User Guide for Three-Phase Electrical Power Measurement and Analysis Functions

APPLICATION NOTES

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1 Revise history

Version number	author	Date of preparation /modification	Reason for change	Major changes (Just write the main points)
1.0	Yihui Zhang	2025/5	first draft	User Guide for Three-Phase Electricity Measurement and Analysis Functions

2 Introduction

With the continuous development of modern power system, the stability and reliability of three-phase power system are very important to ensure the quality of power supply. In order to meet this demand, Siglent has introduced the three-phase electricity measurement and analysis software of SDS5000X HD series oscilloscopes. Through the deep integration of hardware innovation and intelligent algorithm, it can realize high-precision and high-efficiency testing ability, support synchronous sampling of three-phase voltage/current waveforms, integrate one-button key parameter measurement functions, cover core functions such as power quality, harmonic analysis, ripple analysis and efficiency analysis, and cooperate with real-time display of space vector diagram to significantly accelerate the debugging of motor drive system. This scheme can provide fast, accurate and repeatable electrical measurement results in electric drive system of electric vehicle, industrial motor power quality evaluation and renewable energy inverter test, and become an efficient test tool for R&D verification and fault diagnosis in power system, industrial automation, new energy and other fields.

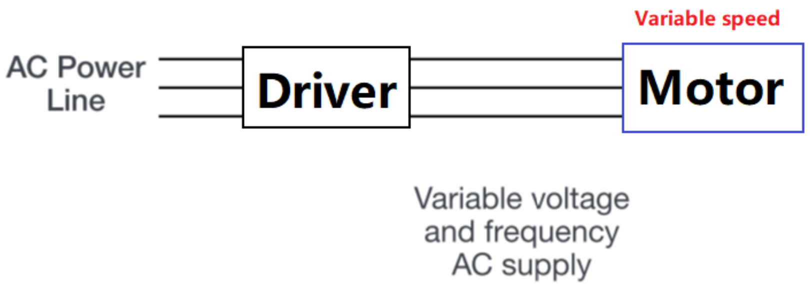
3 Background theory

This section provides basic knowledge of terms and principles to better understand the required configuration settings.

3.1 Basic introduction of motor drive system

Since the early stage of electrical engineering, three-phase AC induction motor (ACIM) has firmly occupied the core position in the industrial field, and is famous for its reliability, high efficiency and economic practicability, and its maintenance requirements are extremely low. With the development of technology, there are diversified choices in the field of motors and drivers, such as brushless DC motor (BLDC) and permanent magnet synchronous motor (PMSM) with higher efficiency and lighter weight. Although they need more precise control algorithms, they undoubtedly bring new vitality to the industry. Although different types of systems have their own unique performance characteristics, the motor drivers they rely on generally adopt a key technology——ulse width modulation (PWM). Through this technology, the driver can flexibly adjust and optimize the frequency and voltage transmitted to the motor to ensure that the motor can perform optimally in various application scenarios.

In modern motor drive technology, variable frequency speed regulation has become the mainstream control strategy. Pulse width modulation (PWM) waveform is generated by variable frequency driver (VFD), and the system can accurately adjust the output frequency, thus realizing the dynamic control of motor speed. This kind of driver usually adopts three-phase AC power supply architecture-this design not only conforms to the natural electromagnetic characteristics of industrial motors, but also can significantly improve the energy conversion efficiency and optimize the torque output stability. The three-phase balanced power supply mode can effectively reduce harmonic loss and provide a stable electromagnetic field distribution foundation for high power density motors.



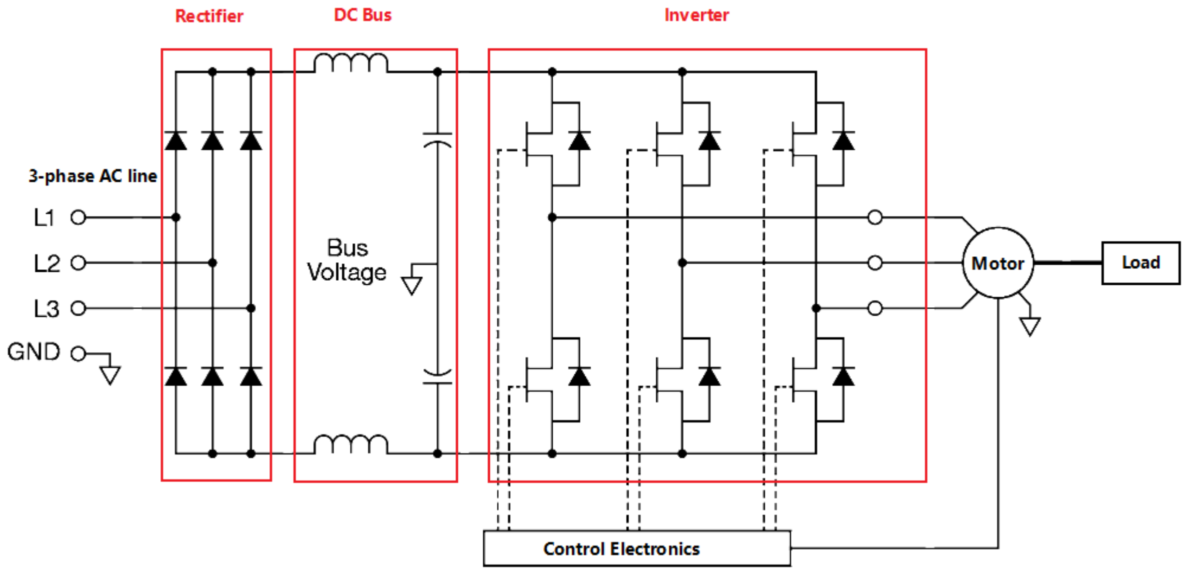
The motor driver adjusts the input of the motor to control the speed and torque.

3.2 Driving principle of PWM motor

As the core regulation mechanism of modern motor drive technology, pulse width modulation (PWM) has found universal application, covering mainstream models such as AC induction motor (ACIM), brushless DC motor (BLDC) and permanent magnet synchronous motor (PMSM). Its core value lies in dynamically controlling the amplitude and frequency of the output voltage base by adjusting the duty cycle of the switching devices, thus breaking through the traditional power frequency power supply limitation and enabling the refined energy management of the motor system.

The PWM driver can be powered by DC, single-phase AC or three-phase AC power supply. The following figure shows a variable frequency drive (VFD) powered by a three-phase power supply, which is very common in industrial equipment.

The rectifier converts three-phase alternating current (AC) into direct current (DC) to provide a stable DC power supply for subsequent inverters. DC Bus smooths the rectified DC voltage to suppress ripple; The inverter converts DC into AC with adjustable frequency and voltage to drive the motor to run. The inverter consists of three pairs of semiconductor switches (such as MOSFET, GTO, power transistor, IGBT, etc.) and related diodes. Each pair of switches provides power output for one phase of the motor, and the control electronics generate pulse width modulation signals to control the semiconductor switches of the upper and lower legs of each phase to turn on alternately.



Functional module of three-phase motor system

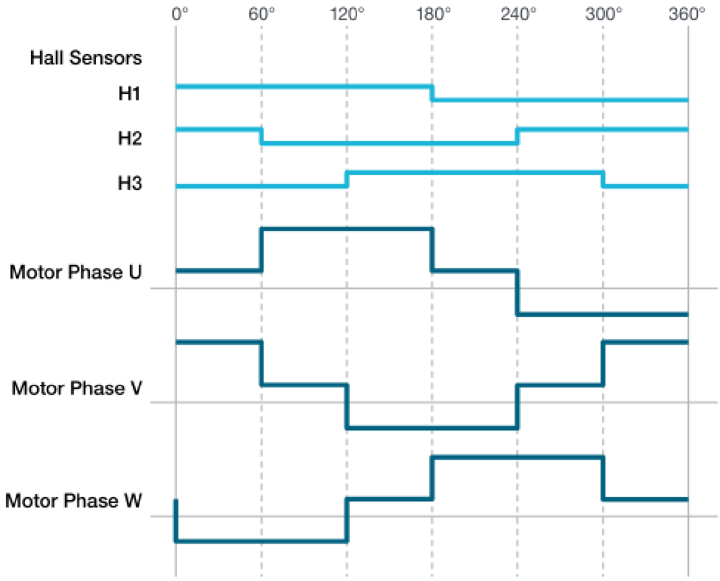
This basic architecture can adapt to many types of motors, but the complexity of Control Electronics modules is very different.

The following is a brief description of several common drivers used to drive motor systems.

3.2.1 Trapezoidal wave driver (6-step)

Trapezoidal wave driver, also known as six-step commutation driver, is a classic method to control brushless DC motor (BLDC). Its name comes from dividing the electrical cycle of the motor into six discrete steps in the driving process, and each step corresponds to a specific current conduction combination to form a trapezoidal waveform phase current, thus driving the rotor to rotate.

BLDC motors are usually equipped with three Hall sensors (H1, H2, H3), and the sensor outputs are combined to form six states (such as 001, 011, etc.). Corresponding to the position of the rotor at every 60° electrical angle, the conduction phase of the inverter is switched according to the Hall signal, and only two phases are energized at a time, and the third phase is suspended. Each commutation step lasts for 60 electrical angle, and a complete cycle (360°) is completed in six steps. By adjusting the PWM duty cycle of the conducting phase, the average voltage of the motor is controlled to realize the speed adjustment. The following figure shows a set of typical PWM waveforms.



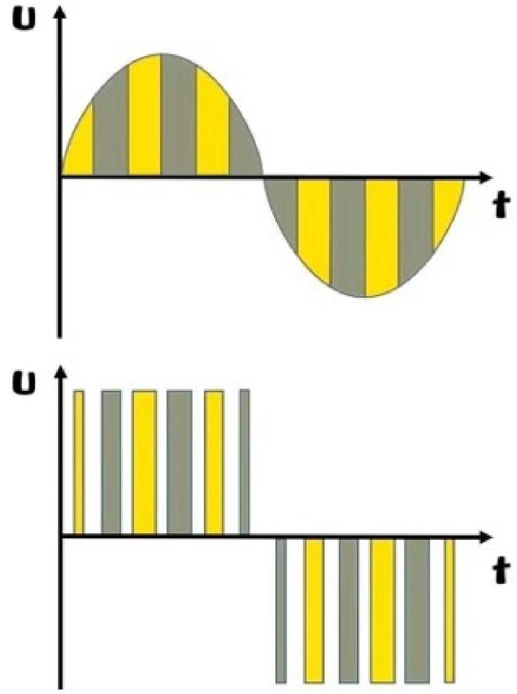
Hall sensor provides feedback for a simple six-step controller, and the driver outputs U, V and W.

The trapezoidal wave driver provides basic driving function of brushless DC motor with simplified control logic via six-step commutation mechanism, which is an ideal choice for low-cost and low-complexity applications. Despite the torque ripple and efficiency limitation, it still has an irreplaceable market position in consumer electronics, industrial auxiliary equipment and other fields.

3.2.2 Scalar driver

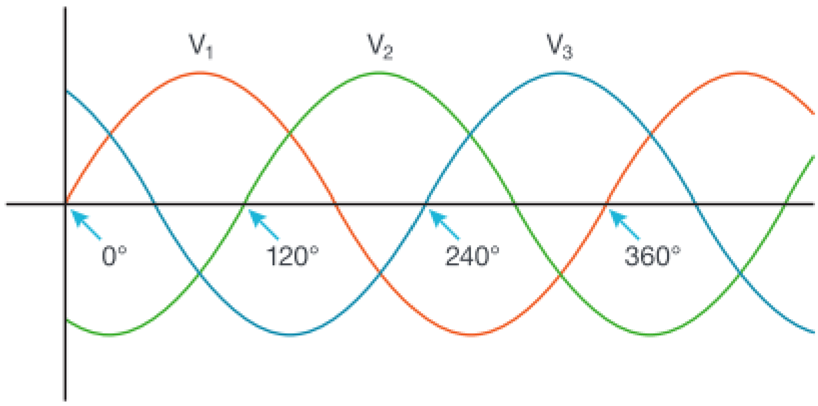
Scalar driver is an AC motor speed regulation method based on constant voltage-frequency ratio (V/f) control, which is mainly used to control three-phase AC induction motor (ACIM) or permanent magnet synchronous motor (PMSM). Its core idea is to maintain the air gap flux of the motor approximately constant by adjusting the proportional relationship between the amplitude and frequency of the output voltage, so as to achieve the speed control.

The control equipment in the scalar driver generates three low-frequency sine waves with a phase difference of 120°. In order to control the operation of the motor or other loads, the control electronic equipment will generate PWM waveforms corresponding to these sine waves. These PWM waveforms can control the on/off of current or voltage by adjusting the pulse width of the switching elements and based on the principle of area equivalence in PWM technology, the average voltage between phase A and phase B will show the characteristics of sine waves.



Area equivalence principle

The average voltage presented by the motor winding is approximately sine wave, and the other two phases of the motor winding also have similar average voltages with a phase difference of 120.



Three-phase voltage signal

To a great extent, the motor behaves like an inductor to the output voltage of the inverter. Because of the high impedance of inductor to high frequency signal, the current drawn by motor mainly comes from the lower frequency components in PWM waveform output. This causes the current waveform drawn by the motor to be approximately sinusoidal.

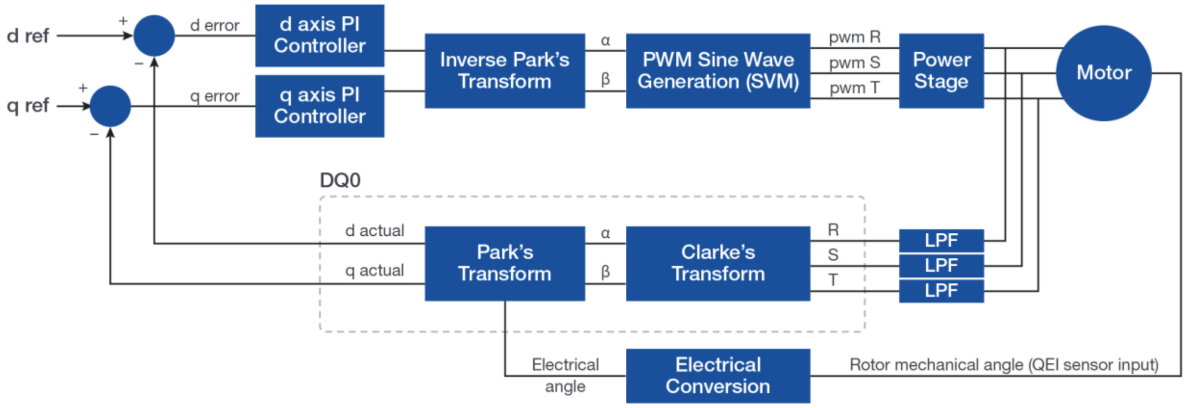
Scalar drive realizes the basic speed regulation function of AC motor at the lowest cost through constant voltage frequency ratio control, which is a cost-effective frequency conversion solution in industrial and consumer fields. Although its dynamic performance and efficiency are not as good as vector control, it still occupies a dominant position in steady-state or medium-high speed scenarios such as fans, pumps and household appliances.

3.2.3 Vector driver/field oriented control

Vector drive is an important control process in the field of industrial automation, which adopts advanced vector control technology and enables precise motor control. This kind of driver can achieve optimal control by detecting the running state of the motor in real time and adjusting the motor in real time according to the preset control algorithm. Vector drive is similar to scalar drive in that they both use sinusoidal current to drive the motor, but vector drive can provide smoother operation, faster acceleration performance and better torque control. These control systems usually adopt field oriented control (FOC) and are much more complicated than scalar drivers.

The core idea of FOC is to decompose the stator current of the motor into two orthogonal components: the current component D that produces magnetic flux and the current component Q that produces torque. By controlling these two components independently, the motor can be controlled efficiently and accurately.

FOC system converts three-phase stator current into two DC components in rotating coordinate system through coordinate transformation. The most commonly used transformations are Clarke transformation and Park transformation. Clarke transform transforms a three-phase stationary coordinate system into a two-phase stationary coordinate system, while Park transform transforms a two-phase stationary coordinate system into a rotating coordinate system, in which the D axis is aligned with the magnetic field of the motor, and the Q axis is 90 degrees ahead of the D axis. In D-Q coordinate system, the excitation current I_d and torque current I_q are controlled by PI (proportional integral) controller respectively, so as to realize accurate control of the motor.



Block diagram of vector control system

Vector driver and magnetic field oriented control technology have obvious advantages in the field of motor control, and their application makes motor control more accurate, efficient and reliable. With the continuous progress of technology and increasing application requirements, vector driver and magnetic field oriented control technology will play a more important role in the future.

4 Measurement type

The three-phase electrical analysis function of SDS5000X HD covers a variety of measurement types, aiming at comprehensively and accurately evaluating the performance and state of three-phase power system.

4.1 Wiring type

Wiring types can be set to measure 1V1I (1-phase 2-wire), 2V2I (2-phase 3-wire), 2V2I (3-phase 3-wire), 3V3I (3-phase 3-wire), and 3V3I (3-phase 4-wire) to support various power supply and motor configurations.

V in the following types represents the voltage measuring point and **I** represents the current measuring point.

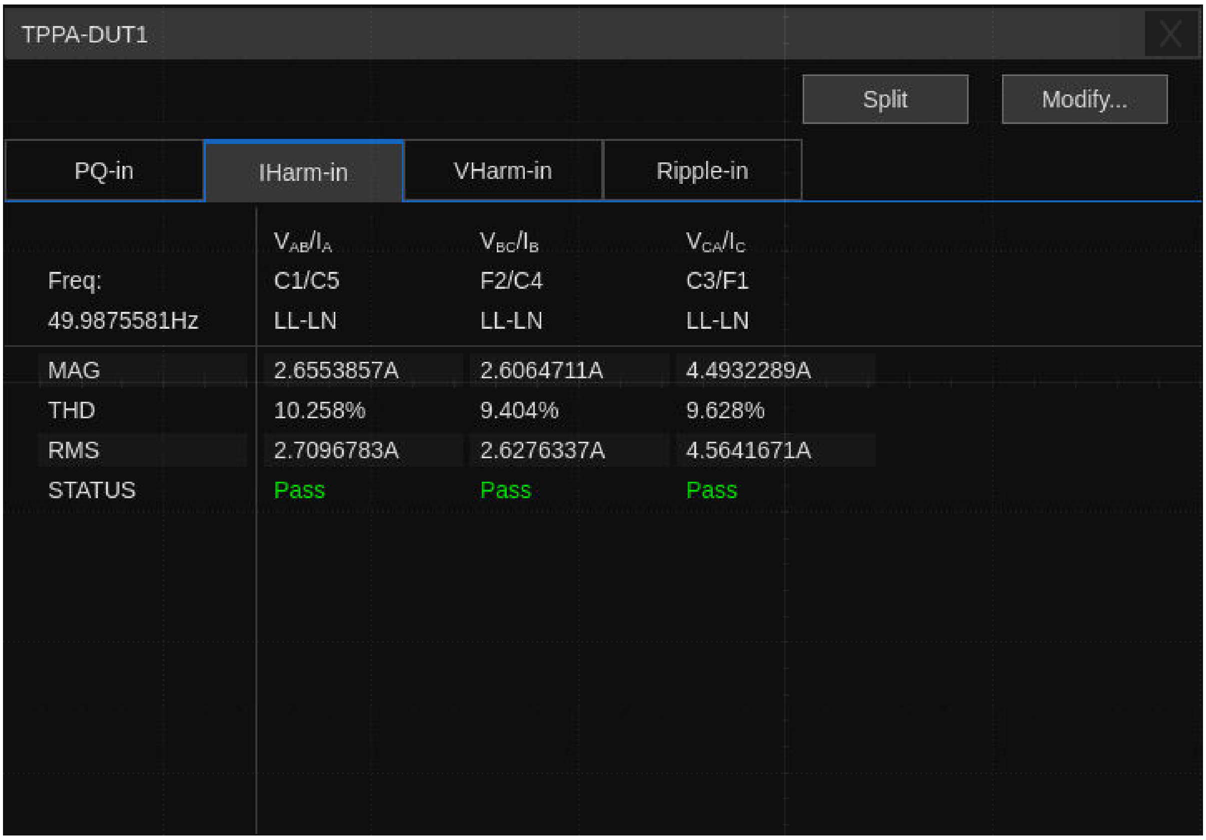
Wiring type	circuit configuration	characteristic
1V1I(1-phase 2-wire)	Single-phase system: 1 phase line (L)+1 neutral line (N)	Only single-phase voltage and current need to be measured, which is suitable for simple scenes such as household electricity consumption.
2V2I(2-phase 3-wire)	Two-phase system: 2 phase wires (L1, L2)+1 neutral wire (N)	It is necessary to measure two-phase voltage and current, which is common in some special industrial equipment or old distribution systems.
2V2I(3-phase 3-wire)	Three-phase three-wire system (Δ shape): 3 phase wires (L1, L2, L3) and no neutral wire.	It is necessary to measure two-wire voltage and two-wire current (the third phase can be deduced by calculation), such as industrial motor power supply.
3V3I(3-phase 3-wire)	Three-phase three-wire system (Δ shape or Y shape does not lead to neutral wire): 3 phase wires (L1, L2, L3).	It is necessary to measure three-phase line voltage and three-phase line current, which is suitable for Δ-shaped system with balanced load.
3V3I(3-phase 4-wire)	Three-phase four-wire system (Y-shape): 3 phase wires (L1, L2, L3)+1 neutral wire (N)	It is necessary to measure three-phase voltage (to neutral point) and three-phase current, such as low-voltage

		distribution system or unbalanced load scenario.

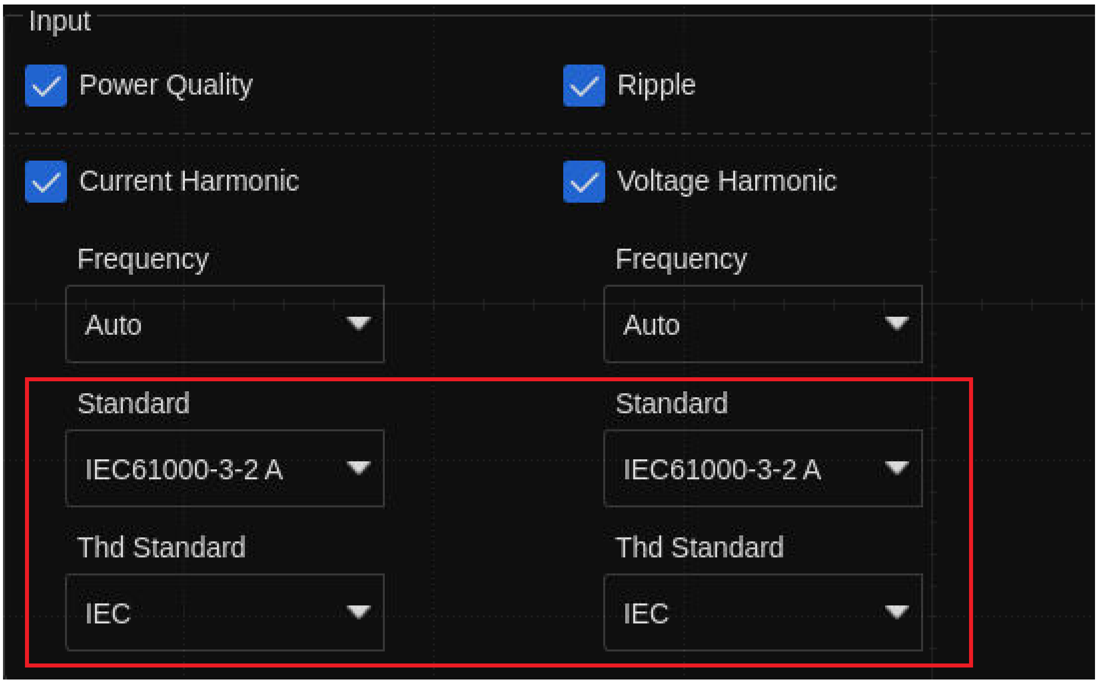
Table. Analysis of wiring types

4.2 Harmonic

Harmonic measurement function can display the signal components of fundamental frequency and its harmonics, and measure the RMS amplitude and total harmonic distortion(THD) of the signal. It can be measured at the input and output of the motor driver, perform harmonic analysis on multiple harmonics, and measure current/voltage amplitude, THD and current/voltage RMS parameters with a single button. The measurement can be evaluated according to the IEC6100-3-2 standard or the total harmonic distortion test standard in CSA certification, and the test results can be recorded in a detailed report, indicating the result status (pass/fail).



Harmonic measurement result chart



Set to compare harmonic measurements with industry standards.

Current Harmonic-TPPA-DUT1-Input(IEC61000-3-2 A)

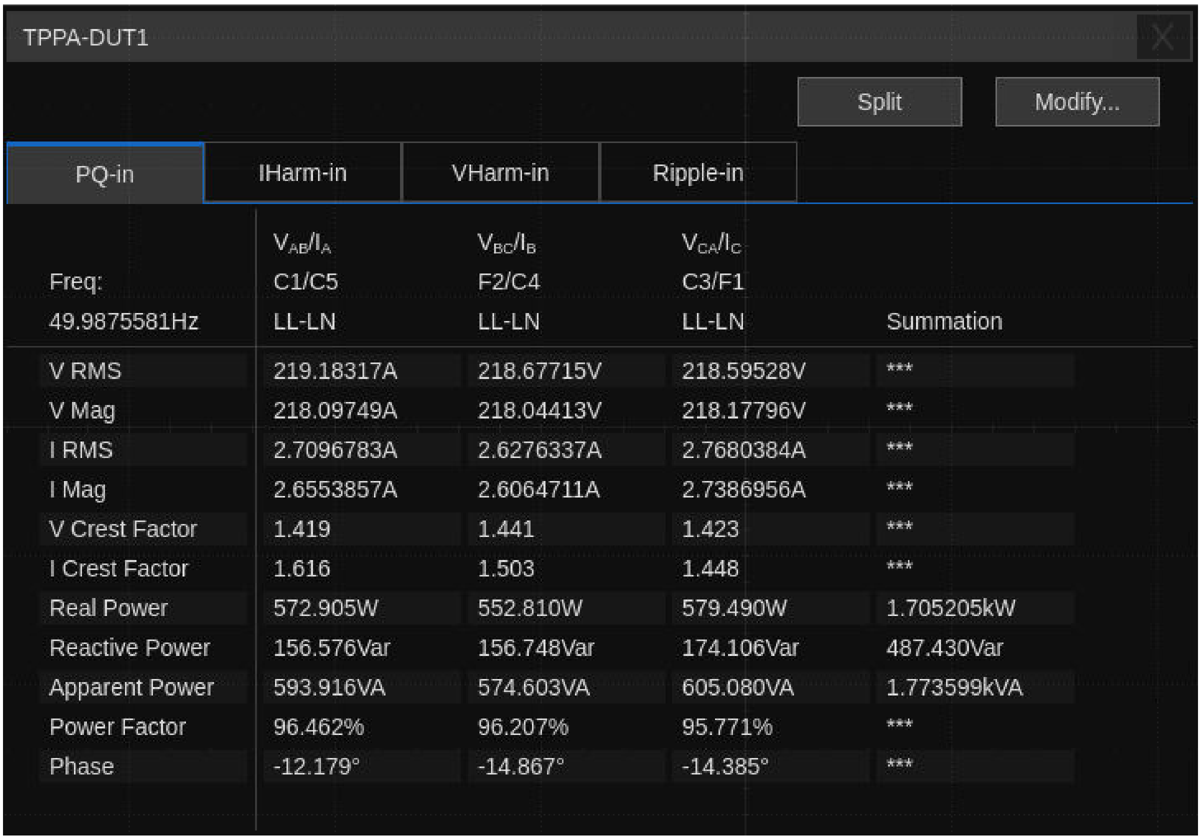
Harm	Name	Value(RMS)	Limit(RMS)	Margin(%)	State
	Ia	0.061890	2.300000	97.31%	PASS
3	Ib	0.035645	2.300000	98.45%	PASS
	Ic	0.075928	2.300000	96.70%	PASS
	Ia	0.060303	0.430000	85.98%	PASS
4	Ib	0.025452	0.430000	94.08%	PASS
	Ic	0.085205	0.430000	80.18%	PASS
	Ia	0.032227	1.140000	97.17%	PASS
5	Ib	0.029907	1.140000	97.38%	PASS
	Ic	0.062134	1.140000	94.55%	PASS
	Ia	0.167480	0.300000	44.17%	PASS
6	Ib	0.016541	0.300000	94.49%	PASS
	Ic	0.181641	0.300000	39.45%	PASS
	Ia	0.018372	0.770000	97.61%	PASS
7	Ib	0.016052	0.770000	97.92%	PASS
	Ic	0.031250	0.770000	95.94%	PASS
	Ia	0.041992	0.262857	84.02%	PASS
8	Ib	0.066650	0.262857	74.64%	PASS
	Ic	0.098877	0.262857	62.38%	PASS
	Ia	0.042480	0.400000	89.38%	PASS
9	Ib	0.008636	0.400000	97.84%	PASS

Pass 1/1 Pass 1/1 Pass 1/1

Report table after comparing harmonic measurement with industry standard.

4.3 Power quality

The power quality measurement includes a series of measurement items, which are used to characterize the power consumption characteristics of the driver, including: the RMS value and magnitude of voltage \ current, the crest factor of voltage \ current, frequency and phase, and it also shows the real power, reactive power, apparent power and power factor. These same measurement items are applicable to both the input and output of the driver.



TPPA-DUT1

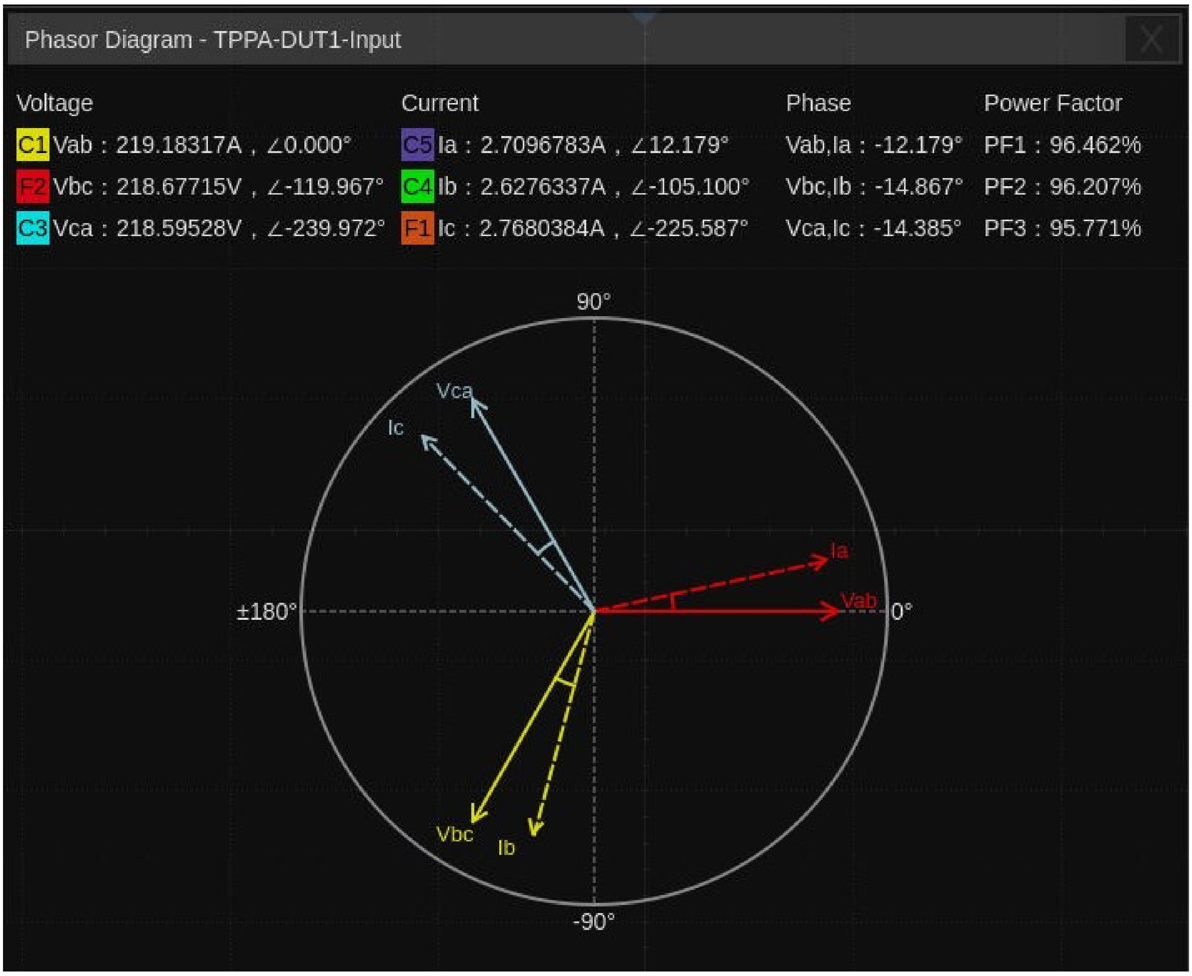
Split | Modify...

PQ-in | IHarm-in | VHarm-in | Ripple-in

Freq: 49.9875581Hz	V_{AB}/I_A C1/C5 LL-LN	V_{BC}/I_B F2/C4 LL-LN	V_{CA}/I_C C3/F1 LL-LN	Summation
V RMS	219.18317A	218.67715V	218.59528V	***
V Mag	218.09749A	218.04413V	218.17796V	***
I RMS	2.7096783A	2.6276337A	2.7680384A	***
I Mag	2.6553857A	2.6064711A	2.7386956A	***
V Crest Factor	1.419	1.441	1.423	***
I Crest Factor	1.616	1.503	1.448	***
Real Power	572.905W	552.810W	579.490W	1.705205kW
Reactive Power	156.576Var	156.748Var	174.106Var	487.430Var
Apparent Power	593.916VA	574.603VA	605.080VA	1.773599kVA
Power Factor	96.462%	96.207%	95.771%	***
Phase	-12.179°	-14.867°	-14.385°	***

Power Quality Measurement Item

In addition, the voltage and current vectors can be visually presented by phasor diagram, which is convenient to quickly evaluate the offset degree of each phase and the equilibrium state of the three-phase system. The amplitude of each vector is quantitatively characterized based on the RMS value, and its phase angle is accurately analyzed by discrete Fourier transform (DFT) algorithm.

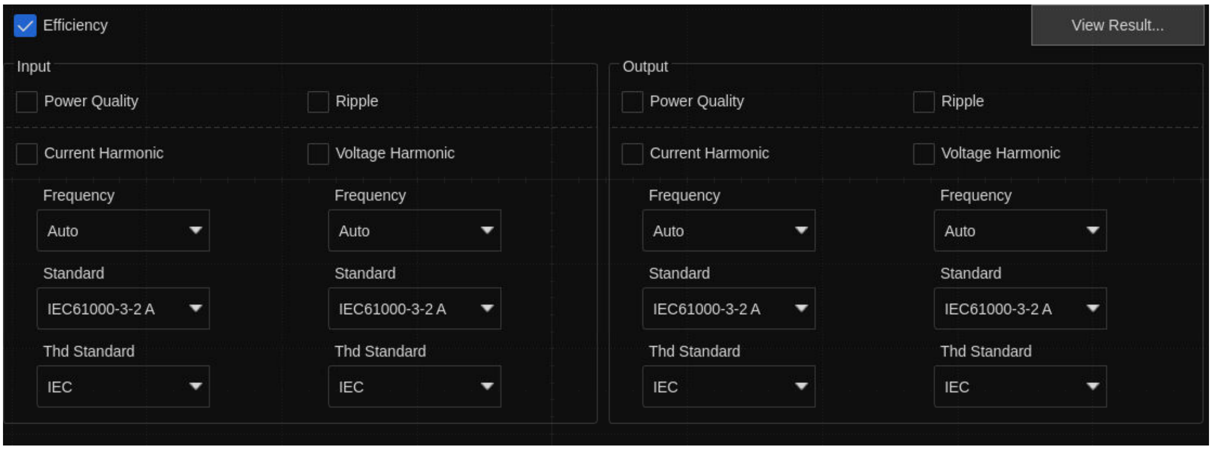


Phasor diagram

The phasor diagram provides a visual representation for a three-phase system. Under normal circumstances, the voltages between phases should be basically the same, and the phase difference should be 120°.

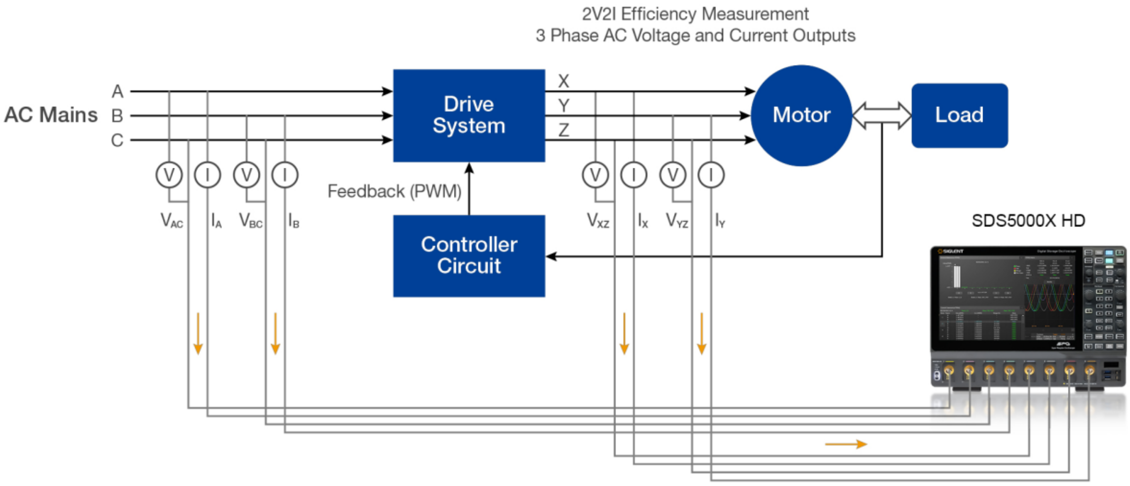
4.4 Efficiency

Efficiency measurement measures the ratio of output power to input power corresponding to the voltage-current pairs of output and input.



Efficiency Analysis Item Settings

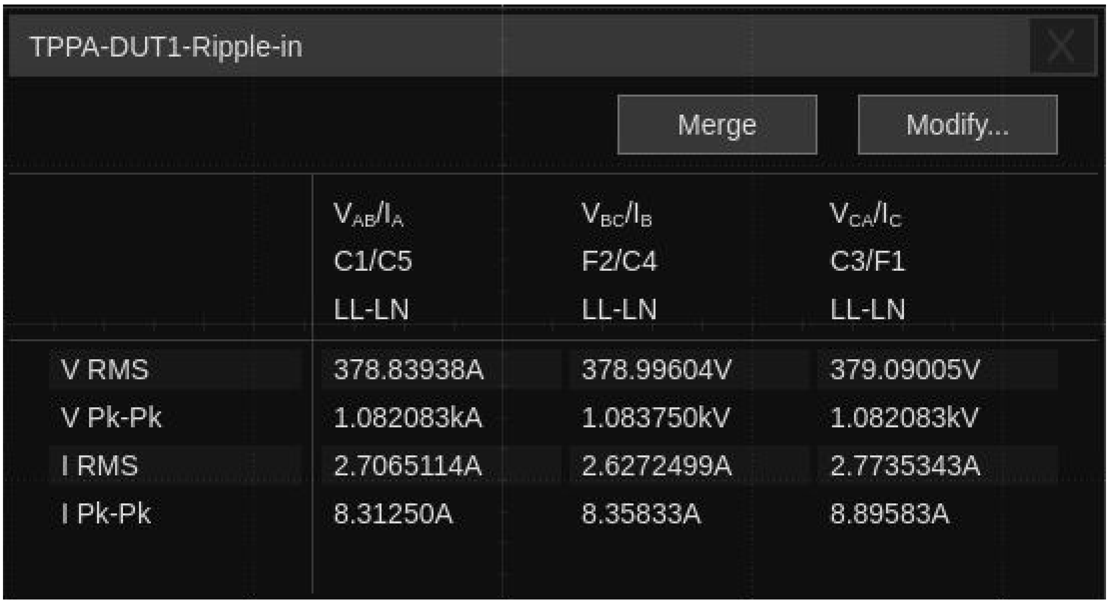
On the SDS5000XHD oscilloscope, the two-wattmeter method is used for input and output, which enables to measure the three-phase input and output power completely with eight input channels, as shown in the following figure.



Measuring system efficiency with 3-wire input and 3-wire output using 8 oscilloscope input channels.

4.5 Ripple

Ripple analysis function can capture and analyze the ripple phenomenon within the circuit, which is crucial for ensuring the normal operation of the circuit and equipment. By capturing and analyzing the ripple, we can find the potential problems in the circuit promptly and take corresponding measures to repair and optimize it. This helps to avoid problems such as equipment damage, functional interference and premature aging, thus improving the overall stability and reliability of the system.



TPPA-DUT1-Ripple-in

Merge | Modify...

	V_{AB}/I_A C1/C5 LL-LN	V_{BC}/I_B F2/C4 LL-LN	V_{CA}/I_C C3/F1 LL-LN
V RMS	378.83938A	378.99604V	379.09005V
V Pk-Pk	1.082083kA	1.083750kV	1.082083kV
I RMS	2.7065114A	2.6272499A	2.7735343A
I Pk-Pk	8.31250A	8.35833A	8.89583A

Ripple analysis result diagram

5 Measurement challenge

The signals in three-phase electrical system usually contain various frequency components, and may be affected by noise and interference, leading to poor signal stability and challenging waveform capture. Especially, the output of motor driver adopts pulse width modulation technology, and the signal waveform is more complicated. It is quite challenging to measure these signals stably, so it is necessary to have a higher precision oscilloscope and appropriate trigger settings to capture the waveform stably.

The voltage in three-phase electric system is usually high, which requires oscilloscope and probe to have enough rated voltage and common-mode rejection ability to ensure the safety and accuracy of measurement. At the same time, operators need to strictly abide by safety regulations to avoid dangerous situations such as electric shock.

In addition to measuring the output of the driver, it is also important to evaluate the performance of the driver input stage, such as harmonics, power and power factor. These measurements involve many connections with the equipment to be tested, and improper detection methods and poor connections to the motor drive system are common sources of errors in motor drive measurement.

Therefore, to clearly observe the signals of a motor drive system using an oscilloscope, it is necessary to carefully configure the setup, ensure waveform stability, and employ a reliable measurement algorithm.

6 Measurement method

This section mainly introduces the measurement methods of three-phase electrical system.

6.1 Oscilloscope probe selection

Voltage and current probes are required for power measurements in variable frequency drive system. When selecting voltage probe for motor drive measurement, it is important to consider:

- Motor drive measurement involves a relatively high voltage. For example, in a 480 V_{ac} three-phase motor drive, the DC bus voltage is usually around 680 V_{dc}. Confirm the voltage rating of the probe and the voltage rating of the accessories used to connect the probe.
- The common-mode voltage may also be relatively high. In other words, the measurement signal is often "floating" relative to the ground, so ground-referenced probes cannot be used. It is important to ensure that the degree of signal floating does not exceed the common mode voltage rating of the probe.
- Most frequencies of interest are below 400 MHz, so a probe with this bandwidth should be sufficient for most daily measurements.

For these reasons, the high voltage differential probe is usually recommended as a general voltage probe for power electronic inverter subsystem, driving input/output and control system measurement.

Siglent high-voltage differential probe (such as DPB6150A) and current probe (such as CP6030A) are very suitable for various VFD measurement situations.

Note: When measuring the voltage difference between the phase line and the neutral line (zero line), an ordinary passive probe with a ground reference should not be used. This is because the neutral line may not be directly grounded, which could result in a large current flowing through the ground terminals of the probe and the oscilloscope, creating a significant safety hazard. It may cause damage to the device under test (DUT) or the oscilloscope, and even lead to electric shock.

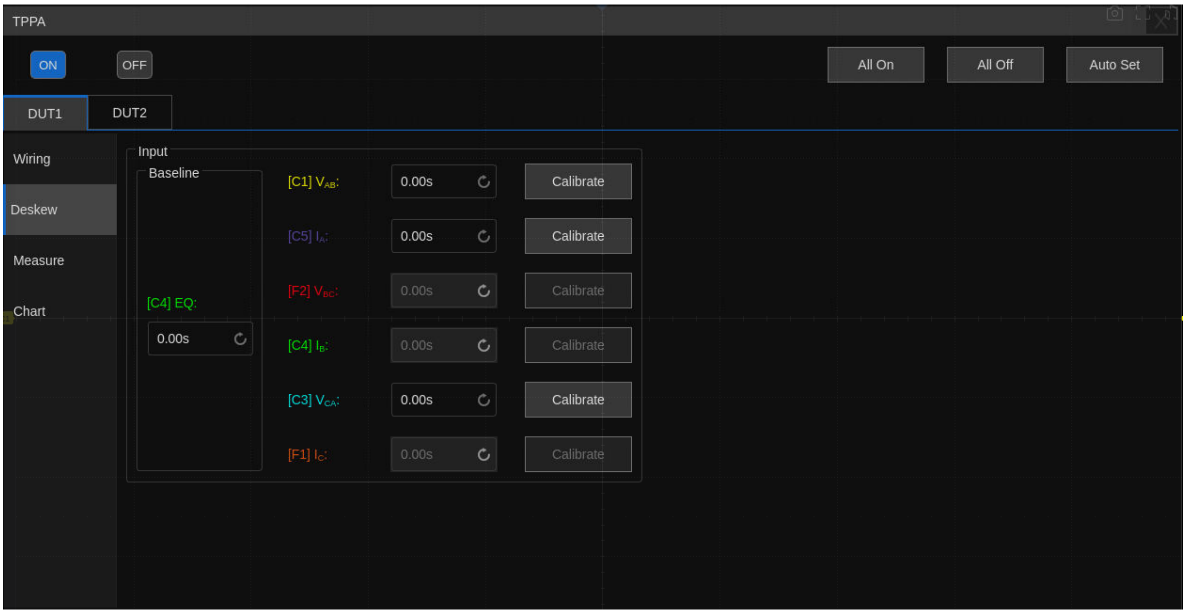
6.2 Oscilloscope probe setting

Before measurement, it is very important to perform degaussing procedure on the current probe to remove any residual magnetism in the probe core, which will lead to inaccurate measurement. The above process usually requires removing all the conductors in the jaws of the current probe, and then pressing a specific button to start the degaussing and zeroing procedure. For example, the Siglent current probes, such as CP6000 series, feature automatic degaussing and zeroing directly. After pressing the degaussing and zeroing button, the indicator light will be green, and after degaussing, the indicator light will go out. If degaussing is successful, the buzzer will beep twice; If degaussing fails, the buzzer will beep for about 1s.

When connecting the current probe, ensure you observe to the arrow mark on the probe to get the correct polarity reading. The arrow indicates the direction of positive current flow (from positive to negative potential).

6.3 Deskew

The Deskew process is used to correct various propagation delays between any two oscilloscope channels (including probe and probe cable). This is very important, because the phase relationship is very important for many measurements of variable frequency drive (VFD) system. Deskew should be performed initially, and then re-run when any part of hardware settings changes (e.g.,different probes, different oscilloscope channels, etc.) or the ambient temperature changes. The basic step is to provide a synchronization signal to different channels through the calibration board of Siglent DF2100A. After setting the corresponding input channels, touch calibration can automatically perform calibration.

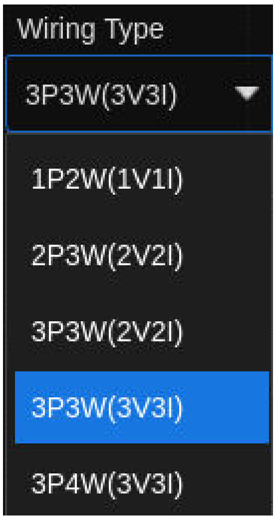


Deskew function

6.4 Wiring type configuration

Generally, the input and output of variable frequency drive (VFD) are three-phase. However, some variable frequency drives used in commercial, residential or automotive drive systems may be powered by single-phase alternating current (AC) or direct current (DC). In addition, three-phase systems can be wired and modeled in two configurations: star (or Y-shape) and triangle. Wiring configuration determines the calculation method used in power analysis. Therefore, in order to obtain the expected results, it is very important to understand and select the correct wiring configuration, which is suitable for both the input and output of motor drivers. See section 4.1 for a detailed introduction to wiring types.

The following figure shows the wiring configuration supported by three-phase electrical analysis on the SDS5000XHD oscilloscope of Siglent.



Wiring type selection

The following table shows the channel requirements corresponding to the specific configuration.

type	Parameter to be	Number of	Measurement

	measured	Oscilloscope Channels Required	Method
1V1I(1-phase 2-wire)	1-phase voltage (L-N) and 1-phase current	2 channels	The differential probe is connected to L-N, and the current probe measures L line.
2V2I(2-phase 3-wire)	Two-phase voltage (L1-N, L2-N) and two-phase current (L1, L2)	4 channels	Two differential probes measure L1-N and L2-N respectively, and two current probes measure L1 and L2 line currents.
2V2I(3-phase 3-wire)	Two-line voltage (L1-L3, L2-L3) and two-line current (L1, L2)	4 channels	The differential probe measures L1-L3 and L2-L3 voltages, and the current probe measures L1 and L2 line currents (L3 current is calculated by $I_{L3}=-I_{L1}-I_{L2}$).
3V3I(3-phase 3-wire)	Three-wire voltage (L1-L2, L2-L3, L3-L1) and three-wire current	6 channels	Three groups of differential probes measure the three-wire voltage, and three current probes measure the current of each phase line.
3V3I(3-phase 4-wire)	Three-phase voltage (L1-N, L2-N, L3-N) and three-phase current	6 channels	Three voltage probes measure the voltage of each phase (to neutral line) and three current probes measure the current of each phase line.

wiring configuration and channel requirements

7 Measurement example

This section introduces the method of 2V2I(3-phase 3-wire) measurement by using the three-phase electrical analysis software on SDS5000XHD oscilloscope, aiming at providing stable and accurate electrical measurement for motor drivers.

7.1 Instrument demand

Ensure the appropriate firmware version and options are installed.

number	name	quantity	remarks
1	Oscilloscope SDS5000XHD	1 pcs	Firmware version: the latest
2	High voltage differential probe	2 pcs	Can be determined according to the specific measurement configuration.
3	Current probe	2 pcs	Can be determined according to the specific measurement configuration.

For complete specifications of the instrument, please refer to the corresponding data sheet: https://www.siglentna.com/

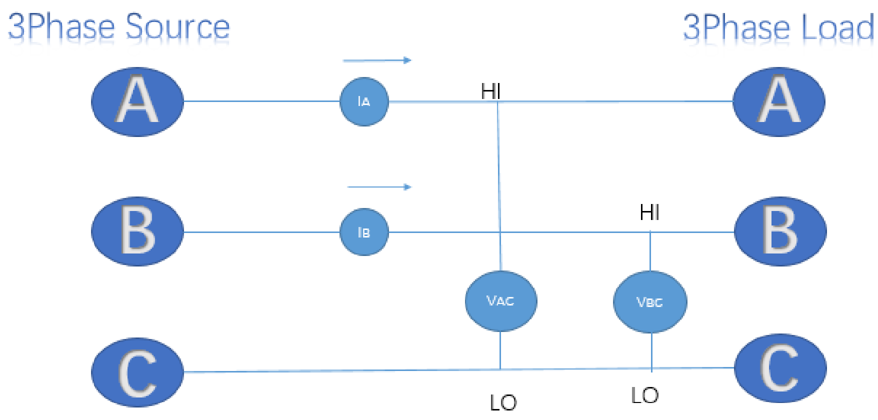
7.2 2V2I(3-phase 3-wire) measurement

First, make safety preparations, ensure that the power supply has been disconnected, and confirm whether the rated voltage and current range of oscilloscope and probe are suitable for the system under test. Choose a suitable probe. For 2V2I(3-phase 3-wire) system, two voltage probes and two current probes are usually needed, and the attenuation ratio of the probe is adjusted according to the amplitude of the measured signal.

SDS5000XHD supports Deskew function, and customers can use DF2001A calibration board to perform deskew as required. After connecting the voltage and current probes, use the deskew function of oscilloscope to perform automatic calibration.

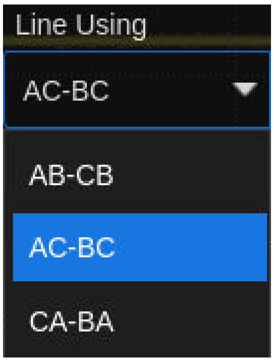
Wiring configuration selection 2V2I(3-phase 3-wire):

Motor drivers typically utilize a three-wire output configuration, and precise measurements can be achieved by using only two channels on an oscilloscope for voltage measurement and another two channels for current measurement. When connecting the power supply to the load using three wires, it is necessary to measure at least two power paths to calculate the total power, which requires two voltage channels and two current channels, as illustrated in the following diagram. The voltage channels are connected between phases, with one phase serving as the reference phase. The load and the power supply can be connected in either a Δ or a star configuration, but there should be no neutral conductor between them. In this scenario, two power paths can be used to calculate the total power delivered to the load.



2V2I(3-phase 3-wire) connection mode

The Line Using menu determines the phase used as the voltage reference.



Line Using

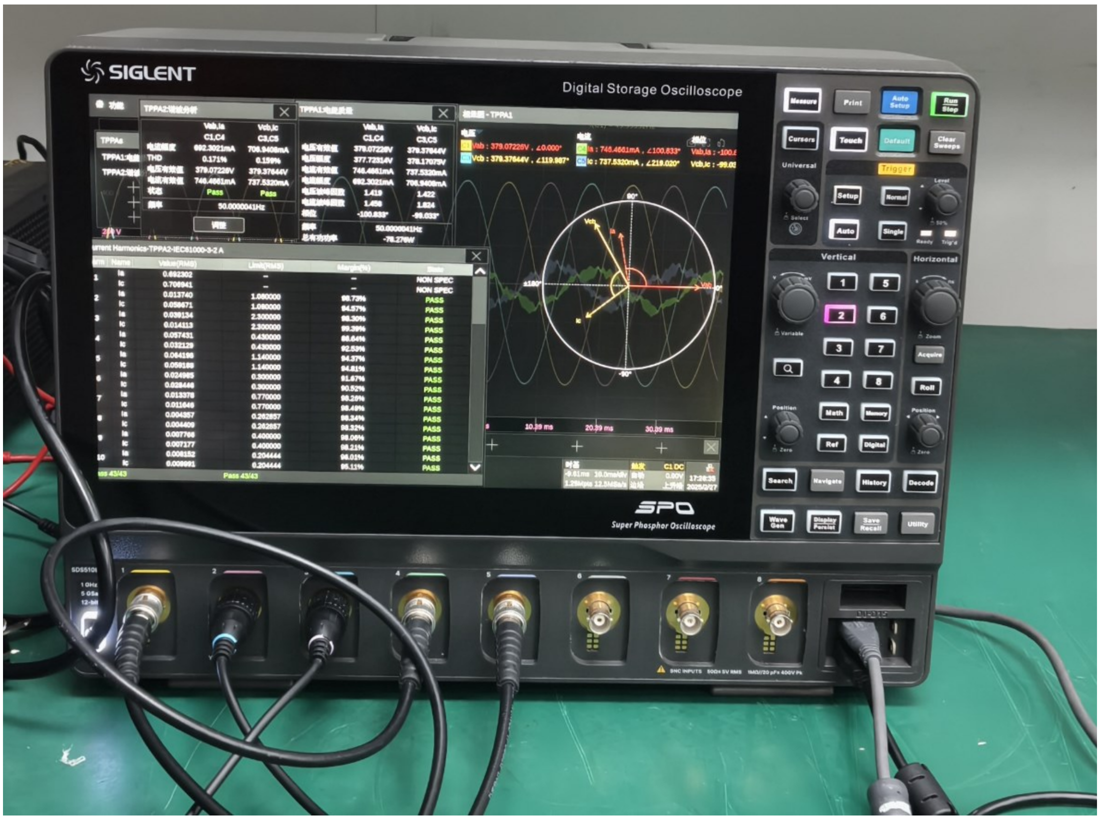
In the example above, the current is measured on phase A and phase B, while the voltage is measured with phase A and phase B relative to phase C.. That is, the measured values are V_{AC} (voltage between phase A and phase C), V_{BC} (voltage between phase B and phase C), I_A (phase A current) and I_B (phase B current). In this example, the total power is:

Instantaneous power, $P1 = V_{AC} \times I_A$

Instantaneous power, $P2 = V_{BC} \times I_B$

Total power = P1+P2.

After connecting the signal through the connection mode in the above figure, select the corresponding measurement items (harmonics, power quality or ripple analysis). If you need to measure the efficiency, you can test it according to the connection mode in Section 4.4. SDS5000XHD three-phase electrical measurement software includes an Auto set function, which can automatically configure the oscilloscope and measure according to the selected wiring type and measurement items, and it will optimize the vertical, horizontal, acquisition and trigger parameters on the oscilloscope, which greatly simplifies the measurement setup.



Practical measurement demonstration

8 Summary

The SDS5000XHD offers an efficient and reliable power measurement solution for three-phase electrical systems, leveraging its multi-channel synchronous acquisition capability and high-precision computation. Through standardized wiring, calibration, and software configuration, users can easily achieve the synchronous measurement of three-phase voltage and current signals, obtaining real-time waveforms and power parameters for each phase. This ensures phase balance and power quality in three-phase electrical systems, significantly enhancing testing efficiency and data reliability. It is well-suited for core energy efficiency evaluation needs in the fields of power electronics, industrial drives, and new energy.

About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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