CDT 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). 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 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 physically the leakage current flowing and 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
- Unipolar +5 V DC power supply
- 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

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

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

Typical applications

On Board Charger:

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

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.

Standards*

- IEC 62752
- UL 2231

*Complete list of standards available in safety manual

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Sensor Reference 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*	Y	N	2	Mounted		Mounted	
DCDT-SF 0.3-S2	90.W6.A2.2xx.0*	Y	Y	2	Mounted		Mounted	
DCDT 0.3-S4	90.W4.A2.4xx.0*	Y	N	4	Mounted	Mounted	Mounted	Mounted
DCDT-SF 0.3-S4	90.W6.A2.4xx.0*	Y	Y	4	Mounted	Mounted	Mounted	Mounted

The following table summarizes the Tripping configuration of the transducer:

Applicable Standard		Tripping level at rated frequency (50 Hz or 60 Hz)			Recovery Level at rated frequency (50 Hz or 60 Hz)			LEM tripping reference	xx item number
		Min (mA)	Typ (mA)	Max (mA)	Min (mA)	Typ (mA)	Max (mA)		
IEC62752 IΔn = 30 mA	AC	TBD	22.2	TBD	TBD	16.6	TBD	xCDT-IEC30m	00
	DC	TBD	4.4	TBD	TBD	3.3	TBD		
IEC62752 IΔn = 20 mA	AC	TBD	15	TBD	TBD	11.25	TBD	xCDT-IEC20m	01
	DC	TBD	4.4	TBD	TBD	3.3	TBD		
IEC62752 IΔn = 15 mA	AC	TBD	11	TBD	TBD	8.25	TBD	xCDT-IEC15m	02
	DC	TBD	4.4	TBD	TBD	3.3	TBD		
IEC62752 IΔn = 10 mA	AC	TBD	6.9	TBD	TBD	5.17	TBD	xCDT-IEC10m	03
	DC	TBD	4.4	TBD	TBD	3.3	TBD		
IEC62752 IΔn = 6 mA	AC	TBD	4.5	TBD	TBD	3.37	TBD	xCDT-IEC6m	04
	DC	TBD	4.4	TBD	TBD	3.3	TBD		
UL2231 CCID20	AC	TBD	16.8	TBD	TBD	12.6	TBD	xCDT-UL20m	05
	DC	TBD	4.4	TBD	TBD	3.3	TBD		
UL2231 CCID5	AC	TBD	5	TBD	TBD	3.75	TBD	xCDT-UL5m	06
	DC	TBD	4.4	TBD	TBD	3.3	TBD		
Multiple time tripping level selection via SPI in the following list: xCDT-IEC30m, xCDT-IEC20m, xCDT-IEC15m, xCDT-IEC10m, xCDT-IEC6m, xCDT-UL20m, xCDT-UL5m									07
Single time tripping level selection via SPI in the following list: xCDT-IEC30m, xCDT-IEC20m, xCDT-IEC15m, xCDT-IEC10m, xCDT-IEC6m, xCDT-UL20m, xCDT-UL5m									08

Custom tripping levels and timings are available upon request. Default characteristic selected with B-sample is xCDT-IEC20m.

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Absolute maximum rating

Parameter	Symbol	Unit	Value
Maximum primary conductor temperature	T_B max	°C	150 °C (for short term period) [1]
Primary withstand peak current per primary conductor	$\hat{I}_{P\ max}$	A	TBC
Primary withstand peak residual current	$\hat{I}_{P\ R\ max}$	A	2
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 of thermal design.

Absolute maximum ratings apply at 25 °C unless otherwise noted.
Stresses above these ratings may cause permanent damage
Exposure to absolute maximum ratings for extended period of time may degrade reliability.

General electrical rating

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Primary nominal AC RMS voltage (continuous)	$U_{P\ N\ AC}$	V		400		
Ambient storage temperature [1] [2]	$I_{P\ N\ AC}$	A			48	Under qualification tests
Resistance of any primary conductor	R_P	uΩ		166	TBD	@ 25 °C
Base FIT of DCDT 0.3-S2 and DCDT 0.3-S4		FIT		1063 [2] [3]		

Notes: [1] Corresponding to an ambient temperature of 105 °C and a max primary conductor temperature of 150 °C
[2] To be confirmed after DV Test
[3] This value is calculated using SN 29500 Standard and temperature profile of 73 °C average temperature.

Conditions of acceptability

When installed in the end-use equipment, consideration shall be given to the following:

1. These devices must be mounted in a suitable end-use enclosure
2. The terminals have not been evaluated for field wiring
3. LEM xCDT family sensors shall be used in a pollution degree 2 according to IEC 60664
4. 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)
5. These devices are intended to be mounted on the printed wiring board of the end-use equipment.

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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)	d_{Cl}	mm	3	Shortest distance through air
Creepage distance (primary to primary)	d_{Cp}	mm	3.4	Shortest path along device body
Clearance (primary to secondary)	d_{Cl}	mm	9	Shortest distance through air
Creepage distance (primary to secondary)	d_{Cp}	mm	9	Shortest path along device body
Case material	-	-	V0	According to UL 94
Comparative tracking index	CTI		600	

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1. 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*
Operating temperature (sensor internal PCBA T°C)	T_A	°C	−40		120	Software temperature fault protection at 120°C
Ambient storage and transportation temperature	$T_{A\,st}$	°C	−40		125	
Relative humidity	RH	%		50		

General electrical ratings (low frequency sensing element)

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		90	100	Filtering capacitors 100 nF and 47 uF required on sensor 5V supply. Over full temperature and supply voltage range
Start-up time	t_{start}	ms		800	TBD	

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 $I_{P\,R}$: −6.6 mA < $I_{P\,R}$ DC < 6.6 mA	ε_{tot}	mA	−1.3		1.3	Evaluated on 100 samples/200 ms. To be confirmed after DV tests.
Total error CH1 referred to primary $I_{P\,R}$: −300 mA < $I_{P\,R\,DC}$ < −6.6 mA and 6.6 mA < $I_{P\,R\,DC}$ < 300 mA	ε_{tot}	mA		±15 % $I_{P\,R\,DC}$		To be confirmed after DV tests.
Total error CH2 referred to primary $I_{P\,R}$: −5.3 mA < $I_{P\,R}$ DC < 5.3 mA	ε_{tot}	mA	−1		1	Evaluated on 100 samples/200 ms. To be confirmed after DV tests. xCDT-SF version only

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Test winding characteristics (low frequency sensing element)

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	

DCDT 0.3-S2, DCDT-SF 0.3-S2, DCDT 0.3-S4, DCDT-SF 0.3-S4

SPI and tripping output characteristics (low frequency sensing element)

Parameter	Symbol	Unit	Min	Typical	Max	Comment
Output logic high		V	2.6	3.3		Output current 5 mA
Output logic low		V		0	0.7	Output current −5 mA
Input logic high		V	2.8			
Input logic low		V			0.6	
Sink / source output maximum current	$I_{out\ max}$	mA	−10		10	
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 (low frequency sensing element) [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	120			
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			
Data output valid to slave select edge	$t_{SPI\ 8}$	ns			50	

Notes: [1)] Refer to SPI specification document for protocol details.

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2. Current transformer sensor performances

Measurement output characteristics (Current Transformer, 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 conductor 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 conductor 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 have to 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.

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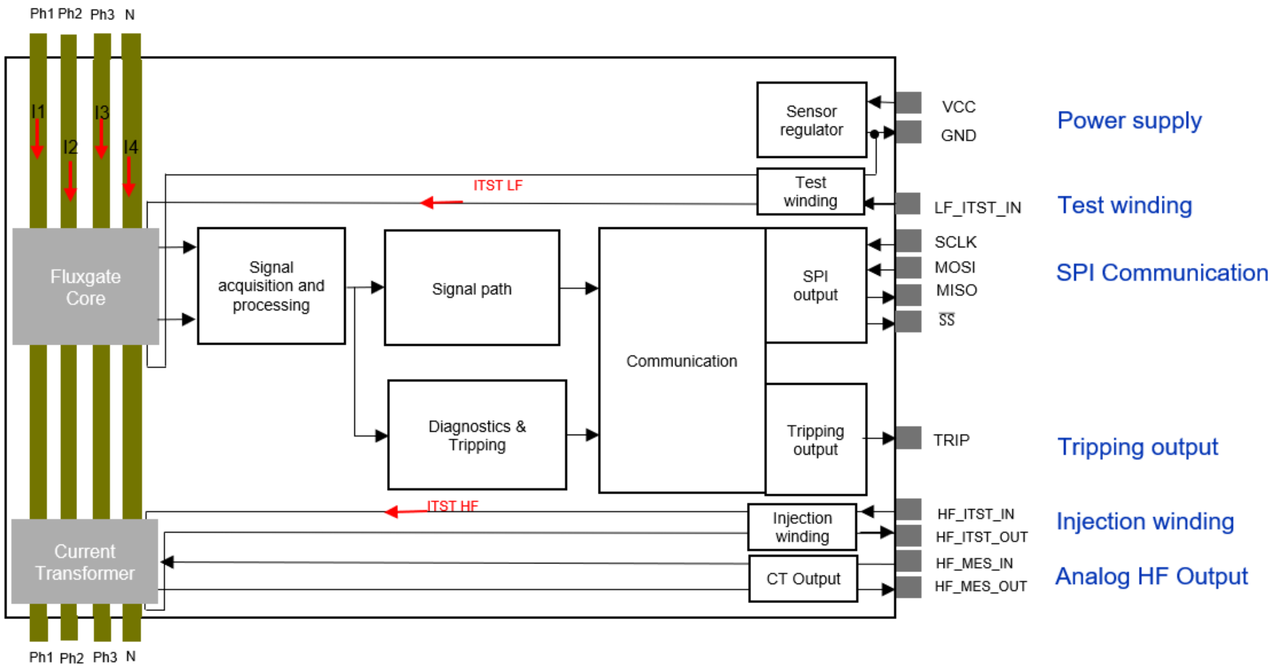
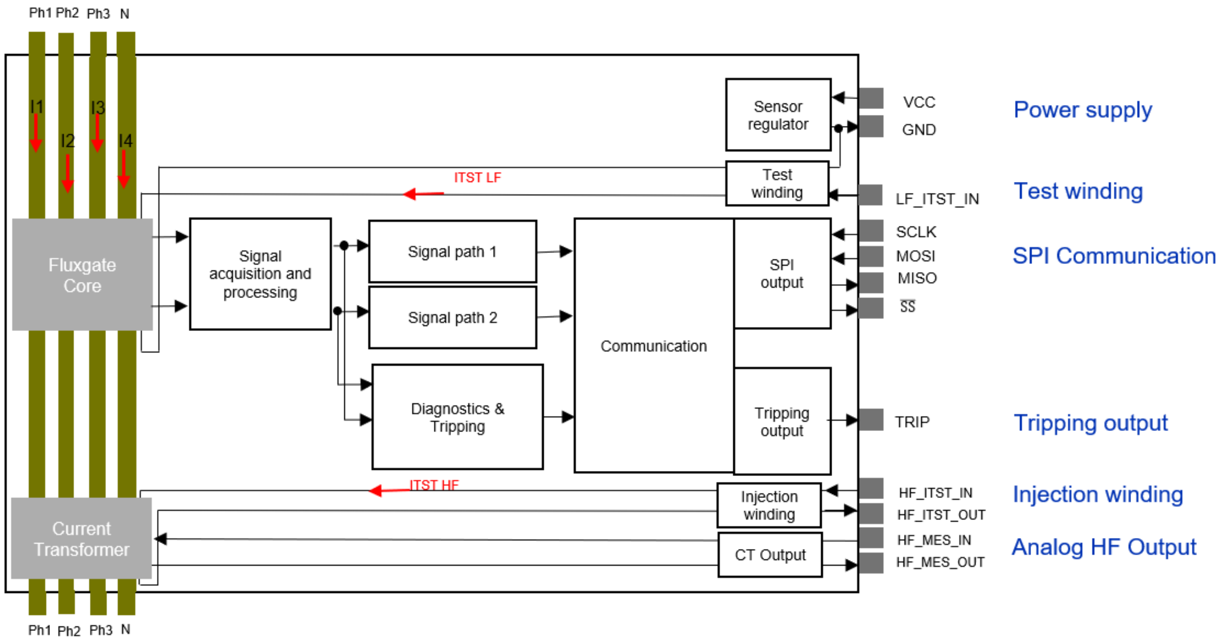
Sensor Internal Architecture (DCDT 0.3-Sx*)



Sensor Internal Architecture (DCDT SF 0.3-Sx*): Safety Variant



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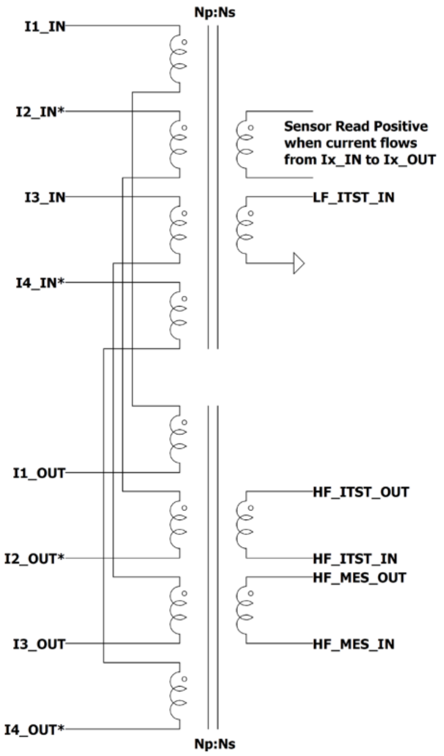
Sensor Magnetic Structure (DCDT 0.3-Sx*and DCDT-SF 0.3- Sx*)



* Refer to sensor reference table to identify primary conductor configuration.

Sensor Pin Out

Low Frequency Sensor Element				
Pin n°	**Signal Type**	**Direction**	**Signal Name**	**Description**
1	Digital	Sensor Input	SCLK	Serial Peripheral Interface Clock
2	Digital	Sensor Input	MOSI	Serial Peripheral Interface Master Output Slave Input
3	Digital	Sensor Output	MISO	Serial Peripheral Interface Master Input Slave Output
4	Digital	Sensor Input	$\overline{SS}$	Serial Peripheral Interface Slave Select
5	Digital	Sensor Output	TRIP	Tripping Signal
6	Power		0 V	Negative power supply rail
7	Power		VCC	Positive power supply rail
8	Analog	Sensor Input	LF_ITST_IN	Low frequency test winding current input

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High Frequency Sensor Element				
Pin n°	**Signal Type**	**Direction**	**Signal Name**	**Description**
9	Analog	Sensor Output	HF_ITST_OUT	High frequency test winding current output
10	Analog	Sensor Input	HF_ITST_IN	High frequency test winding current input
11	Analog	Sensor Output	HF_MES_OUT	High frequency measurement current output
12	Analog	Sensor Input	HF_MES_IN	High frequency measurement current input

High Current Primary Conductor				
Pin n°	**Signal Type**	**Direction**	**Signal Name**	**Description**
13	Analog	Sensor Input	I1_IN	Primary Conductor 1 input current
14	Analog	Sensor Input	I2_IN	Primary Conductor 2 input current*
15	Analog	Sensor Input	I3_IN	Primary Conductor 3 input current
16	Analog	Sensor Input	I4_IN	Primary Conductor 4 input current*
17	Analog	Sensor Output	I1_OUT	Primary Conductor 1 output current
18	Analog	Sensor Output	I2_OUT	Primary Conductor 2 output current*
19	Analog	Sensor Output	I3_OUT	Primary Conductor 3 output current
20	Analog	Sensor Output	I4_OUT	Primary Conductor 4 output current*

* Refer to sensor reference table to identify primary conductor configuration.

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Sensor Application Notes

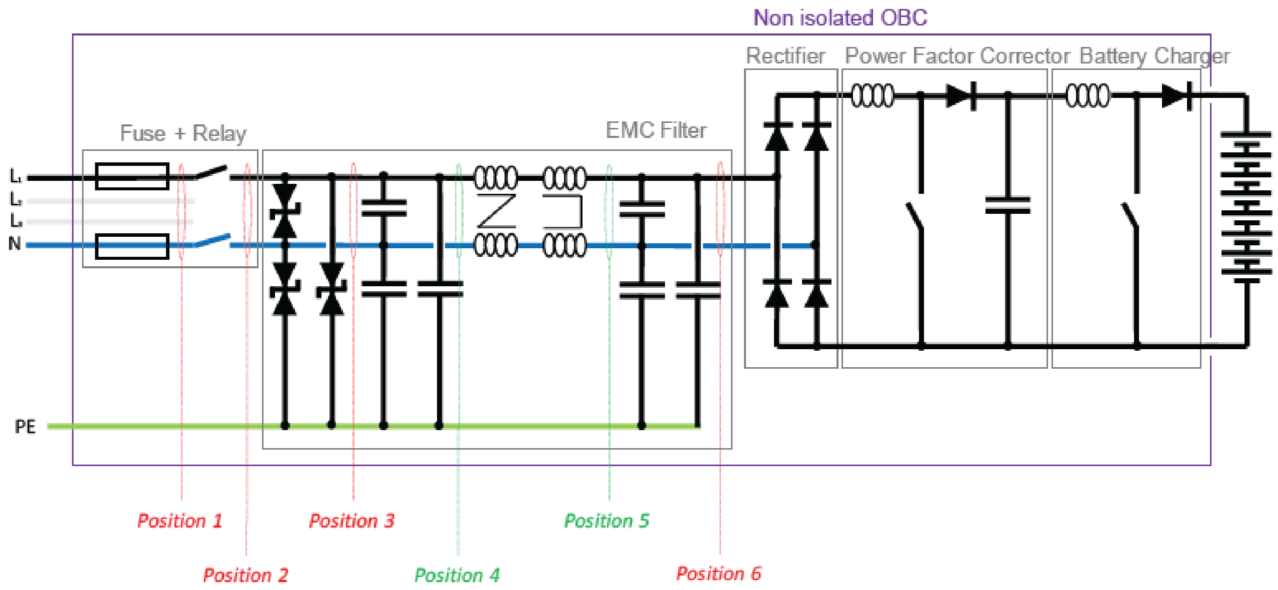
xCDT sensor Application note reference PDM number includes information that will ensure robust integration of the sensor in customer application (test set-up, magnetic environment...).
SPI Technical Specification reference PDM number detail the Serial Peripheral Interface protocol to be implemented by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

Correct Sensor Integration inside Power Converters regarding EMC constraints

The differential transducer placement inside client application, typically 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

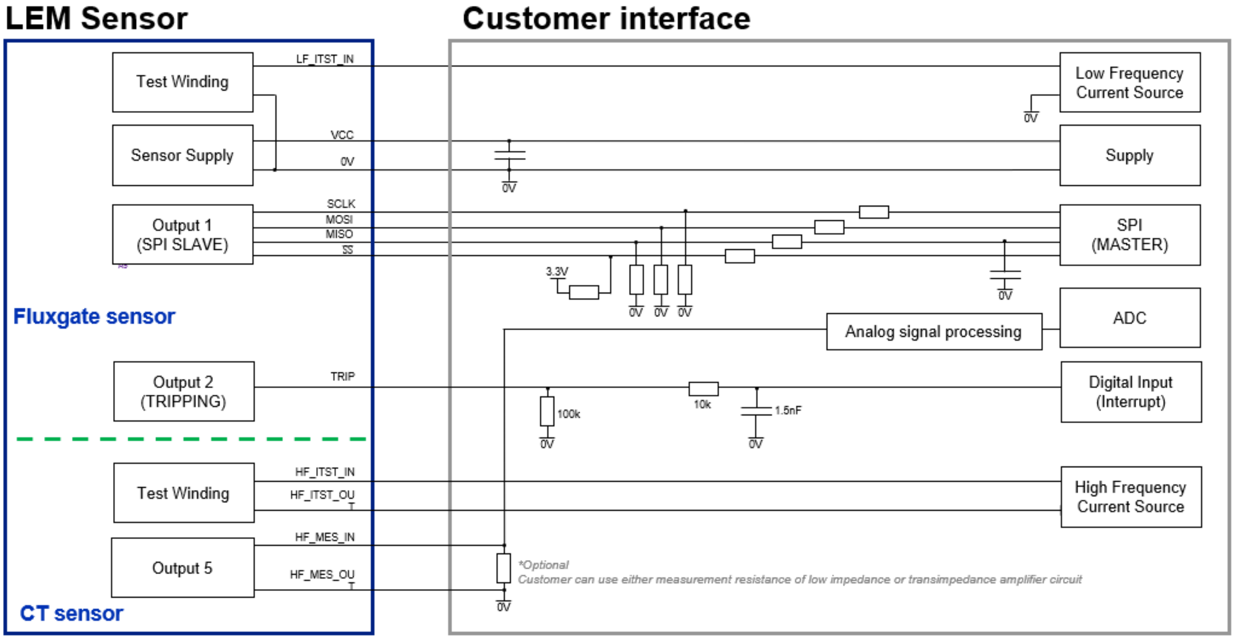
Test winding customer driving circuit for low frequency sensor element must be designed carefully to avoid interactions with the sensor. It must behave as a perfect current source while injecting current and shall be floating while unused.

Test/Injection Winding High Frequency Sensing Element Design rules

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 components values



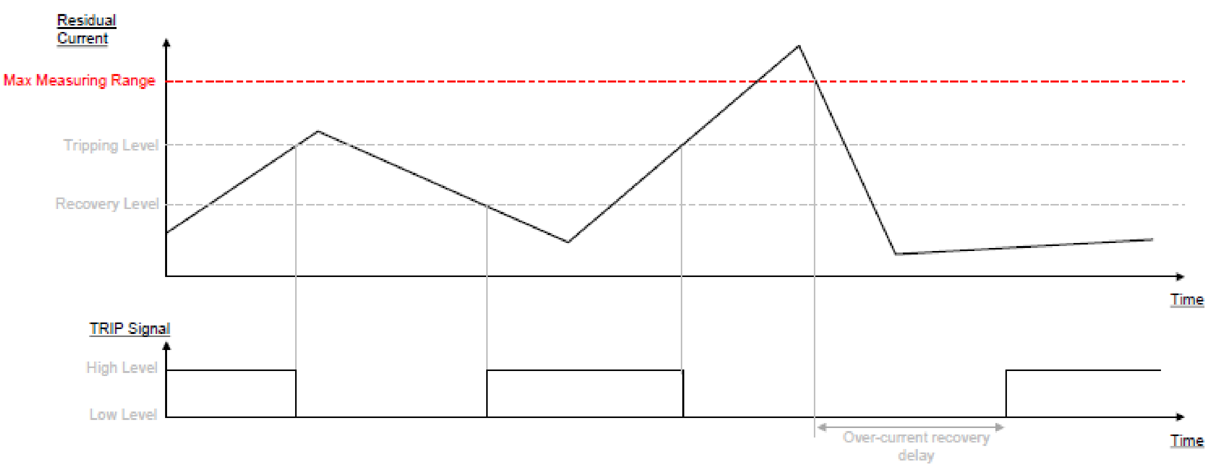
Tripping Pin and SPI Signal

The tripping pin and SPI signal are used to indicate 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. This TRIP pin is set-up in high impedance at start-up of the sensor and requires a pull-down resistor for safe operation.

Safe state shall be considered as an OR between SPI tripping signals and SPI active faults.

Tripping timing diagram

The tripping signal will operate as follow:



Note: The maximum over-current recovery delay is TBD ms.

The 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...).

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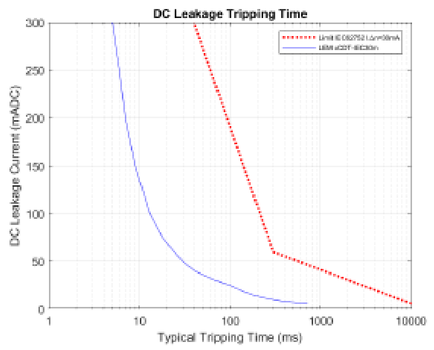
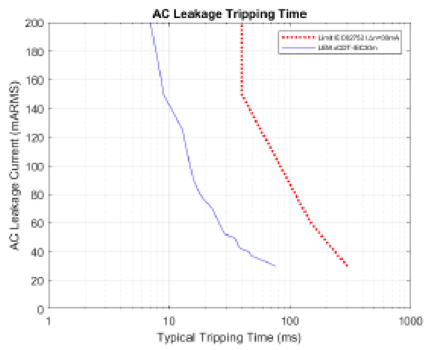
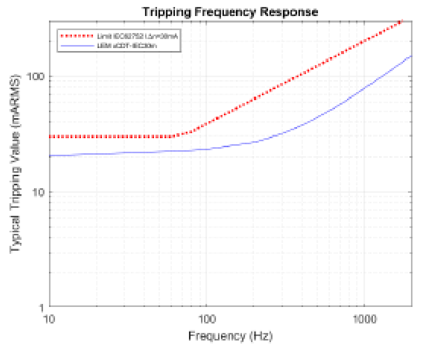
On following graphs, the red dashed curve gives you the tripping characteristic required by the norm and the blue curve gives you the theorical tripping time programmed in sensor software. To consider measurement tolerance, customer can include a maximum LEM actual tripping time variation of +/- 10 % compared to theorical blue curve on short tripping time.

xCDT-IEC30m (to be confirmed after DV Test)



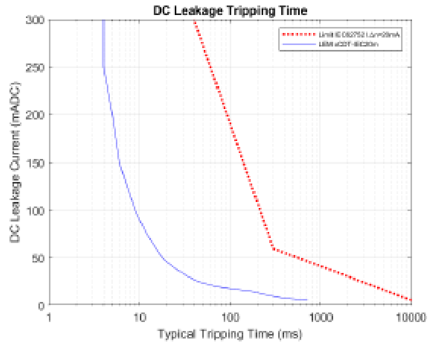


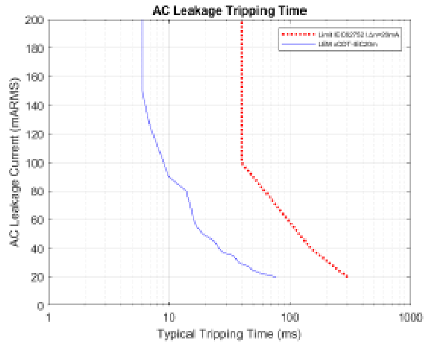


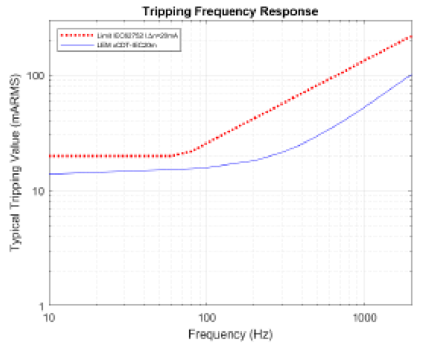
DC Tripping	
Current (mA DC)	Tripping Time (ms)
20	130
30	70.0
100	13.0
200	6.99
300	5.00

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)
20	73.0
30	35.0
100	9.01
200	5.01
300	3.99

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

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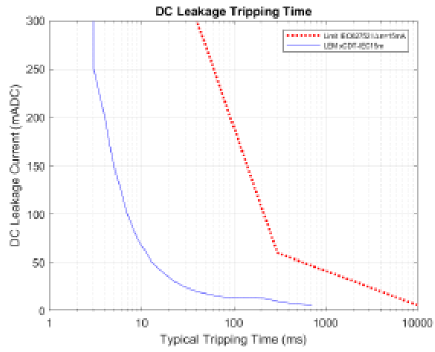
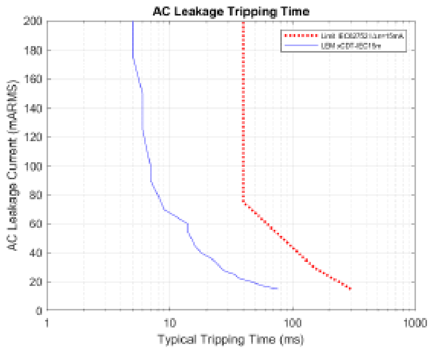
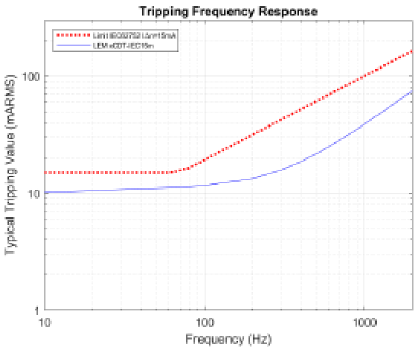
xCDT-IEC15m (to be confirmed after DV Test)



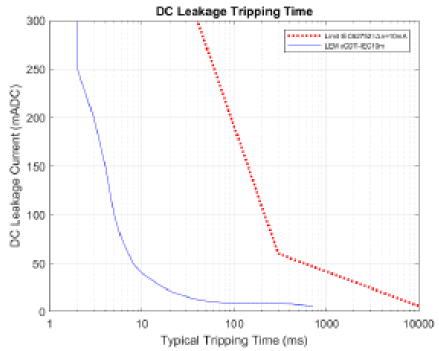


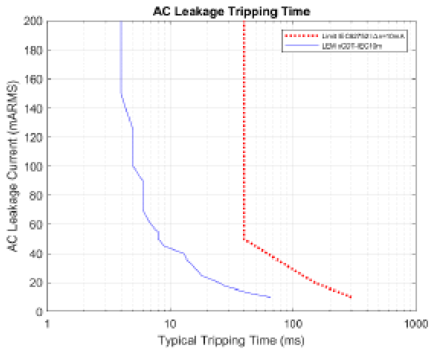


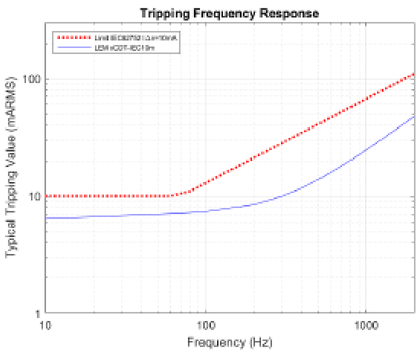
DC Tripping	
Current (mA DC)	Tripping Time (ms)
20	40.0
30	23.0
100	6.99
200	3.98
300	3.01

AC Tripping	
Current (mA RMS)	Tripping Time (ms)
30	26.0
70	9.01
100	6.99
200	4.99

xCDT-IEC10m (to be confirmed after DV Test)







DC Tripping	
Current (mA DC)	Tripping Time (ms)
20	22.0
30	14.0
100	5.01
200	2.99
300	2.00

AC Tripping	
Current (mA RMS)	Tripping Time (ms)
30	16.0
70	5.97
100	4.98
200	4.00

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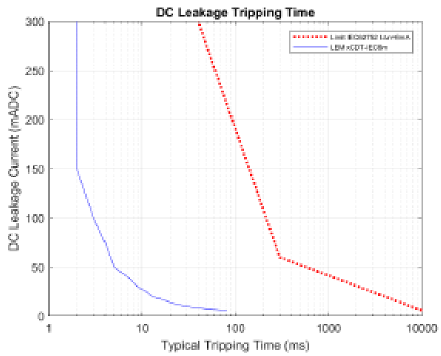
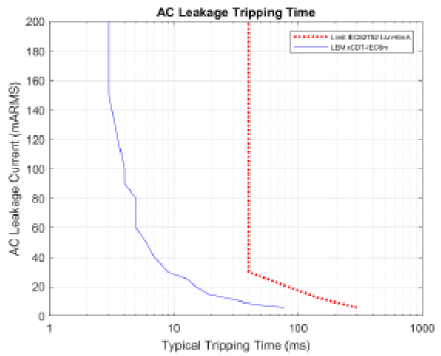
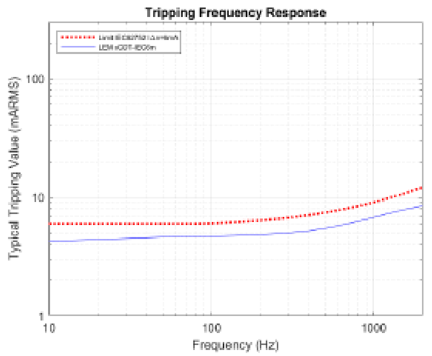
xCDT-IEC6m (to be confirmed after DV Test)



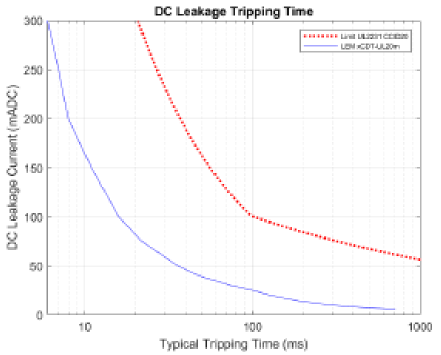


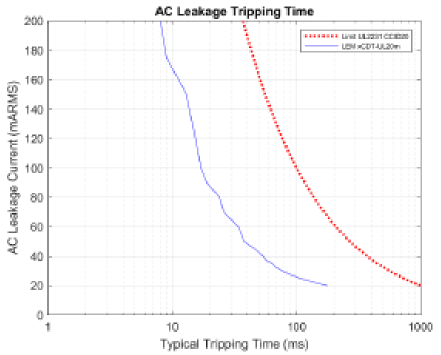


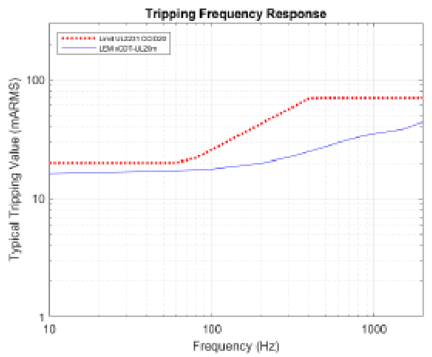
DC Tripping	
Current (mA DC)	Tripping Time (ms)
20	13.0
30	9.00
100	2.99
200	2.00
300	1.99

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

xCDT-UL20m (to be confirmed after DV Test)



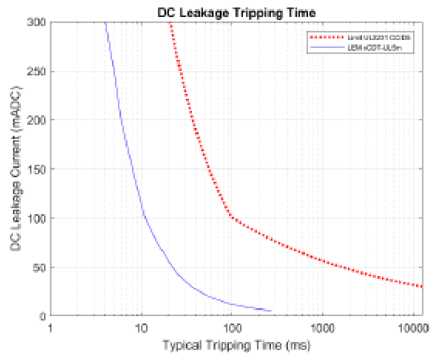


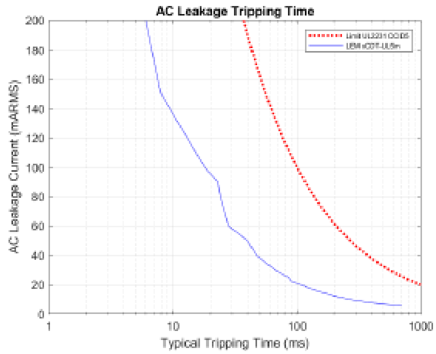


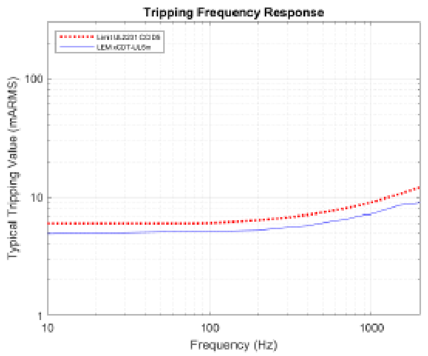
DC Tripping	
Current (mA DC)	Tripping Time (ms)
20	129
30	75.0
100	16.1
200	7.95
300	5.99

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

xCDT-UL5m (to be confirmed after DV Test)







DC Tripping		AC Tripping	
Current (mA DC)	Tripping Time (ms)	Current (mA RMS)	Tripping Time (ms)
20	56.1	30	67.0
30	36.1	70	26.0
100	11.0	100	18.2
200	6.02	200	6.04
300	3.98		

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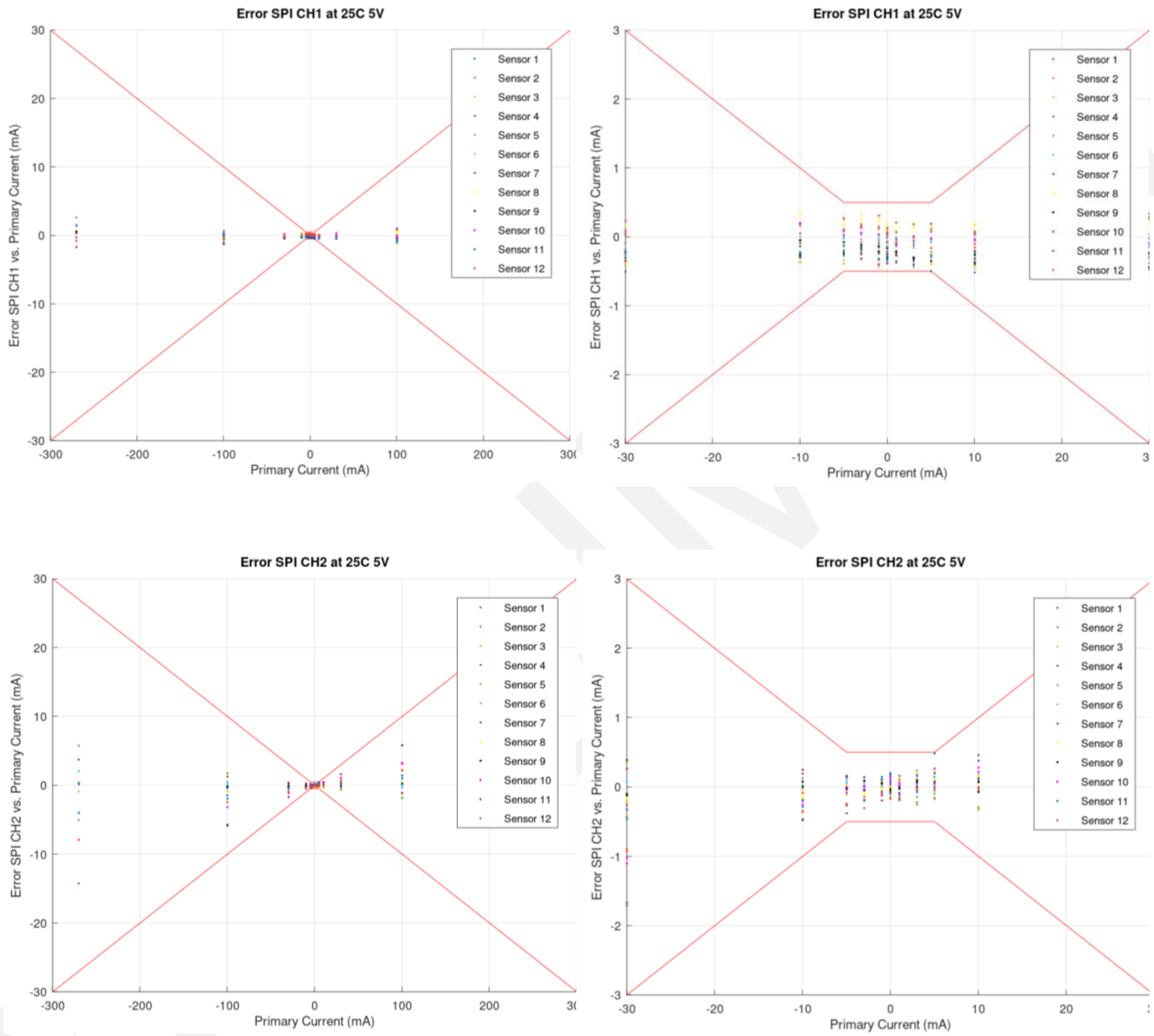
The absolute error of the sensor measurement channels versus voltage supply is given as follow (data extract DV test results 22/07/2022):



The absolute error of the sensor measurement channels versus external field is given as follow: **TBC**

The primary conductor current is limited with regards to the temperature of the sensor as follow: **TBC**

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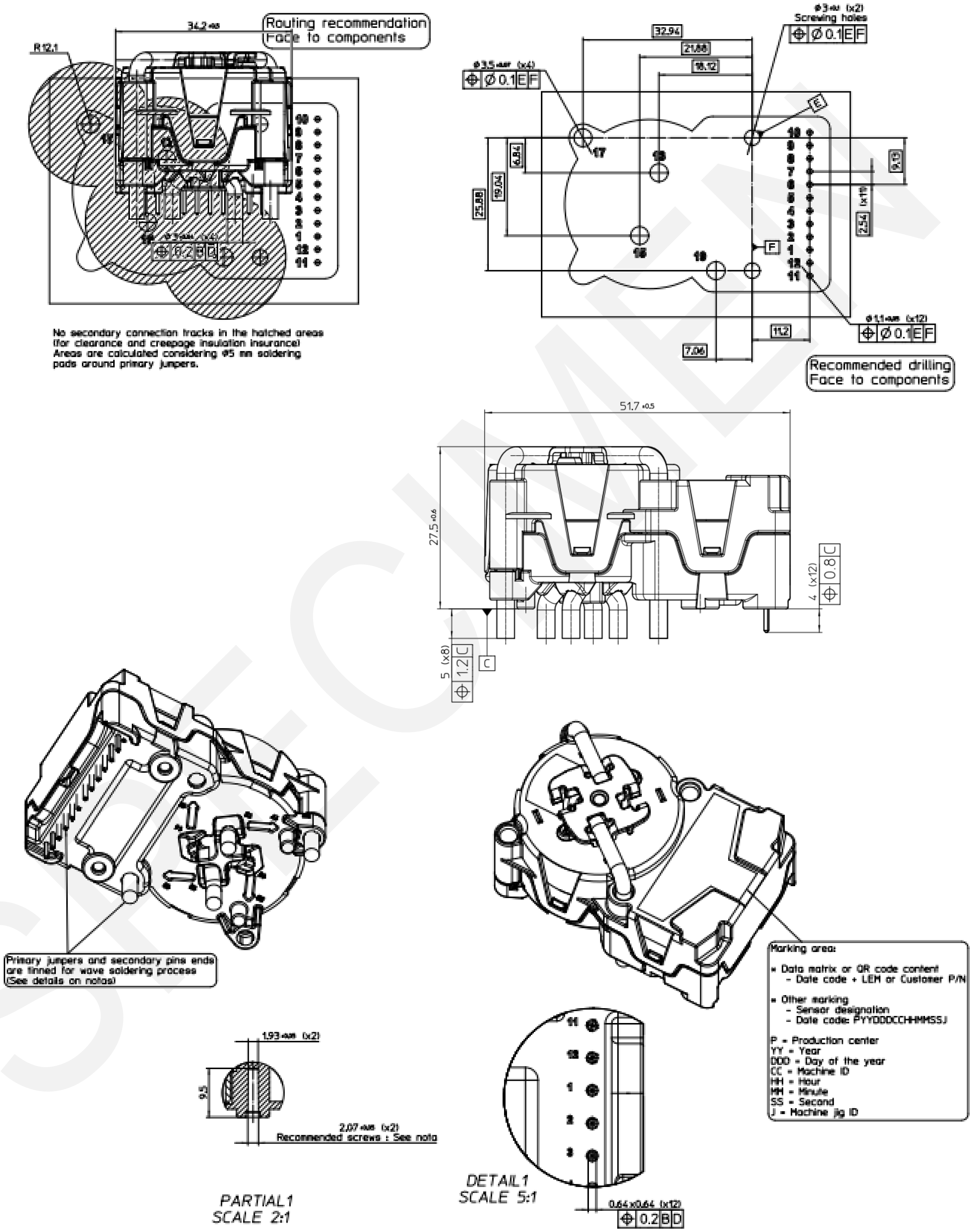
Dimensions DCDT 0.3-S2, DCDT-SF 0.3-S2, DCDT 0.3-S4, DCDT-SF 0.3-S4 (in mm)

DCDT-SF xxx-S2



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

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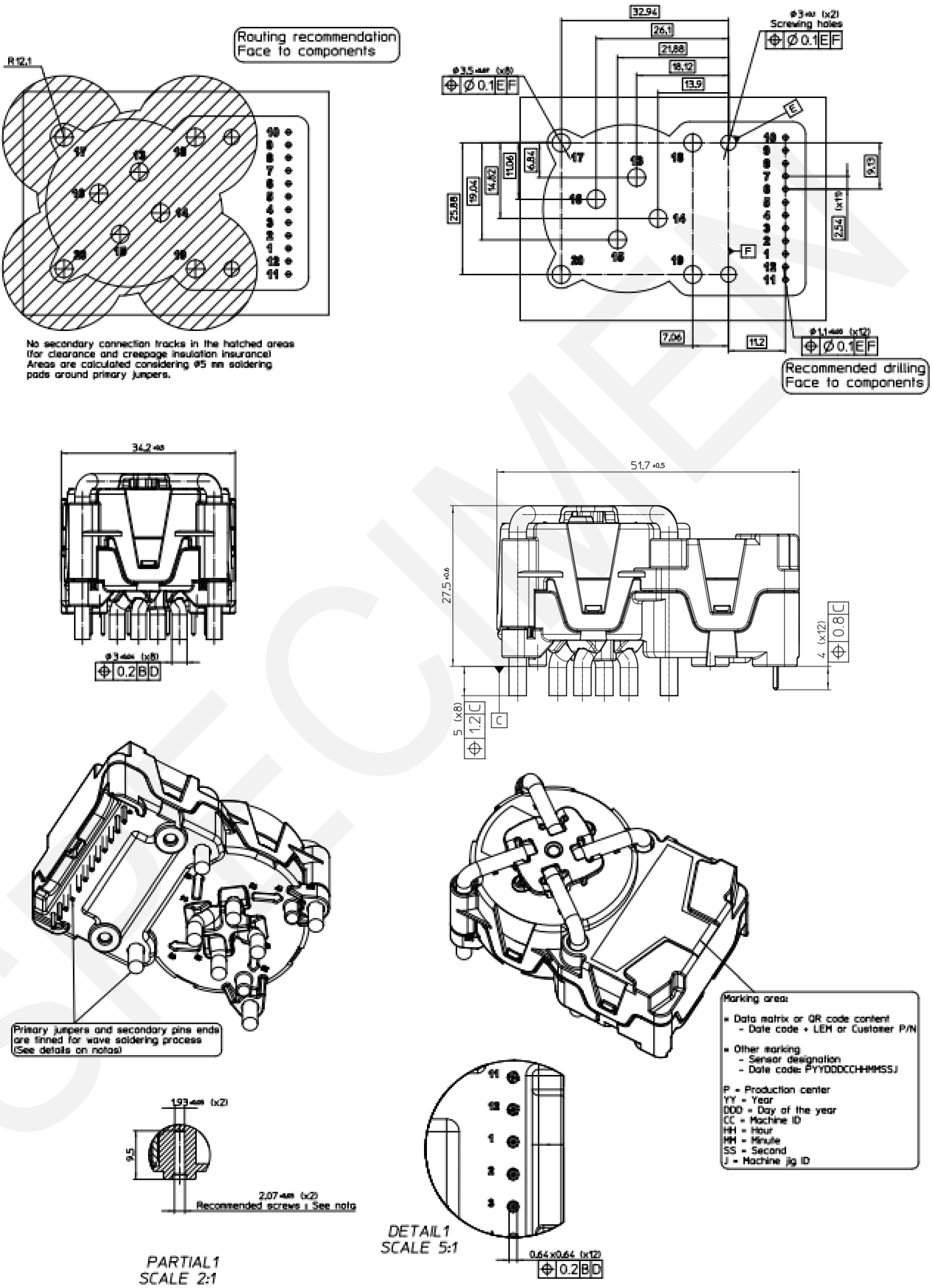

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Mechanical characteristics

• Plastic case	PA66-GF25
• Mass	
DCDT-SF 0.3-S2	52 g
DCDT-SF 0.3-S4	62 g
• Primary conductor material	EN CW004A Cu-etp
• Electrical terminal coating	Nickel + Male Tin Plating
• Degrees of protection provided by enclosure	IP40

Mechanical characteristics

• 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.

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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.

c UR us Underwriters Laboratory Inc. recognized component

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Version history

Date	Version	Comment
…	…	…

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