

Enersine ESD34 400V 100A/150A Active Harmonic Filter User's Manual

Ver. 1.0



No. 192321852058000



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Model Number Description

This manual describes the following equipment:





Preface

We thank you for the trust in selecting our *Enersine* ESD34 Active Harmonic Filter.

Our equipment complies with EN 50178 standard in accordance to Low Voltage Directive 73/23/EC and is authorize to use the CE marking.



The purpose of this manual is to introduce the operating principles of the *Enersine* ESD34 Active Harmonic Filter and to provide instructions for its safe operation. The manual also provides troubleshooting assistance should an abnormal message or behavior occur.

Should an abnormal message not covered in this manual appear, please contact your local authorized service agent for troubleshooting and repair.

All of the installation, operation, and maintenance of this device must be performed by authorized and qualified technicians who are familiar with this manual.



Safety Instructions

While the *Enersine* Active Harmonic Filter is undergoing installation, operation, maintenance, or calibration, you are reminded of the following safety instructions:

- (1) The *Enersine* is connected to hazardous high voltage. Death can result if the device is not installed properly.
- (2) The installation, calibration, and maintenance of the *Enersine* must be done by qualified technicians according to local and international installation standards.
- (3) A proper grounding of the *Enersine* must be double verified before the filter is powered on. Improper grounding can cause the device to work abnormally and also presents a potential electric shock hazard.
- (4) Before any maintenance work is performed make sure that the power switch is off for at least three minutes to allow the internal capacitors to totally discharge.
- (5) When routine maintenance is performed be sure to avoid potential electric shock hazards from the interior of the filter or energy storage components such as capacitors. Also, we recommend that you wear safety glasses.
- (6) Improper installation of the filter could increase harmonic currents and voltages, which can damage power systems or the load connected.
- (7) Improper operation can damage the internal components of the filter.
- (8) Improper procedure in breaking the circuit can damage the filter or introduce safety hazards.

The operation and maintenance of the filter must be performed by qualified technicians who are familiar with this user's manual.

When replacing any components be sure to proceed as indicated in this manual to avoid safety hazards.

NAblerex

1 Function and Operating Principles

1-1 Functional Features

The *Enersine* is a solid-state power converter which offers the following features under normal conditions:

- Eliminates harmonic currents generated by non-linear loads.
- Compensates reactive power for lagging or leading loads.

The *Enersine* is a harmonic current generator that creates opposite, phase-shifted harmonic currents of the same amplitude.

The benefits of the improved harmonic currents are:

- (1) No risk of harmonic resonance
- (2) Reduced voltage waveform distortion
- (3) Reduced voltage drops on transformers and cables
- (4) Reduced overheating of transformers and cables
- (5) Improved power factor

The **Enersine** is not recommended for use with loads that have a high current rise rate. Such a load, for example that of a rectifier with an extra-low inductance rating employing phase control, may cause the **Enersine** to shut down. If the **Enersine** is applied to such a load, we recommend installing a 3-5% reactor at the input side of the load to reduce the rise rate of the load input current.

In certain applications where there are devices having similar characteristics, such as a load which generates high-frequency current, power factor correction capacitors, certain types of passive harmonic filters, etc., those devices may also affect the normal operation of the *Enersine* or cause it to shut down.



1-2 Major Components

Enersine provides 3 phase harmonic and reactive current compensations, and the main components of the filter are as following,

- 1 set of Electromagnetic Contactor and Soft-starting circuit. It helps to limit the amplitude of the inrush current when DC capacitor set is charging
- 1 set of Link Inductor. It is a power transmission interface between the IGBT power converter and the power system.
- 1 set of Ripple Current Filter module. Its main function is to absorb the high frequency ripple current and compensate specific amount of reactive power.
- 1 set of High Frequency Inductor-Capacitor module. It acts as the power transmission interface component between power converter and power system.
- 1 set of IGBT Power Converter module. This is to transform the harmonics energy from the connected power system and re-generate an equal but opposite phase shifted harmonic current back to the power system. This re-generated energy will cancel the harmonics produced by the power system.
- 1 set of DC Capacitor module which store energy taken from the power system before the IGBT Converter can use it to re-generate the opposite phase shifted compensating harmonic current.



- (1) Power Switch (Only for IP20 version)
- (2) Main Fuse
- (3) Soft-start Circuit
- (4) Electromagnetic Contactor
- (5) Link Inductor

- (6) Ripple Current Filter Module
- (7) High Frequency Inductor
- (8) IGBT Power Converter Module
- (9) DC Capacitor Module

Figure 1-1 Enersine ESD34 Major Components Bock Diagram



1-3 Characteristics and Specifications

1-3-1 General Characteristics

Storage Temperature	-20°C ~ 70°C	
Operating Temperature	0° ~ 40° C without derating ^{#1}	
Relative Humidity	< 95%	
Operating Altitude	<1000 m without derating #2	
Reference Harmonic Standard	EN 61000-3-4 , IEEE 519-1992	
Reference Design Standard	EN60146	
Safety Standard	EN50178	
Flactromagnetic	EN55011, EN61000-4-2, EN61000-4-3, EN61000-4-4,	
Compatibility	EN61000-4-5, EN61000-4-6, EN61000-6-2,	
Company	EN61000-6-4,	

#1 Above 40°C (104°F), the maximum output current must be derated by 3.5% every additional 1°C (1.8°F) up to 50°C (122°F) maximum limit

#2 Over 1000m (3300ft) above sea level, the maximum output current must be derated by 1% every additional 100m (330ft).

1-3-2 Electrical Specification

Model	100A 150A	
Input Voltage	400V +15%,-20%	
Phase/Wires	3 phase 4 w	vires/3wires
Frequency	50/60	±3 Hz
Maximum Compensation Current/Phase	100 Arms 150 Arms	
Maximum Compensation Current of Neutral Line	300 Arms	450 Arms
Compensated Harmonic Orders	From 2^{nd} to 51^{st} order and can be selective.	
Power Factor Correction	Compensates both lagging and leading reactive power. Power factor can be configured from 0.7 lagging to 0.7 leading.	
CT Ratio	Can be set. Primary Current: 100-10,000 A Secondary Current: 1 A (standard)/5 A (optional) ^{#1}	
CT Location	Source Side: Closed Loop Control; Load Side: Open Loop Control	



Model	100A	150A
Parallel	Up to 8 Units	
Response Time	< 20 ms	
Inrush Current	Less than rated current	
Current Limitation	Yes, at full correction	
Maximum Heat Loss	2500 Watts	3200 Watts
Airflow requirements	> 550 m³h	> 700 m³h
Noise Level	<65 dB from 1 meter	

#1 Request optional PCB APKT2

1-3-3 Mechanical Specification

Model		100A 150A		
Color	IP00	None		
Color	IP20	RAL9011(PANTONE Process Black C)		
Dimensions	IP00	440 x 445 x 1500 mm		
(W*D*H)	IP20	600 x 600 x 1900 mm		
Waight	IP00	108 Kgs	120 Kgs	
vv eight	IP20	193 Kgs 205 Kgs		

1-3-4 HMI & Communication Interface Specification

	LCD Control Panel offers the following functions:
	• Meter: parameter, waveform, and spectrum
7" LCD Touch Screen	• Event log: Up to 300 records (FIFO)
Control Panel	• Configuration: Compensation Setting,
	Compensation Logic Control, and System Setting.
	• Multi-language
Dwy Contracto	3 Output Dry Contacts
Dry Contacts	1 Input Dry Contact
Communication Interface	USB, RS-485, Ethernet
Configuration	Configurable by using our computer service software or by
	using the LCD Control Panel
Monitoring Software (optional)	ESD-Link34
Communication Protocol	J-Bus/MOD Bus Protocol



1-4 <u>Compensation Ability</u>

As long as the **Enersine** is powered on and running it provides harmonic current compensation and power factor correction. Therefore the current on the source side is less than that on the load side. In addition, the improvement of the voltage waveform distortion and the voltage regulation may increase harmonic currents on the load side. Therefore, any compensation capability analysis must be done when the **Enersine** is running.



The harmonic current on the load side is measured when the **Enersine** is running.

1-5 <u>Capacity Selection</u>

The **Enersine** compensates harmonic currents comprehensively, which requires neither measuring the impedance of the power system nor analyzing the load's harmonic spectrum or its individual amplitude. To select the appropriate model, measure the estimated load harmonic current amplitude to be compensated, and then select the **Enersine** model which has an output compensated current rating at least 1.25 times that. For example, if the load harmonic current is 70 A choose the 100 A **Enersine**.

Even if the selected filter offers insufficient compensated harmonic current, the *Enersine* will not be at risk of overloading. It has current-limiting capability up to its full rated compensating capability. Therefore it will not shut down or malfunction as most passive filters do. Simply add more units in parallel to increase its compensating capacity



2 Installation and Wiring

2-1 Installation Environment

- 1. Because the *Enersine* is an electronic control device, its installation environment can affect its operational reliability and lifetime. The filter is equipped with cooling fans to reduce the heat generated during operation. Therefore, do not block the ventilation openings during installation.
- 2. Do not install the filter in an environment which is overly dusty, hot, humid, corrosive, or vibrating. It is strongly recommended that you install the filter in a clean and dust-free room with controlled temperature at 15-25 °C.

2-2 General Requirement for Ventilation and Maintenance

2-2-1 IP00 Version

During installation ensure that the following conditions are met.

- 1. Keep at least 250mm of air-flow space around bottom of the filter.
- 2. Keep at least 600mm of air-flow space around top of the filter.
- 3. Do not block the air flow around the filter.
- 4. Keep at least 1,000 mm of free space in front of the filter for future maintenance purposes.



IP00 Version



2-2-2 IP20Version

During installation ensure that the following conditions are met.

- 1. Keep at least 600mm of air-flow space around top of the filter.
- 2. Do not block the air flow around the filter.
- 3. Keep at least 1000 mm of free space in front of the filter for air flow and future maintenance purposes.





2-3 Wiring and Cables



Figure 2-1 and Figure 2-2 show the position of the external interfaces of the filter.

Figure 2-1 IP00 Version External Interfaces





Figure 2-2 IP20 Version External Interfaces



2-3-1 Power Cable Connections

Figure 2-3 shows the position of power source input terminal and please refer to Table 2-1 for choose the suitable power cable size.



Figure 2-3 Power Source Input Terminal

Fable 2-1 Recomment	ded Power (Cable Size and	l Minimum	Circuit Breaker

Model		Recommended Minimum Cable Size	Terminal Block Specification (Fastening with screw)	Recommended Maximum Length	Recommended Minimum Circuit Breaker
	Phase A, B, C	1/0 AWG/55mm ²	M8	20m	
150A	Neutral Line (N)	2/0 AWG/70mm ² x2	M10	20m	200A
	Ground (G)	1/0 AWG/55mm ²	M6	20m	
	Phase A, B, C	$2 \text{ AWG}/38 \text{mm}^2$	M8	20m	
100A	Neutral Line (N)	$1/0 \text{ AWG}/55 \text{mm}^2 \text{ x}2$	M10	20m	125A
	Ground (G)	$2 \text{ AWG}/38 \text{mm}^2$	M6	20m	



2-3-2 CT Wiring

The **Enersine** can be used with 3-phase/3-wire or 3-phase/4-wire systems. A set of external CTs is needed for detect the load current. 3 Parallel CTs are required to install for measure the total output current of the filters when several filters operate in parallel. These CTs connection terminal block show as in Figure 2-4.



Figure 2-4 CT Connection Terminal Bloc
--

Table 2-2 Recommended CT Cable Size

	Recommended	Terminal Block	Recommended
	Minimum Cable Size	Specification	Maximum Length
CT Cable	20AWG/0.5mm ²	Hard-wire • 4mm ²	30m

		concution			
	External CT	Parallel CT			
Accuracy	Class 1.0 or be	etter			
	\geq 5VA (1~2 units in	parallel)			
Burden	\geq 10VA (1~5 units in parallel)				
	\geq 15VA (1~8 units in	n parallel)			
	Primary 100~10,000A	500/1A, 1000/1A,			
CI Ratio	Secondary 1A (Standard)/5A(Optional) [#]	1500/1A, 2000/1A			

Table 2-3 Recommended CT Specification

#Optional PCB APKT2 is requested for xxxx/5A CT.

To avoid the possibility of interference with the CT output signal, do not place power cables and the CT twisted-pair signal cable in the same tray or conduit. If both power and signal cables need to be in the same tray or conduit, ensure that proper partitions are in place to provide isolation between them.



2-3-2-1. External CT Installation

The external CTs can be installed on the source side or on the load side as indicated in Figures 2-5 to 2-8. When used in a 3-phase/3-wire system, the connections can be made as in Figure 2-5 to 2-8. When used in a 3-phase/4-wire system, external CTs can be connected as in Figure 2-7 and Figure 2-8.

We recommend installing the external CTs on the source side, and we recommend using three CTs for the best performance. If the external CTs must be installed on the load side please contacts your local authorized service agent.



Figure 2-5 2 External CTs Installed at Source Side





Figure 2-6 2 External CTs Installed at Load Side



Figure 2-7 3 External CTs Installed at Source Side





Figure 2-8 3 External CTs Installed at Load Side

When the filters are installed in parallel, the wiring of the external CTs is different from the standalone unit. Each CT's output signals must be connected to the External terminal block of the filter in series as shown in Figure 2-9.



Figure 2-9 External CTs Connection for Parallel



2-3-2-2. Parallel CT Installation

Three parallel CTs must be installed at the total output of the filters when the filters operate in parallel. Refer to Figure 2-10 for parallel CT connections



Figure 2-10 Parallel CTs Installation and Connections





Figure 2-10 Parallel CTs Installation and Connections



2-3-3 Communication Wiring

Figure 2-11 shows the position of the communication interfaces, the detail description of these interfaces will be introduced in below sections.



2-3-3-1. Parallel Communication Port

The Parallel Communication port is for running multiple AHF in parallel. To avoid noise interference, do not intermix these cables with power cables. If intermixing cannot be avoided, align them at 90 degrees or separate them by at least 20 cm as indicated in Figure 2-12.



Figure 2-12 Recommended Layout of Communication Cable

No. 192321852058000



The maximum total length of the parallel communication cables must be less than 20 meters, and they must be connected in a ring topology as shown in Figure 2-13. To ensure good communication quality you must set the switches of the two farthest filters to the "ON" position as shown in Figure 2-13.



Figure 2-13 Parallel Communication Cable Connections No. 192321852058000 21



Noted!!

Make sure the filter is turned off when connect the parallel communication cables. After the connections of the parallel communication cables are complete, turn on the power and set the number of parallel units and the unique "Parallel Number" of each filter using either our service software or the LCD control panel. In case of wrong settings, the filter will alarm and cannot be started up. Consult your local authorized service agent for help with the parallel settings.

2-3-3-2. USB Service Port

This USB port is for service only.

Complies with USB V1.0, 1.5Mbps Complies with USB HID (Human Interface Device) V1.0

Pin Assignment:

	$1 \rightarrow \text{VCC} (+5\text{V})$
$\frac{2}{2}$	2 → D-
3 4	3 → D+
	$4 \rightarrow Ground$

 $\rightarrow D+$ → Ground

2-3-3-3. EPO (Emergence Power Off)

The filter comes with an EPO terminal, which allows you to turn off the AHF in an emergency. If the Control Panel is out of order you can still shut down the filter using the EPO switch. Shorting Pin 1 and Pin 2 of the switch turns off the filter immediately.



Figure 2-14 EPO Terminal



2-3-3-4. Control Panel Communication Port

This port has to connect to the RS485-1 communication port of Control Panel . The connections for signal filter as shown in Figure 2-15. To ensure good communication quality you must set the switches of the filter and Control Panel to the "ON" position as shown in Figure 2-15. When multiple filters in parallel, the connections as shown in Figure 2-16 and set the switches of the farthest filter and Control Panel to the "ON" position.



Figure 2-15 Control Panel Communication Cable Connections for Single Unit





Figure 2-16 Control Panel Communication Cable Connections for Parallel

No. 192321852058000



2-4 External View and Dimension





Figure 2-17 ESD34 100A/150A IP00 Dimensions Diagram

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Figure 2-18 ESD34 100A/150A IP00 Fixation Holes











Figure 2-20 ESD34 100A/150A IP20 Dimensions Diagram





Figure 2-21 ESD34 100A/150A IP20 Wiring Position Diagram



3 Control Panel

3-1 LCD Touch Screen Control Panel

This section introduces the key features of LCD Touch Screen Control Panel. Please refer to chapter 4 for the detail function operation of LCD touch screen.



Figure 3-1 LCD Touch Screen Control Panel External Features

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3-1-1 Status Indicators

LCD Touch Screen Control Panel provides two indicators to indicate the operation status of the filter.

Indicator	Display	Description			
	off	The filter is stop working.			
Green	on	The filter is providing compensating current.			
	blinking	he filter is under standby mode.			
	off	The filer is normal			
Dad		There are some external abnormal conditions or internal			
Red	on	breakdown. The filter should stop providing compensating			
		current.			

Table 3-1 Description of Status Indicators of LCD Touch Screen Control Panel

3-1-2 Output Dry Contact

There are three output dry contact connectors for remote monitoring. These output dry contacts are programmable. The user can change the definition for each contact using the LCD touch screen or consult your local authorized service agent. The default definitions of the output dry contacts are shown in Table 3-2.

Electrical specification: 250 VAC/ 2 A, 30 VDC/ 2 A



Table 3-2 The	e Default	Definition	of the	Output	Dry	Contacts
---------------	-----------	------------	--------	--------	-----	----------

	Function	Description
K1	POWER ON	The control logic circuits of the filter are energized.
K2	FILTERING	The filter is providing compensating current.
K3	ERROR	There are some external abnormal conditions or internal breakdown. The filter should stop providing compensating current.



3-1-3 Input Dry Contact

The input dry contact is connected to an external switch, which can be used to turn the filter on and off. There are two operation modes that can be selected: Mode 0 and Mode 1. The default mode is Mode 0. The user can change to Mode 1 via the LCD touch screen or consult your local authorized service agent.

Operation Mode 0:

Refer to Figure 3-2 to connect an external tack switch for use in turning the filter on and off. If you press the switch for two seconds the filter will change from on to off and vice versa as indicated in Figure 3-3.



Figure 3-2 Input Dry Contact Connections for Mode 0



Figure 3-3 Operation in Mode 0

Operation Mode 1 :

Refer to Figure 3-4 to connect an external, two-position switch for use in turning the filter on and off. Two seconds after the switch position is changed to either the "on" or "off" position the filter will correspondingly be started up or shut down, as indicated in Figure 3-5.

When in Mode 1 please close the external switch first, and then press the ON/OFF key on the Control Panel to put the filter in standby mode (Green Indicator blinking). Then you may control the filter from the external switch.



Figure 3-4 Input Dry Contact Connections for Mode 1





Figure 3-5 Operation in Mode 1

3-1-4 RS485-1Communication Port

This port has to connect to the Control Panel Communication Port of the filter. Please refer to section 2-3-3 for detail description.



3-1-5 RS485-2 Communication Port

This is Modbus communication port for remote monitoring. The baud rate can be programmable from 2400 to 57600 via the LCD Touch Screen. Below picture shows the pin assignments and S2 is the switch for terminal resistor.





Figures 3-6 to 3-7 show the outer dimensions of the LCD Touch Screen Control Panel.





Bottom View

Figure 3-6 LCD Touch Screen Control Panel Dimensions Diagram





Figure 3-7 LCD Touch Screen Control Panel Fixation Holes



3-2 Power Supply for Control Panel

A 12VDC power supply is provided for supply the power of the Control Panel.

Please loose two screws as shown below and then raise the top panel.



A DC power supply can be found on the upper-right and 1500mm power cable is provided for connect with the control panel.





4 LCD Touch Screen Operation

Figure 4-1 is a block diagram of the functions provided by the LCD Touch Screen. The detail descriptions of each function please refer to below section.



Figure 4-1 LCD Touch Screen Functions, Block Diagram

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4-1 Main Screen



- [1] Function Menu
- [2] The status of each filter. The LCD Touch Screen Control Panel can monitor and control up to 8units.
 - 1/2/3/4/5/6/7/8: Number of the filter unit.
 - The filter is connected.
 - It is disconnected.
 - : The filter is running and providing compensating current.
 - : The filter is full correcting.
 - : There are some external abnormal conditions or internal breakdown.
- [3] Status Box : Display the newest status of the filter.
- [4] Load Rate
- [5] Control Button
 - E: To turn the filter on.
 - E: To turn the filter off.
 - **U**: To silence the alarm.
 - To clear the fault status.
- [6] Login/Logout Button:
- 【7】 Current Date and Time No. 192321852058000



4-2 Information

4-2-1 Identification

- 1) Press "Menu"→"Information"→"Identification" to enter Identification screen.
- 2) Choose the filter number by press icon $1 \sim 8$ and then you will see the desired filter information.

1	 2 3 6 7 	4 / Menu 8 0
Filter: 1 1 2 3 4	5 6 7 8	
Model Number ESD34150400E00C	Rated Current	150
Serial Number TD76003001	Phase / Wire	3P4W
Rated Voltage 400	Frequency	60
CPU 1 Program Ver. 1.10		
CPU 2 Program Ver. 1.17	Number of Parallel Unit	8
CPU 3 Program Ver. 1.00	Parallel Number	1
Status	Login 2	2013/07/26 14:01

4-2-2 Event log

 Press "Menu" → "Information" → "Event Log" to enter Event Log screen. Choose the filter number by press icon 1 ~ 8 and then you will see the desired filter event log recorders. Each filter can record up to 300 events log records. Old data is deleted to to make room for new in FIFO (first in, first out) orde.

				1 💮 2 🕤 5 💮 6 🕤	3	4	enu
Filter:	1 1	2	3 4	56	7 8		
Num.	Date	Time	Code	Description		Status	
25	2012-12-19	10:13:22	A040	CAN Bus Disconne	ected	YES	
24	2012-12-18	15:15:19	A040	CAN Bus Disconne	ected	YES	
23	2012-12-18	15:13:21	S001	Filtering		NO	
22	2012-12-18	15:13:21	C018	Filter OFF(AP)			
21	2012-12-18	15:13:19	S001	Filtering		YES	
20	2012-12-18	15:13:17	C017	Filter ON(AP)			
19	2012-12-18	15:12:00	C015	CONFIGURATION	UPDATA(A	P)	
18	2012-12-18	15:11:59	C016	IDENTIFICATION	UPDATE(A	P)	
17	2012-12-18	15:11:10	A040	CAN Bus Disconne	ected	NO	
16	2012-12-18	15:11:09	A040	CAN Bus Disconne	ected	YES	
La c	2012 12 10	1 5.00.54	1040	CAN Bue Discours	م ماد م	NO	
Status					Login	2013/07/26 1	4:03



4-2-3 Configuration

- 1) Press "Menu"→ "Information" → "Configuration" to enter Configuration screen.
- 2) Configuration screen offers five informations.

If you need to change any setting expect Dry Contact Settings, you must consult your local authorized service agent.

4-2-3-1. Compensation Settings

	1
Compensation Settings Harmonic Select	ion Compensation Logic Control System Settings Dry Contact Settings
Harmonic Compensation	Enable 🔄 High Order Compensation Disable
Power Factor Correction	Enable Application Mode 5
Compensation Priority	Harmonic 🔽
Reactive Power	Dynamic
Target DPF (cosø)	○ ┿ ● ≰ 0.95
Fixed KVAR	Ο⋕ Οξ [%
Balance Utility	Disable
Status	Login 2013/07/26 14:06

Compensation Setting Details:

Harmonic Compensation	Shows whether Harmonic Compensation is enabled or disabled.				
Power Factor Correction	Shows whether Power Factor Correction is enabled or disabled.				
Compensation Priority	Shows which setting has priority, Harmonic Compensation or				
	Power Factor Correction.				
Reactive Power	Shows whether the reactive power compensation mode is Target				
Reactive 1 ower	DPF or Fixed KVAR when Power Factor Correction is enabled.				
Target DPF ($\cos \Phi$)	Shows the Target DPF setting.				
Fixed KVAR	Shows the Fixed KVAR setting.				
	When 3-Phase current of the load is unbalanced and Balance Utility				
Balance Utility	is enabled the filter will compensate the system current to balance.				
	This function only available for 3P4W system.				
High-Order	The filter will compensate from the 31 st to 51 st harmonic				
Compensation	orders when this is enabled.				
	The filter computes several control parameters for different load				
	types to obtain the best performance.				
	0 For single-phase rectifier				
	1 For 3P3W, 6-pulse rectifier				
Application Mode	2 For 3P3W, 6-pulse and single-phase rectifiers				
	3 For 3P3W, 6-pulse rectifier with even-order harmonic				
	4 For single-phase rectifier with even-order harmonic				
	5 For all load types (default)				
	6 User define				



4-2-3-2. Harmonic Selection

				1	2	93	Θ	4 🥖	Menu
				5	6	9 7	Θ	8 😑	:=
Compensation	Settings Har	monic Selection	Compe	ensation Logic C	Control System	n Settings Dry	/ Contact Sett	tings	
Order	Select	Active	Redu	ition	Order	Select	Active	Redu	tion
2nd			100	- %	3rd		\square	100	- %
4th			100	- %	5th			100	- %
6th			100	- %	7th			100	- %
8th			100	~ %	9th			100	- %
10th			100	- %	11st			100	- %
12nd			100	~ %	13rd			100	~ %
14th			100	- %	15th			100	- %
16th			100	~ %	17th			100	- %
				2					
Status						Log	jin 20	13/07/2	26 14:07

Order : Harmonic order

Select : The selected harmonic order

Active : The active harmonic order

Reduction: The reduction ratio for the specific order

Show next page information



4-2-3-3. Compensation Logic Control

	1 🧲) 2 \ominus 3 😔 4 🖉 Men	
	5 🧲) 6 \varTheta 7 😔 8 😔 🛄	E
Compensation Settings Harmonic Selection	Compensation Logic Con	ntrol System Settings Dry Contact Settings	
Smart Save Energy	Disable 🝸	Auto Restart Enable	~
ON Delay Time (seconds)	10	Delay Time (seconds) 10	
OFF Delay Time (seconds)	10		
Max. ON Current Level	1		
Min. OFF Current Level	0.5		
Status		Login 2013/07/26 14	:09

Compensation Logic Control details:

		When this function is enabled the filter will start up			
		and shut down automatically according to the load			
		and shat to will another the load summer is loss then Min			
		current level. when the load current is less than will.			
	Smart Save Energy	OFF Current Level for OFF Delay Time the filter			
		will shut down automatically until the load current is			
Smart		greater than Max. ON Current Level for ON Delay			
Save		Time.			
Energy	ON Delay Time	The delay time for automatic start-up			
	OFF Delay Time	The delay time for automatic shutdown			
	Max. ON	The current level for automatic start-up			
	Current Level				
	Min. OFF				
	Current Level	I he current level for automatic shutdown			
		When this function is enabled the filter is allowed to			
•		automatically restart when some abnormal conditions			
Auto	Auto Restart	return to normal. Such abnormal conditions include			
Restart		system voltage abnormal, frequency error, etc.			
	Delay Time	The delay time for automatic restart			



4-2-3-4. System Settings

	1 • 2 • 3 • 4 / 5 • 6 • 7 • 8 •
Compensation Settings Harmonic Selection Compens	ation Logic Control System Settings Dry Contact Settings
Phase/Wire 3P4W	CT Direction Detection Enable
Number of External CTs 3 CTs	Phase A CT Normal
Primary Amperage of CTs 1000	(100~10000) Phase B CT Normal
Secondary Amperage of CTs 1 A	Phase C CT Normal
CT Position Source	e 🗸
Parallel CT Ration 500/1	Primary Voltage Level 400
Status	Login 2013/07/26 14:09

System Settings Details:

	Select 3P3W or 3P4W according to the power system that				
Phase/Wire	the filter is connected to. If the system is 3P3W then the				
	neutral line does not need to be connected.				
	Select 2 or 3 as the number of external CTs that are				
Number of External CTs	installed on the Source/Load side. If the system is 3P4W				
	then 3 CTs are needed.				
Primary Amperage of CTs	Set the primary current rating of the External CTs.				
	Set the secondary current rating of the External CTs. The				
Secondary Amperage of CTs	filter can accept 1A and 5A ratings. 1A is standard. If 5A				
	CTs will be used then the optional PCB APKT2 is needed.				
CT Position	Select the location where External CTs are installed.				
	When this function is enabled the filter will diagnose the				
CT Direction Detection	polarity of External CTs. When the polarity is incorrect the				
	filter will alarm and cannot be started up.				
Phase A CT	When the polarity of an External CT is incorrect, reversing				
Phase B CT	the CT's polarity here eliminates the need to reconnect the				
Phase C CT	CT wires.				
	Available Parallel CT ratios are 500:1, 1000:1, 1500:1, and				
Parallel CT Ration	2000:1. When the filter operates in parallel a Parallel CT				
	Ratio must be chosen.				
Primary Voltage Level	The filter allows you to apply different voltage levels from an external transformer installed at the input side of the filter. When an external transformer is used the voltage level should be set to the primary voltage of the transformer.				



4-2-3-5. Dry Contact Settings

			1 🔶 5 🔵	2 🔶 6 🔵	3 🔵 7 🔵	4 🥖 8 🕤	Menu
Compensation Settin	gs Harmonic Selection) Compensati	on Logic Control	System Settin	gs Dry Contac	t Settings	
К1	NO	• ON				•	Test
К 2	NO	Filte	ering			-	Test
К 3	NO	- ERF	ROR			-	Test
Inpu	t 0	•					
						Save	
Status					Logout	2013/07	26 14:16

User can change the Output/Input dry contacts setting. Table 4-1 shows the events that can be selected.

Please refer to Table 3-2 for the default definitions of the output dry contacts.

Item	Event	Item	Event
1	POWER ON	2	Filtering
3	Full correcting	4	ERROR
5	MCCB Tripped	6	Fuse Blown
7	Input Power Abnormal	8	IGBT Fault
9	High Frequency Resonance	10	Over Peak Current
11	Over Current	12	Over Temperature(Power)
13	Fan Fault	14	Temp. Sensor Disconnected
15	DC Bus Error	16	DC Bus Under Voltage
17	DC Bus Over Voltage	18	External CTA Reversed
19	External CTB Reversed	20	External CTC Reversed
21	Parallel CTA Reversed	22	Parallel CTB Reversed
23	Parallel CTC Reversed	24	System Voltage Abnormal
25	System Under Voltage	26	System Over Voltage
27	Frequency Error	28	Phase Rotation Error
29	Control Board Error	30	Control Board EEPROM Error
31	Control Panel EEPROM Error	32	Power Supply Error
33	Current Cable Disconnected	34	CAN Bus Disconnected
35	Parallel Disconnected	36	Parallel ID Duplicated
37	Parallel Setting Error	38	Over Temperature(Control)

Table 4-1 Event List



4-2-4 Parallel Information

1) Press "Menu" \rightarrow "Information" \rightarrow "Parallel Information" to enter Parallel Information screen.

	1 5	 2 3 6 7 	4 / Menu
Parallel Information	on		
NO. 1 OFF State: RUN Ampere: 150	NO. 2 OFF State: RUN Ampere: 150	NO. 3 OFF State: RUN Ampere: 150	NO. 4 ON State: STOP Ampere: 150
NO. 5 OFF State: RUN Ampere: 150	NO. 6 OFF State: RUN Ampere: 150	NO. 7 OFF State: RUN Ampere: 150	NO. 8 OFF State: RUN Ampere: 150
Status		Login	2013/07/26 14:18

No. # : The number of the parallel filter

ON/OFF button : To turn-on/turn-off the filter

State : The state of the filter

Ampere : The current rating of the filter



4-3 <u>Meter</u>

- 4-3-1 Parameter
 - 1) Press "Menu" \rightarrow "Meter" \rightarrow "Parameter" to enter Parameter screen.
 - 2) On Load Side and Source Side pages show the following parameters.

Lo	ad Side S	iource Side Filt	er					
	Freq	60.05	Hz	THI)	ΣS	116	kVA
	Vab	397	V	1.5	%	$\Sigma \mathbf{P}$	107	kW
	Vbc	397	V	1.5	%	ΣQ	-25	kvar
	Vca	397	V	1.5	%	PF	0.92	
	Ia	169	A	35.9	%	DPFa	0.97	
	Ib	169	A	36.2	%	DPFb	0.97	
	Ic	169	A	36	%	DPFc	0.97	
	In	0	Α					_

3) On Filter page show the following parameters.

oad Side S	ource Side Filter				
Freq	60.05	Hz	THI)	
Vab	397	V	1.5	%	
Vbc	397	V	1.5	%	
Vca	397	V	1.5	%	
Ia	70	Α			
Ib	70	A			
Ic	70	Α			
In	0	Α			



4-3-2 Waveform

- 500 500 400 400 300 300 200 200 100 100 0 -100 -100 -200 -200 -300 -300 -400 -400 -500 -500 ISa THD = 4.3 % THD = 35.9 % • 157 A ILa ▼ 169 A 100 • A / Div 100 • A / Div
- 1) Press "Menu" \rightarrow "Meter" \rightarrow "Waveform" to enter Waveform screen.

4-3-3 Spectrum

1) Press "Menu" \rightarrow "Meter" \rightarrow "Spectrum" to enter Spectrum screen.







4-4 Control

Press "Menu" \rightarrow "Control" to enter Control screen

4-4-1 Date and Time Update

Press "Date and Time Update" to set the system date and time.

		1 😔 2 🕯 5 🔵 6 🤇	3 0 7 0	4 / Menu 8 0
Control				
<	Date and Time	Update	\geq	
	Communication			
	Change Pass	word		
	Search Filt	er		
	Language	English	•	
	Screen Timeout	0	Second	l
	Buzzer	Enable	Buzz	zer Test
Status			Logout	2013/07/26 14:24



Note: The current date and time will be lost and reset to the initial conditions (2000-00-00 00:00:00) when the filter is disconnected from the power utility for 168 hours (7 days). This change will not affect the stored parameters in the control panel.



4-4-2 Communication Setting

1 2 3 4 5 🔵 6 😑 7 🔵 8 Control Date and Time Update Communication Setting Change Password Search Filter Language English • Second Screen Timeout 0 Buzzer • Buzzer Test Enable Logout 2013/07/26 14:24 Status

Press "Communication Setting" to enter Communication screen.

There are two kind of communication ports can be chosen.

If RS-485 is choosen, please set ID and Baud Rate.

If TCP/IP is used, please set IP, Gateway and Subnet Mask.

Con Communication Setting								
@ PC 495	ID	1						
© 105 TOS	Baud Rate	57600	•		Save			
	IP	192	168	1	2			
O TCP/IP	Gateway	192	168	1	1			
	Sub Net Mask	255	255	255	0			
					Save			
					Exit			



4-4-3 Change Password

	1 5	26	3 €7 €) 4 / 8 🔵	Menu
Control					
	Date and Time Upo	late			
	Communication Set				
¢	Change Passwor	\geq			
	Search Filter				
	Language	English	-		
	Screen Timeout	0	Secon	d	
	Buzzer	Enable	▼ Buz	zer Test	
Status			Logout	2013/07/2	26 14:24

Press "Change Password" to enter Change Password screen.

Please fill in the blanks below and then press "OK" for changes your username and password immediately.

	User I	Vame							С	Ж	Menu
	Passw	/ord									
Control	New l	New User Name									
	New Password										
	Confir	Confirm Password									
	1	2	3	4	5	6	7	8	9	0	
	а	b	С	d	е	f	g	h	i	j	
	k	I	m	n	0	р	q	r	S	t	
	u	V	W	X	у	Ζ			<	<u></u>	
Status	Shift							Exit)7/26 14:27	



4-4-4 Search Filter

	1 5	26		3 🕤 7 🕤) 4 / 8)	Menu
Control						
	Date and Time Upo	late]		
	Communication Setting					
	Change Password]		
¢	Search Filter			}		
	Language	English	-			
	Screen Timeout	0		Second	ł	
	Buzzer	Enable	-	Buz	zer Test	
Status				Logout	2013/07/	26 14:24

Press "Search Filter" to find out and connect the filter units. If you want to add or remove the filter, please consult your local authorized service agent for help.

4-4-5 Language

Select the language that you would like to use.

		1 🔵 5 🔵	2 🔵 6 🔵	3) 4 💋 8 🔵	Menu
Control						
	Date and Tim	e Update				
	Communication Setting					
	Change Password					
	Search Filter					
Langu	age	Eng	lish	\supset		
Screer	n Timeout	0		Second	ł	
Buzzer	r	Ena	ble	Buz	zer Test	
Status				Logout	2013/07/2	26 14:24



4-4-6 Screen Timeout

After a period of inactivity, the screen turns off to conserve power. You can set the idle time before the screen turns off.

The time setting range from 60 to 3600 seconds. This function will be disabled while set to "0".

	:	2 🔶 2 🔶	3 🔶 4 🖌 Menu 7 🔶 8 🔶 🚞
Control			
	Date and Time U		
	Communication S		
	Change Passwo		
	Search Filter		
	Language	English 🔹]
	Screen Timeout	0	Second
	Buzzer	Enable	Buzzer Test
Status			Logout 2013/07/26 14:24

4-4-7 Buzzer

To enable or disable the buzzer.

		1 🔵 5 🔵	2 🔵	3 🧲	4 /	Menu
Control						
	Date and Time Upda					
	Communication Setting					
	Change Password					
	Search Filter					
	Language	Eng	lish	-		
	Screen Timeout	0		Secon	ł	
Buzzer		Ena	ble	Buz	zer Test	
Status				Logout	2013/07/	26 14:24



5 Optional

5-1 <u>APKT2</u>

When xxxx/5A external CT is used, an optional APKT2 is requested for transfer the secondary current of CT from 5A to 1A.

The optional APKT2 includes below parts,

1	PCBA APKT2	x1
2	Screw	x4
3	Cable	x1

Please follow the procedures below to install the APKT2.

Step 1 : Remove the cover of the control boards and then install the PCBA APKT2 on the upper-left.





Step 2 : Disconnect the cables on PCBA APKI2 and then connect to APKT2 as shown below.



Step 3 : Please use the cable that comes with APKT2 to connect the PCBA APKI2 and APKT2 as shown below.





5-2 ESD-Link34 Monitoring Software

ESD-Link34 Monitoring Software is to monitor *Enersine* Active Harmonic Filter locally or remotely. Operators can use this software to monitor the operational status of *Enersine* and download the waveform, spectrum and event log data.

Main functions of the software are as follows,

- 1) Display the status and information of *Enersine*.
- 2) Download the Waveform from *Enersine*.
- 3) Download the Spectrum from *Enersine*.
- 4) Download the Event log from *Enersine*.
- 5) Dry Contact Setting
- 6) Parameter Record
- 7) Monitor up to 255 *Enersine* at the same time.

For more detail information of this software, please refer to "ESD-Link34 Monitoring Software User Manual".