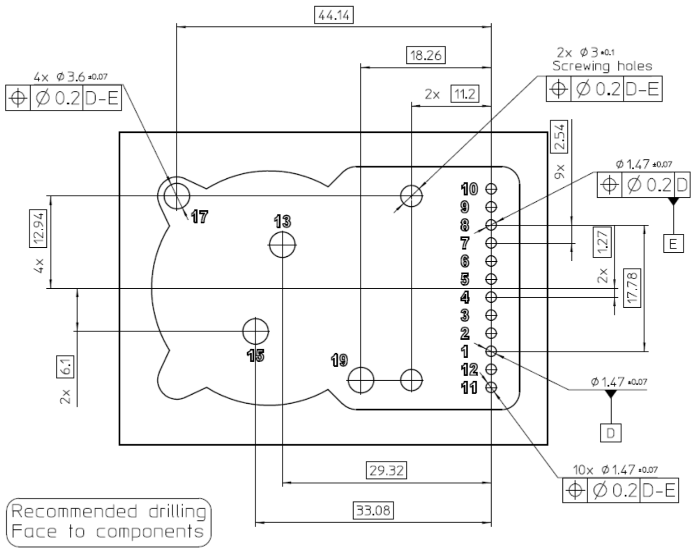
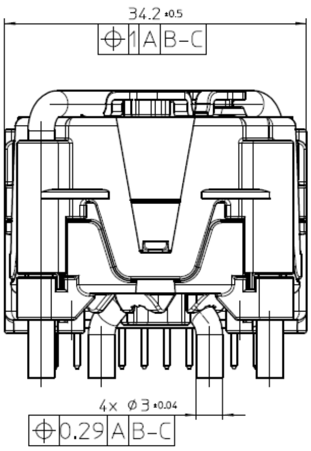
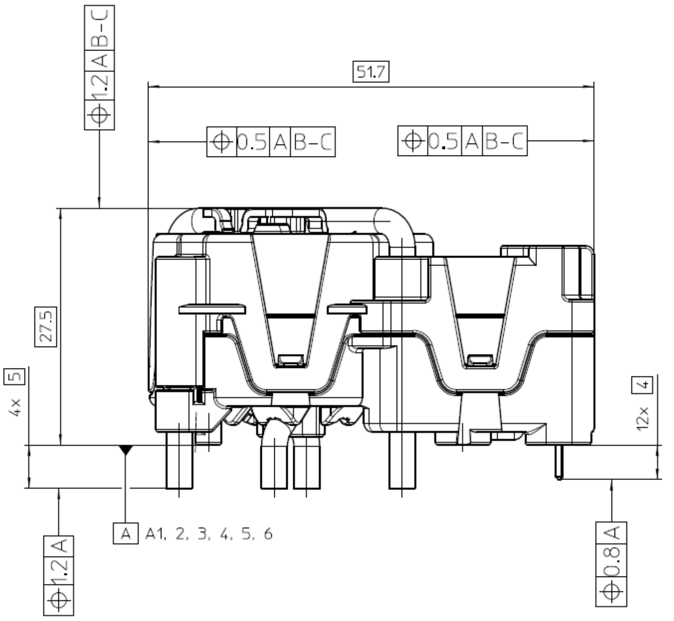
DCDT-SF xxx-S2

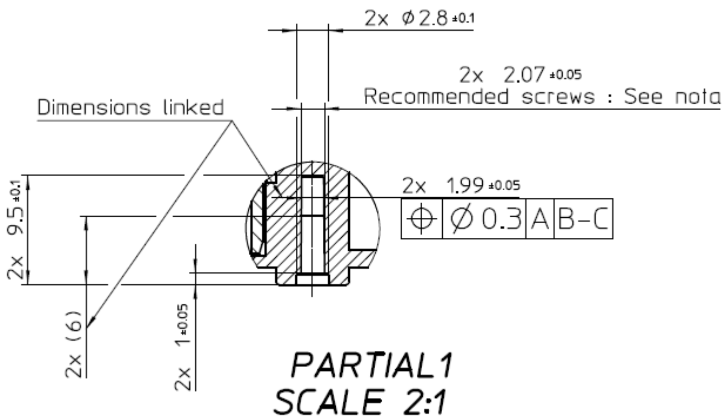


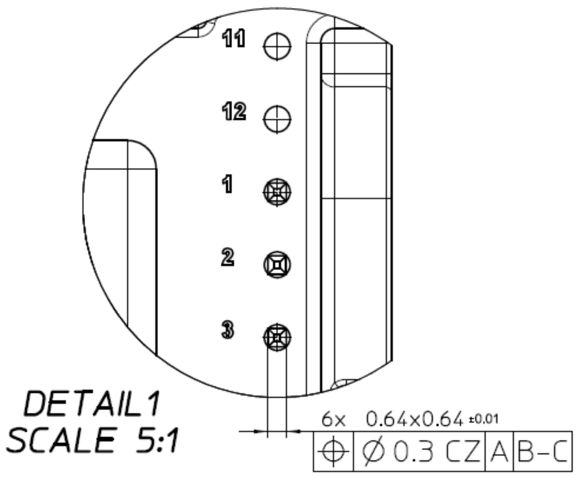
No secondary connection tracks in the hatched areas
(for clearance and creepage insulation insurance)
Areas are calculated considering Ø5 mm soldering
pads around primary jumpers.











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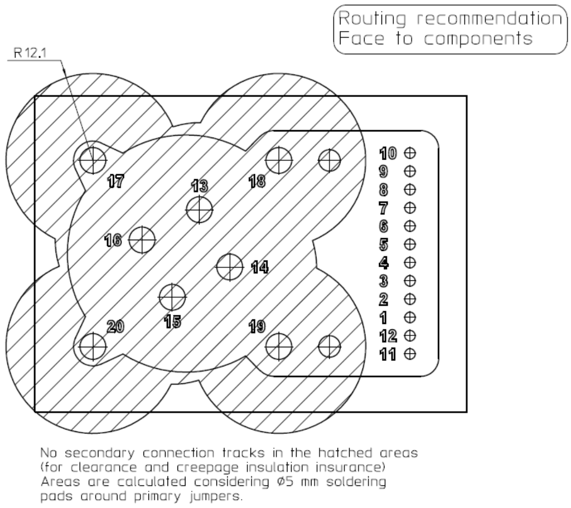
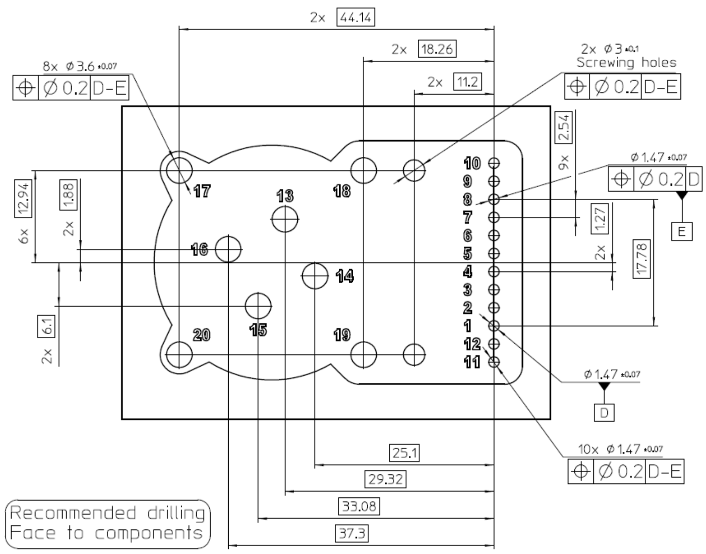
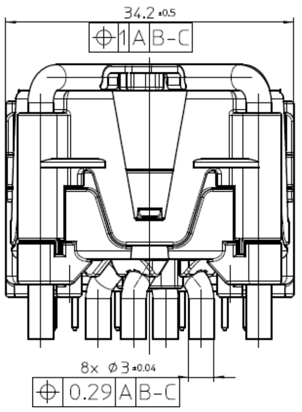
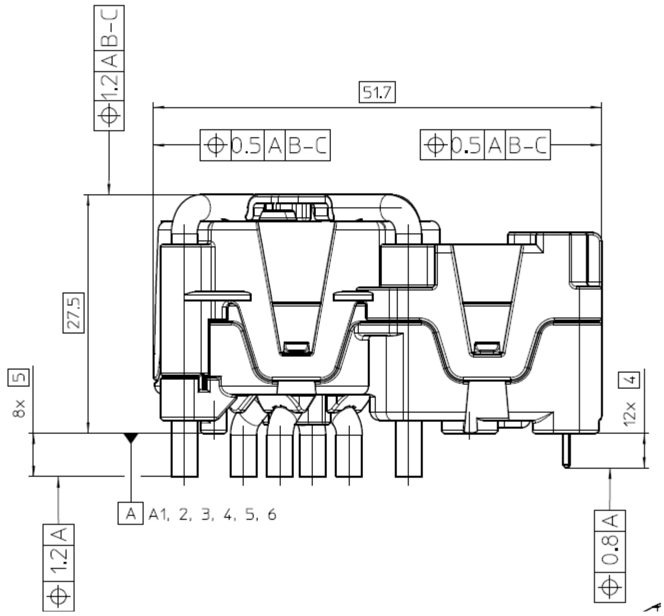
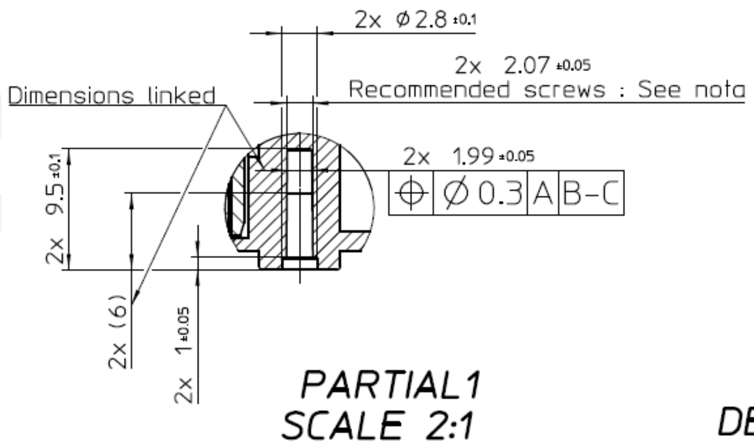
DCDT-SF xxx-S4

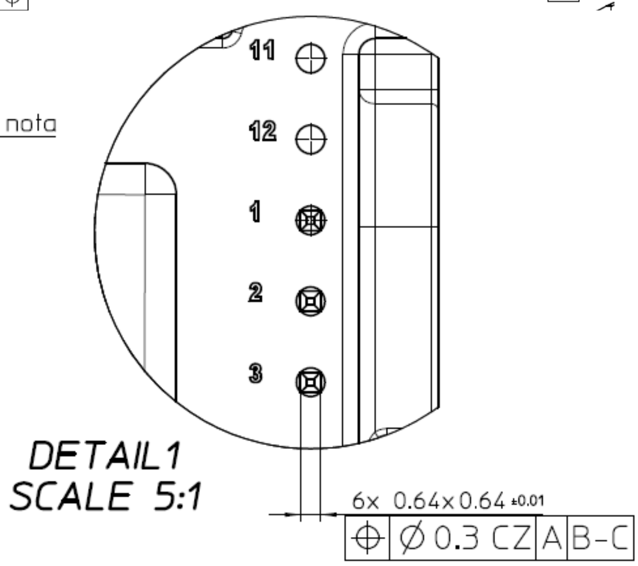












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Mechanical characteristics

• Plastic case	PA66-GF25
• Mass	
- CDT-SF 0.3-S2	33 g
- CDT-SF 0.3-S4	41 g
• Primary conductor material	EN CW004A Cu-etp
• Electrical terminal coating	Nickel + Matte Tin Plating
• Degrees of protection provided by enclosure	IP40
• Connector type	Through Hole
• Soldering type	Wave or selective wave
• Soldering profile	Maximum TBD °C, 10 s
• Recommended PCB thickness	1.6 mm
Mandatory screws for the 2 fixing holes	DELTA PT Ø 2.5 x 8 mm INOX A2 or equivalent non-magnetic steel Fastening torque = 0.6 ±0.1 N·m.

Assembly recommendations

When installed in the end-use equipment, consideration shall be given to the following:
The sensor shall be assembled in industrials ESD protected environment.
These devices are intended to be mounted on the printed wiring board of the end-use equipment.

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Safety

Caution

If the device is used in a way that is not specified by the manufacturer, the protection provided by the device may be compromised.
Always inspect the electronics unit and connecting cable before using this product and do not use it if damaged.
Mounting assembly shall guarantee the maximum primary conductor temperature, fulfill clearance and creepage distance, minimize electric and magnetic coupling, and unless otherwise specified can be mounted in any orientation.

Caution, risk of electrical shock

This transducer must be used in limited-energy secondary circuits SELV according to IEC 61010-1, in electric/electronic equipment with respect to applicable standards and safety requirements in accordance with the manufacturer's operating specifications.
Use caution during installation and use of this product; certain parts of the module can carry hazardous voltages and high currents (e.g., power supply, primary conductor).
Ignoring this warning can lead to injury and or/or cause serious damage.
If applicable: De-energize all circuits and hazardous live parts before installing the product.
All installations, maintenance, servicing operations and use must be carried out by trained and qualified personnel practicing applicable safety precautions.
This transducer is a build-in device, whose hazardous live parts must be inaccessible after installation.
This transducer must be mounted in a suitable end-enclosure.
Besides make sure to have minimum 30 mm between the primary terminals of the transducer and other neighboring components.
If applicable: Main supply must be able to be disconnected.
If applicable: Always inspect the flexible probe for damage before using this product.
If applicable: Never connect or disconnect the external power supply while the primary circuit is connected to live parts.
If applicable: Never connect the output to any equipment with a common mode voltage to earth greater than 30 V.
If applicable: Always wear protective clothing and gloves if hazardous live parts are present in the installation where the measurement is carried out.
This transducer is a built-in device, not intended to be cleaned with any product. Nevertheless, if the user must implement cleaning or washing process, validation of the cleaning program has to be done by himself.
If applicable: When defining soldering process, please use no cleaning process only.

ESD susceptibility
The product is susceptible to be damaged from an ESD event and the personnel should be grounded when handling it.
Do not dispose of this product as unsorted municipal waste. Contact a qualified recycler for disposal.
If CE marking not applicable: Although LEM applies utmost care to facilitate compliance of end products with applicable regulations during LEM product design, use of this part may need additional measures on the application side for compliance with regulations regarding EMC and protection against electric shock.
Therefore, LEM cannot be held liable for any potential hazards, damages, injuries or loss of life resulting from the use of this product.

Underwriters Laboratory Inc. recognized component

Version history

Date	Version	Comment
19/03/2024	1.19	Tripping timing diagrams updated. Architecture and Magnetic drawings. Dimension drawing updated. Various parameter fixes.

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