

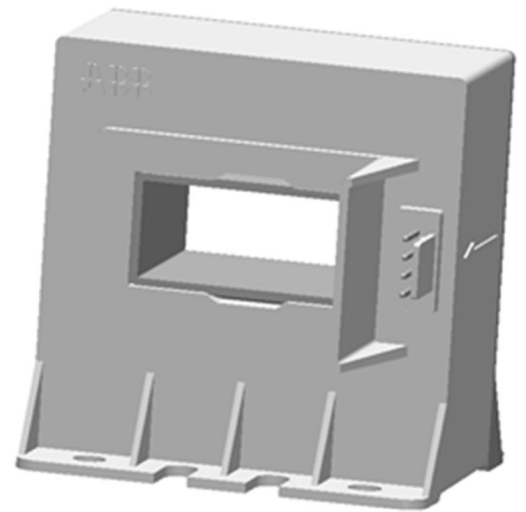
Technical argumentation
Argumentation technique

TYA Range *Gamme TYA*

1SBC146013C1702 Technical Presentation TYA range 1.1 - Version 1.1

Hall effect closed-loop
current sensors

*Capteurs de courant
à effet Hall boucle fermée*



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SUMMARY

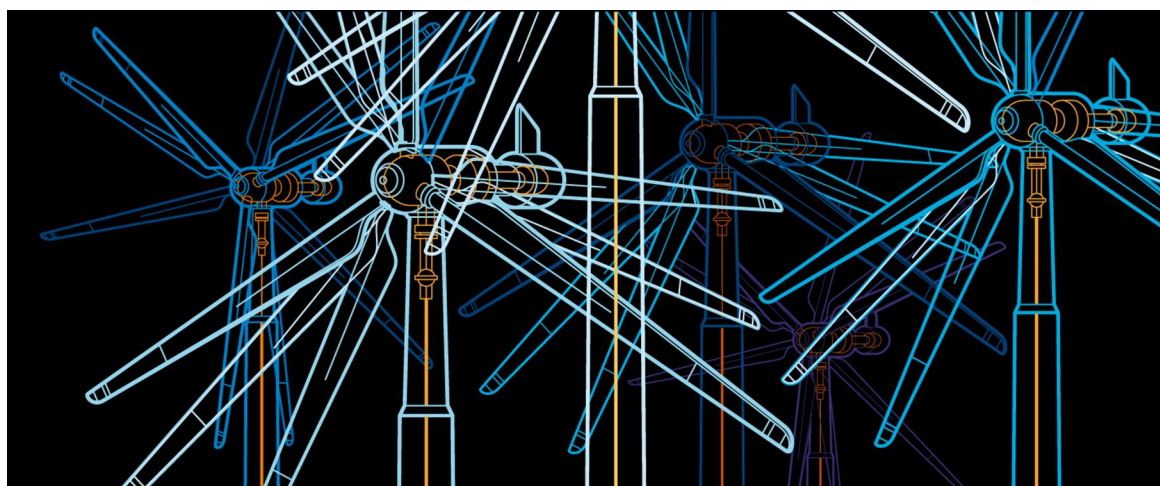
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Chassieu, 13/06/2012

Current sensors TYA Range Technical Presentation

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Technical presentation summary

1. The applications (Industry & Traction)
2. The technology
3. The range
4. The main characteristics
5. The electrical connections
6. The advantages
7. The used standards
8. The technical documentation

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1. The applications (Industry & Traction)

- **Industrial applications**
 - Variable speed drives
 - Uninterruptable Power Supplies (UPS)
 - Solar
 - Windmills
 - Welding applications
 - Active harmonic filters
 - etc,...

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1. The applications (Industry & Traction)

- **Traction applications**
 - Auxiliary convertors (up to 600Vdc line voltage)

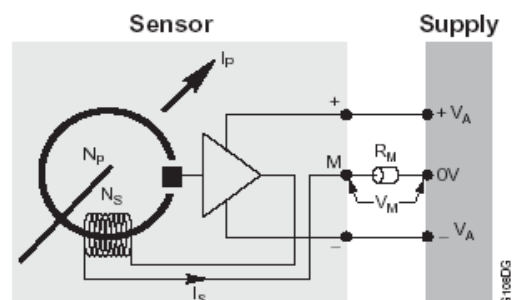
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2. The technology

▪ Functioning principle:

- The primary current I_p flowing across the sensor creates a primary magnetic flux.
- The magnetic circuit channels this magnetic flux. The Hall probe placed in the air gap of the magnetic circuit provides a voltage proportional to this flux.
- The electronic circuit amplifies this voltage and converts it into a secondary current I_s . This secondary current multiplied by the number of turns N_s of secondary winding cancels out the primary magnetic flux that created it (contra reaction). The formula $N_p \times I_p = N_s \times I_s$ is true at any time. The current sensors measures instantaneous values.
- The secondary output current I_s , is therefore exactly proportional to the primary current at any moment. It is an exact replica of the primary current multiplied by the number of turns N_p / N_s .
- This secondary current I_s can be passed through a measuring resistance R_M .
- The measuring voltage V_M at the terminals of this measuring resistance R_M is therefore also exactly proportional to the primary current I_p .



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2. The technology

	Shunt	Current Transformer	Open Loop	Closed Loop
Insulation P/S	NO	YES	YES	YES
Bandwidth	DC to few kHz	AC only	DC to few kHz	DC to 50 kHz
Measuring range	Low	Medium	Medium	High
Maximum overloads	Very Low	Low	Low	High
Power dissipation	High	Medium	Very Low	Low
Output signal	Voltage	Current	Voltage	Current
Supply voltage	No need	No need	$\pm V$	$\pm V$
Accuracy	0.5 to 2%	0.5 to 2%	2 to 4%	< 1%

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2. The technology

- **Major advantages of the TYA technology (closed loop Hall effect technology)**
 - Galvanic insulation
 - High accuracy
 - Fast response time
 - Excellent linearity
 - Low power dissipation
 - Rectangular hole shape

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3. The range

- **General range presentation (Industry):**

- 300 Arms up to 500 Arms
 - 300A rms => TYA300
 - 400 to 500A rms => TYA500

- **General range presentation (Traction):**

- 300 Arms up to 500 Arms
 - 300A rms => TYA300-T
 - 400 to 500A rms => TYA500-T

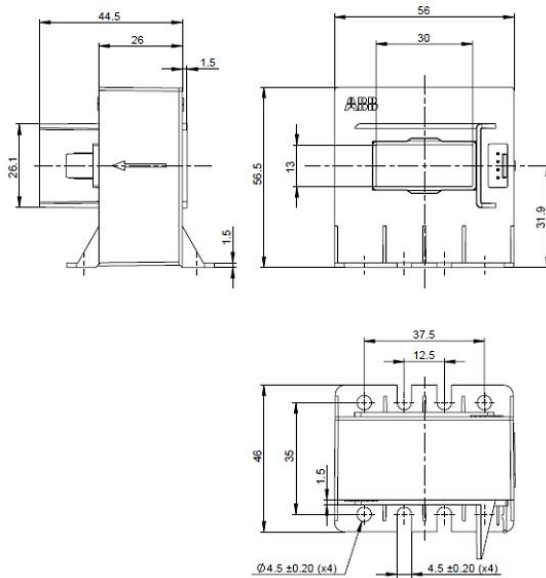
3. The range

- **TYA range:**

- Technology: closed loop Hall effect
- Measuring range: ± 1.5 to $\pm 2 \times I_{PN}$ (few seconds/hour)
- Operating temperature: $-40 \dots +85^{\circ}\text{C}$
- Supply voltage: $\pm 15\text{V}$ or $\pm 24\text{V}$
- Bandwidth: >50 kHz
- Global accuracy: $\pm 1\%$ (at $+25^{\circ}\text{C}$)
- Dielectric strength: $3\text{kVrms} - 50\text{Hz} - 1\text{min}$

3. The range

- TYA 300 or TYA500 industrial range mechanical layout

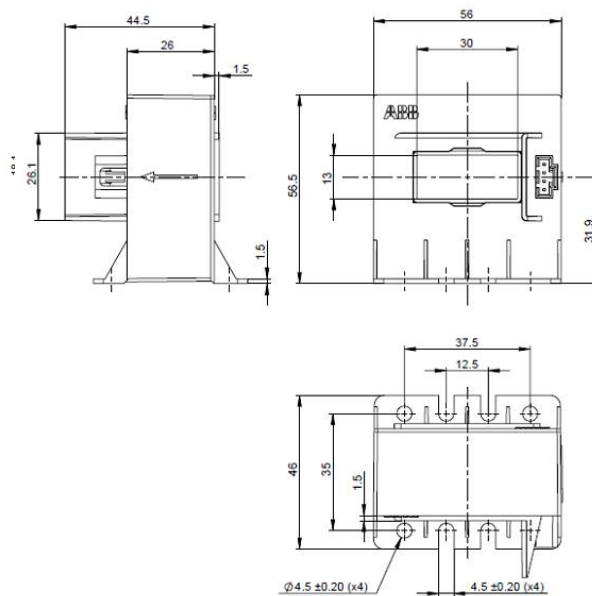


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3. The range

- TYA 300 or TYA500 traction range mechanical layout



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4. The main characteristics

- TYA range main standard characteristics

				TYA300		TYA500	
Nominal primary current	I_{pn}		A rms	300	300	400	500
Measuring range	I_{pmax}	@ $\pm 24V \pm 5\%$	A peak	± 600	± 450	± 650	± 800
Turn ratio	N_s			2000	2000	4000	4000
Secondary current at I_{pn}	I_{sn}		mA	150	150	100	125
Accuracy at I_{pn}	Err%	@ $+25^\circ C$	%	$\leq \pm 1$			
Linearity	L_{in}		%	$\leq \pm 0.1$			
Delay time	t_d		μs	≤ 1			
di/dt correctly followed	di/dt		A/ μs	≤ 50			
Bandwidth	BW	-1dB	kHz	≤ 50			
Max. no-load consumption current	I_{ao}	@ $\pm 24V \pm 5\%$	mA	≤ 25			
Dielectric strength Primary/Secondary	$U_{d_p/s}$	50 Hz, 1 min	kV	3			
Supply voltage	V_a	$\pm 5\%$	V dc	± 15	± 24	± 15	± 24
Operating temperature	T^{op}		$^\circ C$	-40 ... +85			
Storage temperature	T^{st}		$^\circ C$	-40 ... +90			

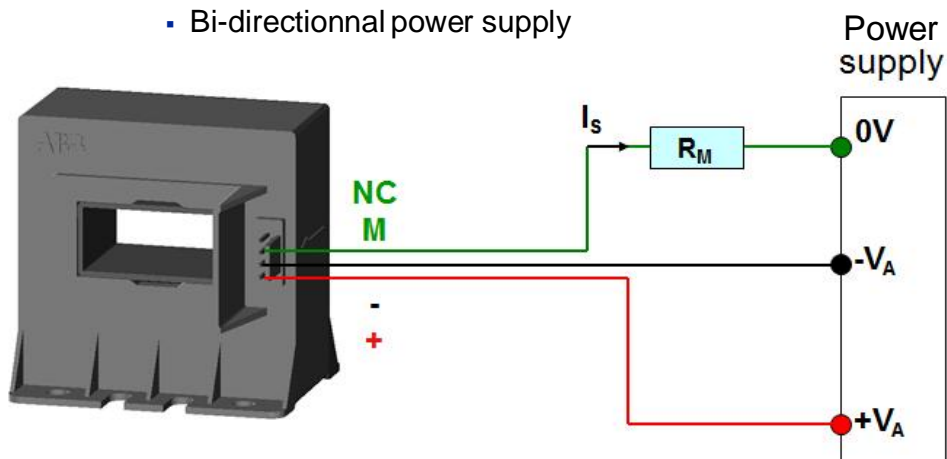
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5. The electrical connections

- TYA range: connection diagram

- Bi-directional power supply

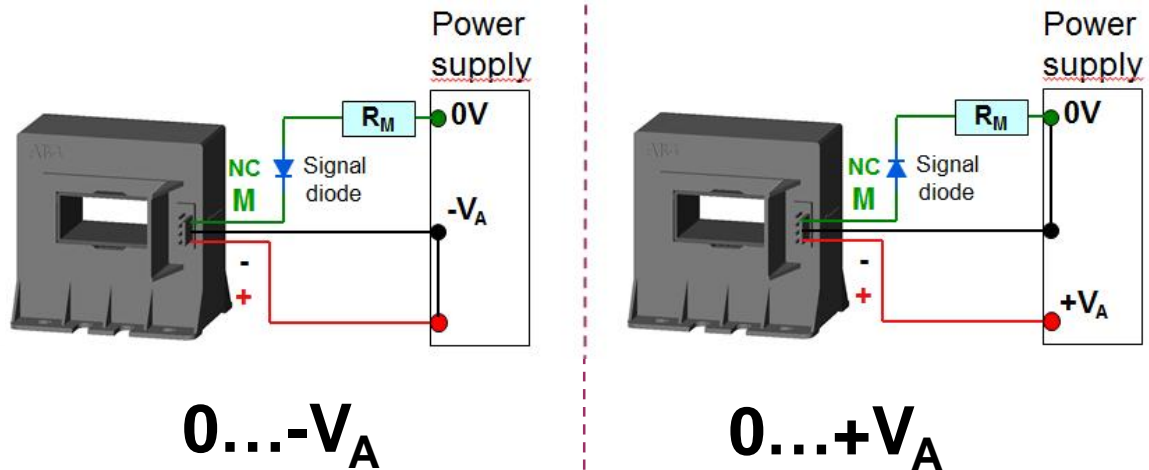


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5. The electrical connections

• Uni-directional power supply



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6. The advantages

• Construction

- Compact design
- Rectangular hole for bus bar or terminals on cable
- PCB potted with resin:
 - to evacuate internal dissipation
 - to reject humidity
 - To ensure mechanical fixing
- Standard connector included in the casing
 - Industrial version
 - Traction version (more robust)
- Vertical mounting
- Physical size matching market requirements

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7. The used standards: Industrial applications

- **EN50178 (Oct 1997)**
 - Safety requirements
 - Rated voltage : 1000Vrms or 1500Vdc
 - Pollution degree : PD2 (normally conducting pollution and random condensation)
 - Overvoltage : OV2
 - Creepage dist. : 24 mm
 - Air distance : 14 mm
 - Material group : Casing : II ($400 \leq CTI < 600$)
Resin: I ($CTI \geq 600$)
 - Partial discharges: 1.25kV (<10pC)

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7. The used standards: Industrial applications

- **EN50178 (Oct 1997)....**
 - Environmental requirements
 - Climatic : -40...+85°C
: 95% relative humidity
 - EMC : design and tests in accordance with
EN61000-6-4 (emission) & EN61000-6-2
(immunity)

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7. The used standards: Industrial applications

- **EN50178 (Oct 1997)....**
 - Testing (see details in the concerned Type Test Report)
 - Functioning : @ +25°C, @ -40°C, @ +85°C
 - : delay time
 - : di/dt
 - : bandwidth
 - : overload
 - : magnetic environment
 - Other climatic tests : humid heat
 - : storage
 - : quick variation of temperature

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7. The used standards: Industrial applications

- **EN50178 (Oct 1997)....**
 - Testing (see details in the concerned Type Test Report)
 - Dielectric : dielectric test
 - : insulation resistance
 - : partial discharges
 - EMC (immunity) : burst
 - : surges
- **EN61000-6-2** : electrostatic discharges
- : conducted perturbations
- : electromagnetic fields
- : network magnetic fields

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7. The used standards: Industrial applications

- **EN50178 (Oct 1997)....**
 - Testing (see details in the concerned Type Test Report)
 - EMC (emission) : radiated
EN61000-6-4: conducted
 - Mechanical : vibrations
: shocks

7. The used standards: Traction applications

- **EN50155 (Jul 2007) ...**
 - Safety requirements
 - Rated voltage : 600Vdc
 - Pollution degree : PD2 (normally conducting pollution and random condensation)
 - Overvoltage : OV2
 - Creepage dist. : 24 mm
 - Air distance : 16 mm
 - Material group : Casing : II ($400 \leq CTI < 600$)
Resin: I ($CTI \geq 600$)
 - Partial discharges: 1.25kV (<10pC)

7. The used standards: Traction applications

- **EN50155 (Jul 2007) ...**
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: shocks

8. The technical documentation

- **Technical file**

- Functioning description (closed loop Hall effect)
- Technical presentation: this document
- Mounting instructions
- Data sheets
- Type tests report
- Reliability forecasts (MTBF calculation)
- Fire/smoke certificate
- Environmental certificate



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