User Manual

AEMC® INSTRUMENTS
CHAUVIN ARNOUX GROUP

AC Current Probe
Model MD361 (BNC)

CURRENT MEASUREMENT PROBES

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Statement of Compliance

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments certifies that this instrument has been calibrated using standards and instruments traceable to international standards.

We guarantee that at the time of shipping your instrument has met the instrument's published specifications.

An NIST traceable certificate may be requested at the time of purchase, or obtained by returning the instrument to our repair and calibration facility, for a nominal charge.

The recommended calibration interval for this instrument is 12 months and begins on the date of receipt by the customer. For recalibration, please use our calibration services. Refer to our repair and calibration section at

Serial #: _____

Catalog #: **2153.10**

Model #: **MD361**

Please fill in the appropriate date as indicated:

Date Received: _____

Date Calibration Due: _____

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1. INTRODUCTION

Thank you for purchasing an AEMC® Instruments **AC Current Probe Model MD361 (BNC)**.

For best results from your instrument and for your safety, read the enclosed operating instructions carefully and comply with the precautions for use. Only qualified and trained operators should use this product.

1.1 INTERNATIONAL ELECTRICAL SYMBOLS

	Signifies that the instrument is protected by double or reinforced insulation.
	CAUTION - Risk of Danger! Indicates a **WARNING**. Whenever this symbol is present, the operator must refer to the user manual before operation.
	Application or withdrawal authorized on conductors carrying dangerous voltages. Type A current sensor as per IEC 61010-2-032.
	Indicates important information to acknowledge.
	This product complies with the Low Voltage & Electromagnetic Compatibility European directives.
	In the European Union, this product is subject to a separate collection system for recycling electrical and electronic components in accordance with directive WEEE 2012/19/EU.

1.2 DEFINITION OF MEASUREMENT CATEGORIES (CAT)

CAT IV: Corresponds to measurements performed at primary electrical supply (< 1000 V).
Example: primary overcurrent protection devices, ripple control units, and meters.

CAT III: Corresponds to measurements performed in the building installation at the distribution level.
Example: hardwired equipment in fixed installation and circuit breakers.

CAT II: Corresponds to measurements performed on circuits directly connected to the electrical distribution system.
Example: measurements on household appliances and portable tools.

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1.3 PRECAUTIONS OF USE ⚠

Failure to observe the precautions for use may create a risk of electric shock, fire, explosion, and/or destruction of the instrument and of the installations.

- Never measure currents above 700 A.
- Between 500 A and 700 A, observe the duty cycle in § 4.3.1 (10 min ON / 30 min OFF).
- Do not use on uninsulated conductors with a voltage exceeding 600 V. Neutral-to-ground is not necessary in this context. See § 4.4.
- Do not expose to falling water.
- Keep the jaw faces clean (see § 5.1).

1.4 RECEIVING YOUR SHIPMENT

Upon receiving your shipment, make sure that the contents are consistent with the packing list. Notify your distributor of any missing items. If the equipment appears to be damaged, file a claim immediately with the carrier and notify your distributor at once, giving a detailed description of any damage. Save the damaged packing container to substantiate your claim.

1.5 ORDERING INFORMATION

AC Current Probe Model MD361 (BNC) ..... Cat. #2153.10

Includes current probe safety sheet and multilingual user manual.

1.5.1 Accessories

Adapter - BNC (Female) to 4 mm Banana (Male) 600 V CAT III ..... **Cat. #2119.94**

Order Accessories and Replacement Parts Directly Online
Check our storefront for availability.

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2. DESCRIPTION

The AC Current Probe Model MD361 (BNC), with an output-input ratio equal to 1 mVAC / AAC, is designed for alternating current measurements in low- and medium-voltamper systems, from (1 to 500) AAC (up to 700 AAC max., see § 4.3.1).

The frequency response is 5 Hz to 10 kHz. The asymmetrically shaped jaws clamp around cables or busbars. The MD361 connects to any scope via a cable with BNC connector. It also features dual or reinforced insulation and conforms to international standards, such as IEC 61010-2-032 Current clamps (see § 4.4).

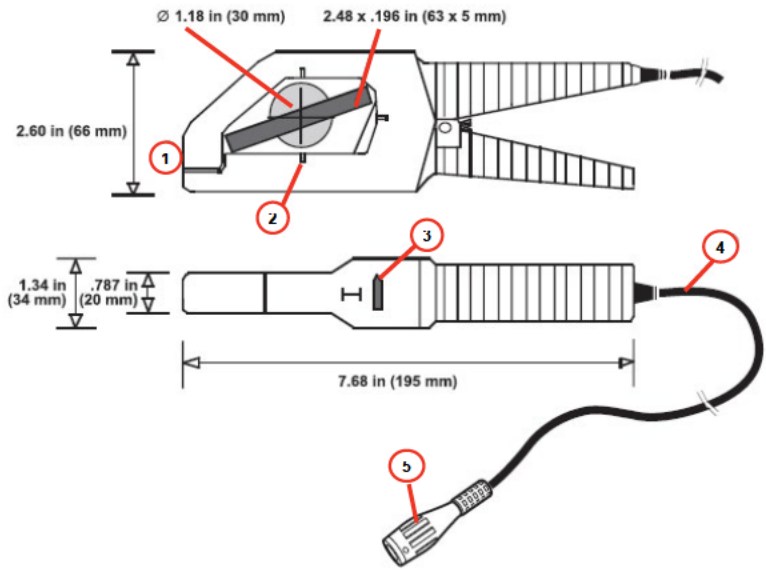
2.1 DIMENSIONS

Overall dimensions: (7.68 × 2.60 × 1.34) in (195 × 66 × 34) mm

Weight: 14.82 oz (420 g)

Output via an insulated 50 Ω BNC connector.

1.	Jaw opening: (7.68 × 2.60 × 1.34) in (195 × 66 × 34) mm Open jaw height: 3.78 in (96 mm)
2.	4 centering marks. Max clamping capacity: Ø 1.18 in (30 mm) cable and 2.48 × 0.196 in (63 × 5 mm) busbar.
3.	The arrow (▬▶) below the I symbol, referred to as the I **arrow**, indicates the direction of current flow. The current is considered to flow in the positive direction when flowing from the current line to the current load. This orientation of the current clamp is required during a power measurement (current measured concurrently with voltage).
4.	Cable length: 6.56 ft (2 m)
5.	Output via an insulated 50 Ω BNC connector.



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3. OPERATION

3.1 WARNING

- Do not clamp a conductor before connecting the current clamp to the scope. Similarly, do not disconnect the current clamp from the scope when the clamp is closed around a cable.
- Open the jaws and clamp the cable carrying the current to be measured. Center the cable using the marks. Observe the direction of the I arrow (➡) if required by the application.
- To read the measured current, apply the appropriate reading coefficient. The current clamp delivers 1 mVAC for a current of 1 AAC.

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4. SPECIFICATIONS

4.1 REFERENCE CONDITIONS

- Temperature: (18 to 28) °C
- Relative humidity: (0 to 85) % RH
- Conductor centered in the jaws
- Sinusoidal current: (45 to 65) Hz
- No direct current
- Scope impedance: 1 MΩ - 47 pF
- Direct-current magnetic field: earth's magnetic field (< 40 A/m)
- External conductor proximity: no direct or alternating current
- Intrinsic error or phase difference

	Current Measurement Range		
A	(1 to 20) A	(20 to 100) A	(100 to 500) A
% of I_{nom}	(0.2 to 4) %	(4 to 20) %	(20 to 100) %
Intrinsic Error (1)	5 % + 0.3 A	5 %	2 %
Phase Difference	(2)	3°	1°

(1) In ± % of the output

(2) Unspecified

NOTE: Linear interpolation between each value (see also the graphs in Section 6. APPENDIX).

4.2 MEASUREMENT RANGE

Current Range	(1 to 700) A_{AC} (1)
Output-to-Input Ratio	1 mV_{AC}/A_{AC}
Frequency Range	5 Hz to 10 kHz (2)

(1) See § 4.3.1

(2) See graphs in Section 6. APPENDIX

- **Nominal current (In):** 500 A_{AC}
- **dV/dt:** typical .24 mV/µs
- **Rise time at 5 A:** typical 18 µs
- **Fall time at 5 A:** typical 23 µs
- **Delay at 5 A:** typical 3.1 µs

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4.3 OPERATING CONDITIONS AND INFLUENCES

NOTE: The current clamp must be used under the following conditions to meet the user safety and measuring performance requirements.

4.3.1 Overloads

- Limit the operating time above 500 A_{AC}

Current	I ≤ 500 A_{AC}	500 A_{AC} ≤ I ≤ 700 A_{AC}
Working	Continuous Operation	10 minutes ON 30 minutes OFF

- Peak current maximum: 1200 A

4.3.2 Influence of Frequency

	Influence of Frequency						
	(1 to 20) A	**(20 to 50) A**	**(50 to 100) A**	**(100 to 200) A**	**(200 to 300) A**	**(300 to 400) A**	**(400 to 500) A**
(5 to 10) Hz	15 %				(1)		
(10 to 20) Hz	5 %				15 %	-	-3 dB
(20 to 45) Hz	5 %						
(45 to 65) Hz (Reference Condition)	5 % + 0.3 A	5 %		2 %			
65 Hz to 3 kHz	5 % + 0.4 A		5 %		(1)		
(3 to 6) kHz	15 % + 0.4 A			(1)			
(6 to 10) kHz	-3 dB		(1)				

(1) Unspecified

- Values to be added to the reference conditions.

NOTE: See also graphs in Section 6. APPENDIX.

- Derating: to calculate the maximum current (A) in continuous operation, depending on frequency (F in kHz), use the formula: 500 (A) x 2/F (kHz)

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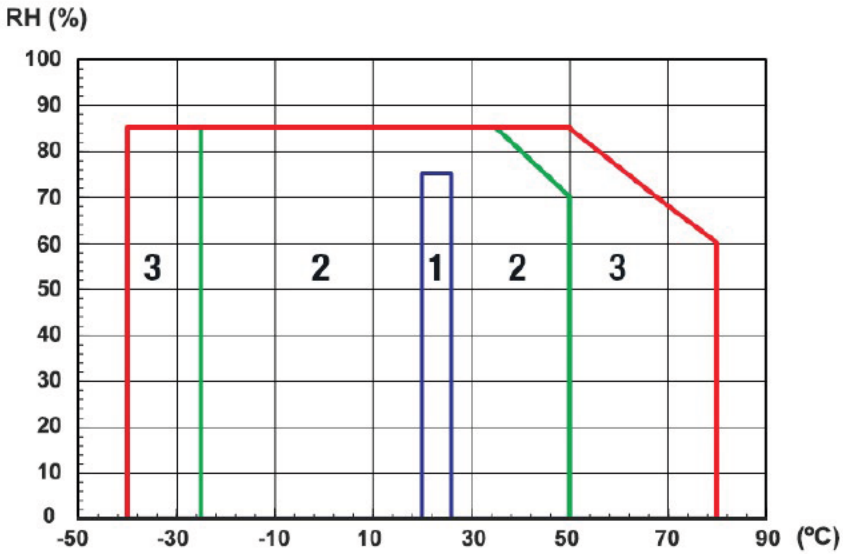
4.3.3 Environmental Conditions

1 =	**Reference Temperature:**	(64.4 to 82.4) °F (18 to 28) °C from (0 to 75) % RH
2 =	**Operating Temperature:**	(-13 to 102.2) °F (-25 to 39) °C from (0 to 85) % RH (-13 to 122) °F (-25 to 50) °C from (0 to 70) % RH
3 =	**Storage Temperature:**	(-40 to 122) °F (-40 to 50) °C from (0 to 85) % RH (-40 to 176) °F (-40 to 80) °C from (0 to 60) % RH



4.4 COMPLIANCE WITH INTERNATIONAL STANDARDS

4.4.1 Electrical Safety

In accordance with IEC 61010-1, 61010-2-032.

- Dual insulation ⧈
- Pollution Degree 2
- Installation CAT III with Operating Voltage: 600 V
- Installation CAT IV with Operating Voltage: 300 V
- Input: 500 AAC
- Output: 1 mVAC/AAC

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4.4.2 Electromagnetic Compatibility (EMC)

- Emission: Class B (i.a.w EN 50081-1)
- Immunity: (i.a.w. EN 50082-2)
  - Electrostatic discharge (i.a.w IEC 61000-4-2):
    4 kV in contact - level 2 - capability criterion B
    8 kV in air - level 3 - capability criterion B
  - Radiated electromagnetic energy (i.a.w IEC 61000-4-3):
    10 V/m - level 3 - capability criterion A
  - Short-duration transients (i.a.w IEC 61000-4-4):
    2 kV - level 3 - capability criterion B
  - Line frequency magnetic field (i.a.w IEC 61000-4-8):
    30 A/m - level 4 - capability criterion A

4.4.3 Mechanical Specifications

- Case Protection level IP20 (i.a.w IEC 60529) with jaws closed
- Drop Test: 1.5 m (i.a.w IEC 60068-2-32)
- Mechanical Shock: 100 g (i.a.w IEC 60068-2-27)
- Vibration: .15 mm - 10/55/10 Hz (i.a.w IEC 60068-2-6)

4.4.4 Flammability Rating

- VO (i.a.w UL94)

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5. MAINTENANCE

WARNING: The instrument contains no parts that can be replaced by untrained or unauthorized personnel. Any unauthorized work or any part replacement with equivalents may seriously compromise safety.

5.1 CLEANING

The instrument should be cleaned periodically to prevent accumulation of dirt and grease.

The clamp must not enclose a cable and must be disconnected from the measuring device. Do not subject the clamp to running water.

- Keep the jaw faces perfectly clean.
- Remove dust with a soft dry cloth.
- Wipe instrument case gently with a soft cloth dampened with soapy water.
- Gently wipe soapy water from clamp using a clean, damp cloth.
- Dry rapidly with a dry cloth or forced air 176 ºF (80 ºC) max.
- Do not use alcohol, solvents, or hydrocarbons. Do not submerge in water.

5.2 REPAIR AND CALIBRATION

To ensure that your instrument meets factory specifications, we recommend that it be sent back to our factory Service Center at one-year intervals for recalibration or as required by other standards or internal procedures.

For instrument repair and calibration:

You must contact our Service Center for a Customer Service Authorization Number (CSA#). Send an email to requesting a CSA#,
you will be provided a CSA Form and other required paperwork along with the next steps to complete the request. Then return the instrument along with the signed CSA Form. This will ensure that when your instrument arrives, it will be tracked and processed promptly. Please write the CSA# on the outside of the shipping container. If the instrument is returned for calibration, we need to know if you want a standard calibration or a calibration traceable to N.I.S.T. (includes calibration certificate plus recorded calibration data).

Ship To: Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments

(Or contact your authorized distributor.)

Contact us for the costs for repair, standard calibration, and calibration traceable to N.I.S.T.

NOTE: You must obtain a CSA# before returning any instrument.

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5.3 TECHNICAL SUPPORT

If you are experiencing any technical problems or require any assistance with the proper operation or application of your instrument, please call or e-mail our technical support team:

Chauvin Arnoux®, Inc. d.b.a. AEMC® Instruments

5.4 LIMITED WARRANTY

The instrument is warrantied to the owner for a period of two years from the date of original purchase against defects in manufacture. This limited warranty is given by AEMC® Instruments, not by the distributor from whom it was purchased. This warranty is void if the unit has been tampered with, abused, or if the defect is related to service not performed by AEMC® Instruments.

Full warranty coverage and product registration is available on our website.

SCAN QR CODE TO REGISTER ONLINE:

Please print the online Warranty Coverage Information for your records.

What AEMC® Instruments will do:

If a malfunction occurs within the warranty period, you may return the instrument to us for repair, provided we have your warranty registration information on file or a proof of purchase. AEMC® Instruments will repair or replace the faulty material at our discretion.

5.4.1 Warranty Repairs

What you must do to return an instrument for Warranty Repair:

First, send an email to requesting a Customer Service Authorization Number (CSA#) from our Service Department. You will be provided a CSA Form and other required paperwork along with the next steps to complete the request. Then return the instrument along with the signed CSA Form. Please write the CSA# on the outside of the shipping container. Return the instrument, postage or shipment prepaid to:

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Caution: To protect yourself against in-transit loss, we recommend that you insure your returned material.

NOTE: You must obtain a CSA# before returning any instrument.

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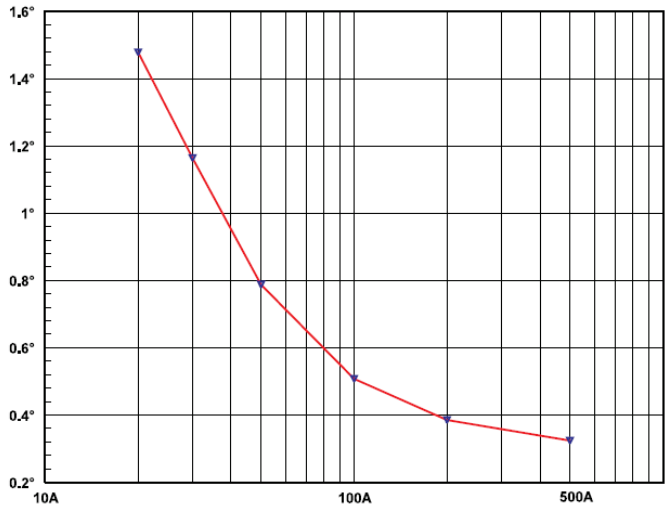
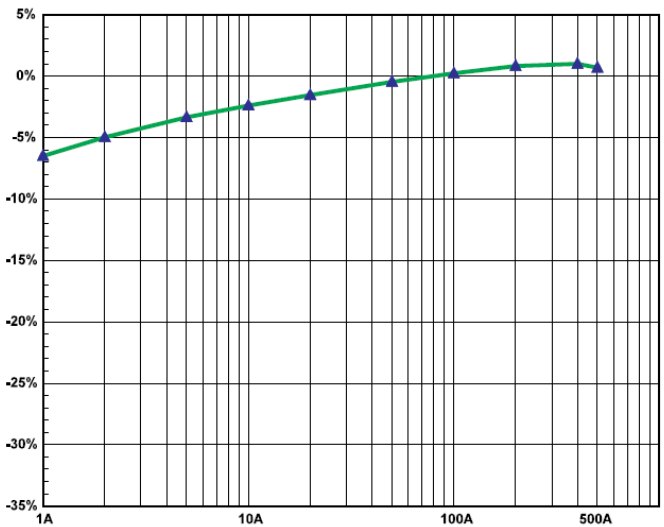
6. APPENDIX

■ Typical phase difference (in °) versus primary current (A) at 50 Hz



■ Typical linearity error (in °) versus primary current (A) at 50 Hz



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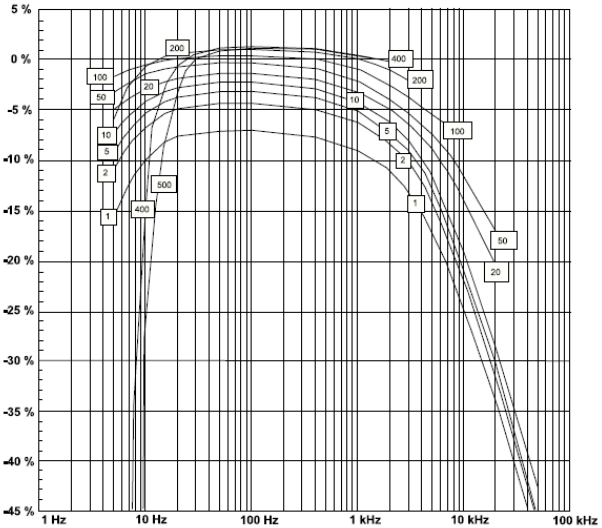
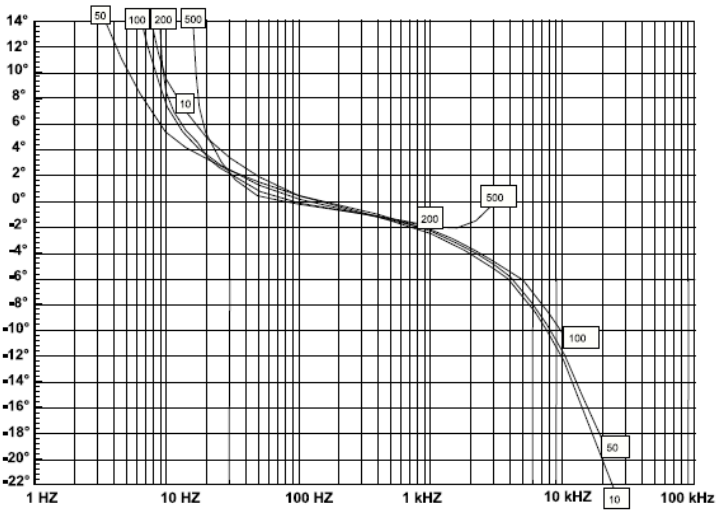
■ Typical error (in %) versus frequency (Hz) - Current A



■ Typical phase difference (°) versus frequency (Hz) - Current A



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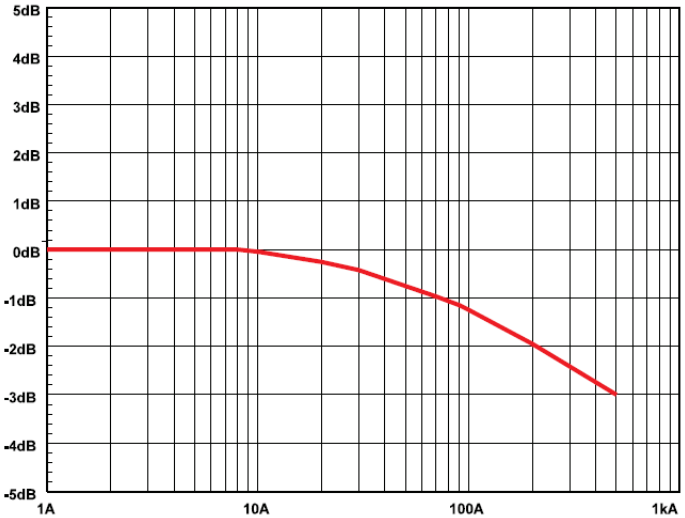
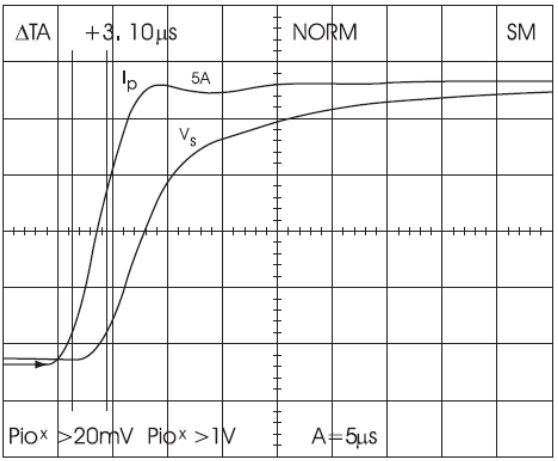
■ Influence of direct current (A) on measurement



■ Response for one step



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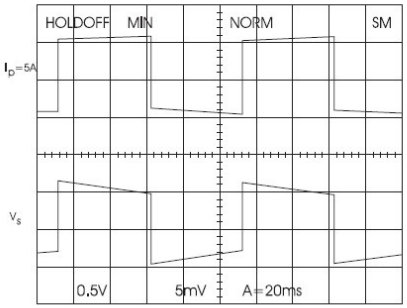
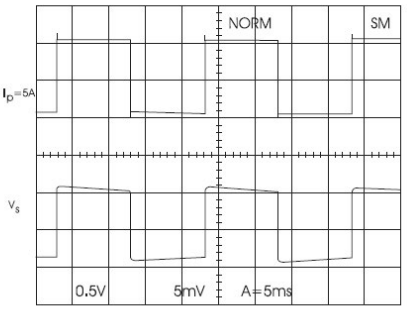
■ Pulse response

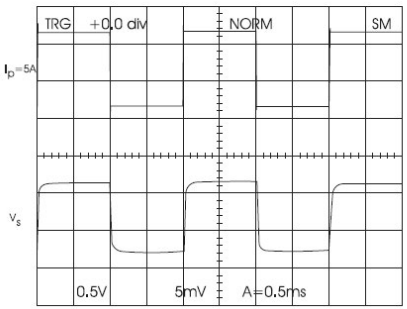
10 Hz



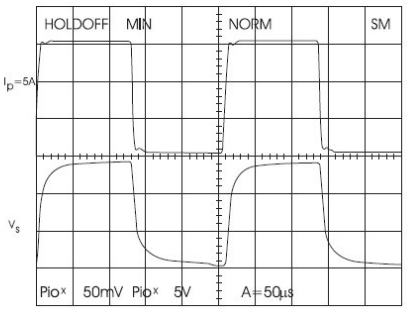
50 Hz



500 Hz



4 kHz



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