AF Zoom Lens
Instruction Manual

Ver.1.9 May. 25, 2017

LMZ1236AMPDC-XFAF

LMZ0824AMPDC-XFAF

LMZ1000AMPDC-XFAF

LMZ20750AMPDC-XFAF

LMZ20550AMPDC-IRAF

LMZ11176AMPDC-IRAF

LMZ25300AMPDC-IRAF

LMZ10360AMPDC-IRAF

LMZ14500AMPDC-IRAF

LMZ16160AMPDC-IRAF

Kowa Optical Products Co., Ltd.

1. Precautions

• Warning and caution labels

This instruction manual uses the following labels. Understand the meaning of the labels before reading the instructions.

Warning	Failure to follow the instructions on this label may lead to a fatal accident or serious injury.
Caution	Improper handling of the product without following the instructions on this label may lead to personal injury or property damage.

• Understanding the pictorial indications

For safe use of this product, this manual uses pictures that represent warnings and cautions. Understand these pictorial indications before using the product.

The ▲ picture indicates that you should pay attention it.

The ⃠ picture indicates that you MUST NOT do something.
For example, the left picture means "do not disassemble."

The ● picture indicates that you MUST do something.
For example, the left picture indicates that you must remove the cable from the connector.

Warning

♦ In case any of the following irregularities occurs, stop using the product.

* Continuing to use the product causes a fire, electric shock, burn, or failure.
  - An abnormal condition is encountered such as smoke and a strange smell.
  - Water or a material has entered the product.
  - The product has been dropped or become damaged.
  - A cable is damaged (e.g., the core is exposed or broken).

In any of these cases, immediately turn off the product and disconnect the cables. Then, contact your distributor or KOWA OPTICAL PRODUCTS CO.,LTD. for repair.

♦ Do not repair, disassemble, or alter the product.

* Doing so causes a fire, electric shock, burn, or failure.

♦ When the product must be connected to a different device, follow the instructions for that device to connect the product in the correct procedure.

* Failure to do so may cause an unexpected problem.

♦ Do not place the product on an unstable surface.

* Doing so may cause the product to drop or fall causing personal injury or a product failure.

♦ Do not connect the product in any manner not specified in this instruction manual.

* Doing so may cause a fire, electric shock, burn, or failure.

♦ Ensure that the cables are seated all the way in.

* Failure to do so may cause a short circuit, fire, electric shock, burn, or failure.

♦ Do not insert a object into the product.

* Doing so may cause a fire, electric shock, burn, and failure.

♦ Do not wet the product or use or store in wet locations.

* Doing so may cause a fire, electric shock, burn, and failure.

♦ Do not handle the product with wet hands.
* Doing so may cause a fire, electric shock, burn, and failure.

♦ When thunder is heard, disconnect the cables or turn off the device connected to the product.
* Failure to do so may cause a failure or electric shock.

♦ Do not keep any containers containing a liquid or small metal objects on or near the product.
* They may enter the product for some reason, causing a fire, electric shock, burn, or failure.

♦ For this product, use a UL-complaint power supply with a nominal output of 12V DC and a maximum rated short-circuit current of 2 A or a power supply bearing an LPS (Limited Power Source) label.
* Failure to do so may cause a failure or electric shock.

⚠ Caution

♦ We will not be liable for any damage caused by loss or corruption of data saved on your computer during the use of the product. You must be responsible for backing up your data.

♦ Slowly insert or disconnect each cable into/from the corresponding connector straight and in the correct direction. Do not apply undue force or squeeze a cable into a connector.
* Doing so may cause a failure.

♦ Do not apply stress on cables or connectors.
* Doing so may cause a failure.

♦ Do not use or store the product at any of the following places.
* Doing so may cause a failure.

- Places exposed to high temperatures or high humidity beyond the specified temperature range or places with much dust
- Places near a heat source (e.g., stove and heater)
- Wet place
- Places exposed to significant temperature or humidity changes
- Places exposed to vibration and/or impact
- Places exposed to direct sunlight

♦ Do not drop the product or apply an impact to the product.
* Doing so may cause a failure.

♦ Do not place a heavy object on the product.

* Doing so may cause the product to lose its balance and drop or fall, leading to personal injury or a product failure.

♦ Do not connect or disconnect cables to/from the product without turning off the device connected with the product.

* Doing so may cause an electric shock or failure.

♦ Do not strongly hold down or strike cables or connectors or do not try to route them with undue force.

* Doing so may cause a failure or damage parts, leading to personal injury.

♦ When moving the product, ensure that the connected cables are removed.

* Moving the product with the cables connected may cause a fire, electric shock, or failure.

♦ When the product will not be used for long periods, disconnect the cables.

* Failure to do so may cause a fire or failure.

♦ When disconnecting a cable, do not pull on the cable itself but hold the connector.

* Pulling the cable alone may cause it to be damaged, leading to a fire, electric shock, or failure.

♦ Do not use the product with condensation in it.

* Doing so may cause a fire, electric shock, or failure.

♦ Do not use a mobile phone or other devices that emit radio waves near the product.

* Doing so may cause the product to malfunction.

♦ To remove stains from the product, use a dry, soft cloth to wipe the product. To use detergent to remove stains, be sure to disconnect the cables and dilute the neutral detergent with water.

* Do not use a detergent that contains benzene, thinner, alcohol, or the like. Using such a detergent may discolor or deteriorate the product.

1. Scope

This document is the instruction manual for LMZ1236AMPDC-XFAF and LMZ1000AMPDC-XFAF.

2. Overview

The lens has 2 motors for zoom and focus, 2 potentiometers for zoom and focus, and control PCB. The lens performs one time AF by analogue video signal from the camera. The iris can be controlled by DC-IRIS. The lens supports PELCO-D controlling with RS422 or RS485.

3. Contents

・AF zoom lens 1
・lens cover 1
・C-mount cover 1
・This document 1

4. Specifications

Video input	Analogue video signal NTSC/PAL
Video output	Analogue video signal NTSC/PAL
Video connector	2 BNC(in and out)
Lens mount	C-mount
Flange back	17.526mm
Power	DC+12V±10%
Power consumption	10W
Operation temperature and humidity	-10 - + 50 degrees Celsius / 20 - 80 % (without condensation) Do not turn on the power below 0 degree Celsius.
Storage temperature and humidity	-20 - + 60 degrees Celsius / 20 - 90 % (without condensation)
IRIS control	4pin DC-Iris
Control cable	14 lines loos end cable
Supported standards	CE (EN61006-3, EN50130-4) FCC part-15 class B RoHS
Product life	Zoom: 100,000 round trip Focus: 100,000 round trip or AF 50,000 times

Table 1 specifications

5. Out drawing

The out drawing of the back panel is shown in Fig.1.

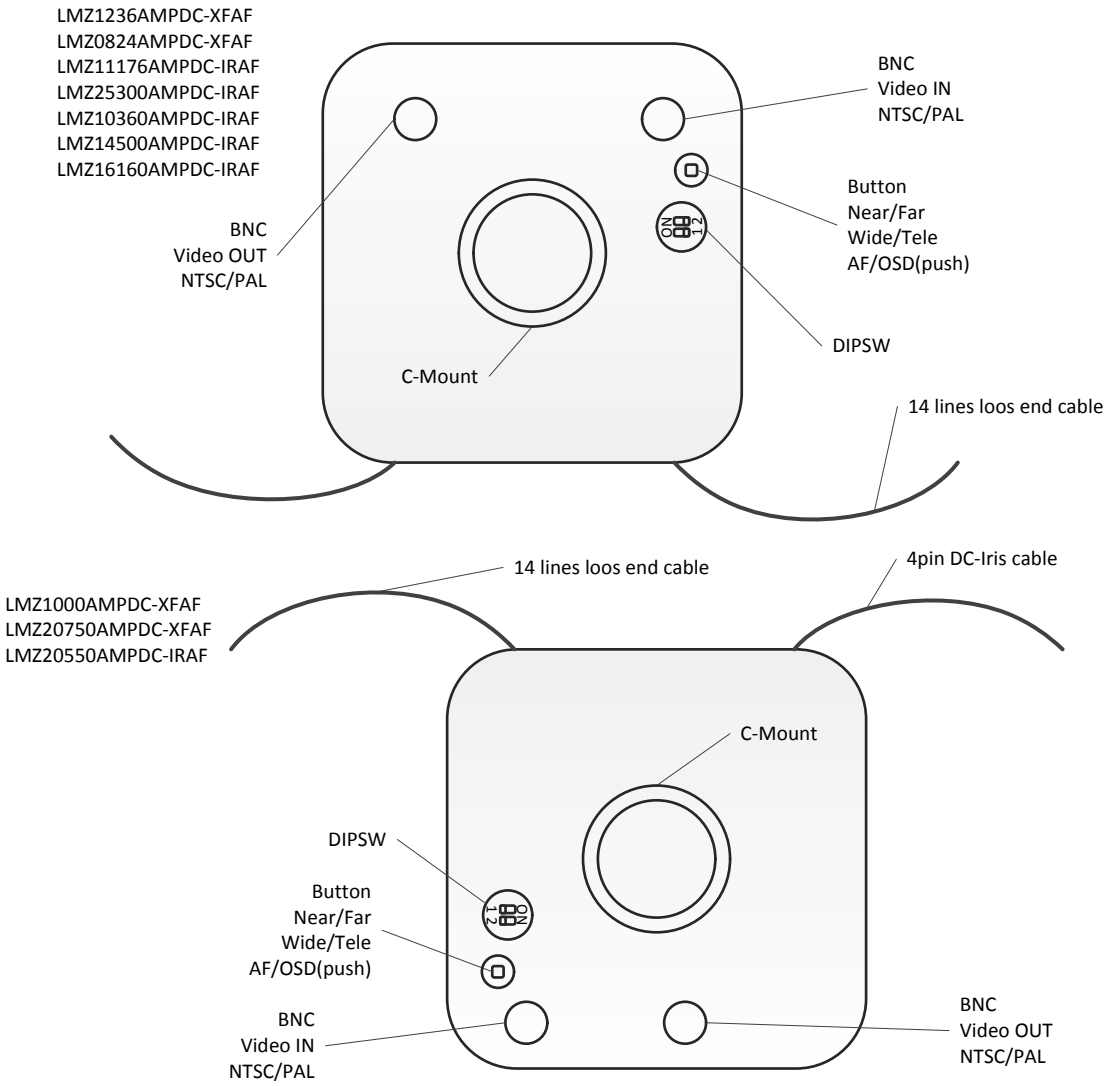

Fig.1 Back panel out drawing

The DIPSW setting is shown in Table 2.

No.		ON	OFF
DIPSW1	RS422/485 Tx terminator switch	Enable	Disable
DIPSW2	RS422 Rx terminator switch	Enable	Disable

Table 2 DIPSW setting

The DIPSW1 and DIPSW2 default settings are OFF. The termination resistors are 110 ohm.

6. Connections

The connection diagram is shown below.

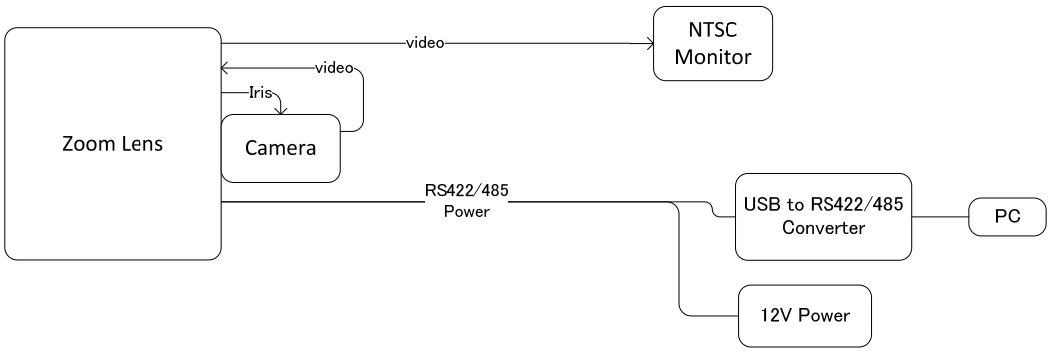

Fig.2 Connection diagram

The cable assign of the 14 lines loos end cable is shown in Table 3.

Color	Description	Note
Shield	Shield	Connect to the FG of the controller.
Blue	RS422 RXD-	
Gray	RS422 RXD+	
Yellow	ZOOM WIPER	The output of the zoom potentiometer. 0-5V (Typ.) with 470 Ohm series resistor.
Orange	RS422 TXD- / RS485B(-)	
Purple	RS422 TXD+ / RS485A(+)	
Black	POWER GND	DC+12V +/- 10% (max 1A).
Brown	POWER DC+12V	
Red	FOCUS WIPER	The output of the focus potentiometer. 0-5V (Typ.) with 470 Ohm series resistor.
Green	SIGNAL GND (WIPER GND / GND of RS422 and RS485)	This should be connected to the GND of the controller when you use RS422 or RS485.
White	NC	Do not connect.
Pink	FOCUS CONTROL+	max 12V Hi-Impedance Threshold : 3.8V (Typ.)
Light blue	FOCUS CONTROL-	
Light green	ZOOM CONTROL+	max 12V Hi-Impedance Threshold : 3.8V (Typ.)
Purple / Black	ZOOM CONTROL-	

Table 3 The cable assign of the 14 lines loos end cable

7. Control commands

The lens can be controlled by PELCO-D serial commands. The UART format is shown below.

Baud rate	2400 / 4800 / 9600(default) / 19200 / 38400
Data-bit	8 bit
Parity	None
Stop bit	1 bit

Supported commands are shown in Table 4.

Command	Description
Move Focus To Near	Moving to Near side. The motor stops by the stop command.
Move Focus To Far	Moving to Focus side. The motor stops by the stop command.
Move Zoom To Wide	Moving to Wide side. The motor stops by the stop command.
Move Zoom To Tele	Moving to Tele side. The motor stops by the stop command.
Stop	Stop the motor.
Execute AF	Executing AF one time.
Inquiry Focus position	Inquiring the focus position (0x0000～0xFFFF)
Inquiry Zoom position	Inquiring the zoom position (0x0000～0xFFFF)
Set Zoom position	Preset the zoom position (0x0000～0xFFFF)
Set Focus position	Preset the focus position (0x0000～0xFFFF)
Set Continuously Focus Speed	Set the zoom motor speed for each 4 levels
Set Continuously Zoom Speed	Set the focus motor speed for each 4 levels
Set Zoom Speed	Set the zoom motor speed(from 4 levels)
Set Focus Speed	Set the focus motor speed(from 4 levels)

Table 4 Supported commands

The command structure is shown below.

Sync Byte	Address	Command1	Command2	Data1	Data2	Checksum

The Sync Byte (synchronization byte) is always 0xFF. The address is the logical address of the receiver/driver being controlled. The check sum is a 8-bits value calculated by modulo256 of the payload data that consists of 5 bytes (from "Address" to "Data2"). After sending a command, you should basically wait for the reply from the lens.

Move Focus to Near

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**01h**	**00h**	**00h**	**00h**	00h-FFh

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Move Focus to Far

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**80h**	**00h**	**00h**	00h-FFh

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Move Zoom to Wide

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**40h**	**00h**	**00h**	00h-FFh

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Move Zoom to Tele

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**20h**	**00h**	**00h**	00h-FFh

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Stop

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**00h**	**00h**	**00h**	00h-FFh

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Execute AF

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**2Bh**	**00h**	**00h**	00h-FFh

Duaring performing this command, some commands can be queued in the queueing memory. The queueing memory is 128 bytes. You can set to on/off the queueing in the OSD menu. The auto-focusing could be interrupted to quit by Move Focus commands and Stop command.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Inquiry Focus position

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**8Bh**	**00h**	**00h**	00h-FFh

reply

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**8Dh**	**MSB**	**LSB**	00h-FFh

The position is described in Data1 and Data2 as 16bits value(0000h-FFFFh)

Inquiry Zoom position

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**55h**	**00h**	**00h**	00h-FFh

reply

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**5Dh**	**MSB**	**LSB**	00h-FFh

The position is described in Data1 and Data2 as 16bits value(0000h-FFFFh)

Set Zoom position

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**4Fh**	**MSB**	**LSB**	00h-FFh

The position is described in Data1 and Data2 as 16bits value (0000h-FFFFh). While performing this command, some commands can be queued in the queueing memory. The queueing memory is 128 bytes. You can set to on/off the queueing in the OSD menu.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Set Focus position

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**87h**	**MSB**	**LSB**	00h-FFh

The position is described in Data1 and Data2 as 16bits value (0000h-FFFFh). While performing this command, some commands can be queued in the queueing memory. The queueing memory is 128 bytes. You can set to on/off the queueing in the OSD menu.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Set Continuously Focus Speed

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**83h**	**kinds**	**speed**	00h-FFh

kinds:

00h	SLOWEST SPEED
01h	LOW MEDIUM SPEED
02h	HIGH MEDIUM SPEED
03h	HIGHEST SPEED

The speed is described in Data2 as 8 bits valus(00h-FFh)

The speed is stored in the non volatile memory in the lens.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Set Continuously Zoom Speed

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**81h**	**kinds**	**speed**	00h-FFh

kinds:

00h	SLOWEST SPEED
01h	LOW MEDIUM SPEED
02h	HIGH MEDIUM SPEED
03h	HIGHEST SPEED

The speed is described in Data2 as 8 bits valus(00h-FFh). The speed is stored in the non volatile memory in the lens.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Set Focus Speed

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**27h**	**00h**	**kinds**	00h-FFh

kinds:

00h	SLOWEST SPEED
01h	LOW MEDIUM SPEED
02h	HIGH MEDIUM SPEED
03h	HIGHEST SPEED

*The focus speed can be set to one of them.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Set Zoom Speed

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**25h**	**00h**	**kinds**	00h-FFh

kinds:

00h	SLOWEST SPEED
01h	LOW MEDIUM SPEED
02h	HIGH MEDIUM SPEED
03h	HIGHEST SPEED

*The zoom speed can be set to one of them.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Set Preset

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**03h**	**00h**	**preset_id**	00h-FFh

preset_id is described in Data2 as 8 bits valus(01h-FFh). The lens has 255 zoom and focus position memories. The lens can storage the current zoom and focus positions into the memory.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Call Preset

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**07h**	**00h**	**preset_id**	00h-FFh

preset_id is described in Data2 as 8 bits valus(01h-FFh). The zoom and focus preset positions is called from the preset memory, and the zoom and focus positions are changed as the preset positions.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

Clear Preset

Synch Byte	Address	Command1	Command2	Data1	Data2	Checksum
FFh	ID	**00h**	**05h**	**00h**	**preset_id**	00h-FFh

preset_id is described in Data2 as 8 bits valus(01h-FFh). The preset position stored in the memory is cleared.

reply

Synch Byte	Address	Data	Checksum
FFh	ID	00h	00h-FFh

8. OSD menu.

You can change the setting using the buttons on the rear panel. Hold down the button for longer than 3 seconds to display the OSD menu.

PAGE	Menu	Description	Range	Default	Note
PAGE1	MODEL	Lens model			Do not change.
	UARTDUPLEX	The duplex of UART	HALF/FULL	HALF	Needs to reboot.
	BAUDRATE	The baud rate of UART	2400/4800/9600/ 19200/38400	9600	Needs to reboot.
	MY ID	PELCO-D ID of this lens	01-FF	01	
	FSPEED0	Focus motor speed (slowest)	0-255	80	
	FSPEED1	Focus motor speed (slow)	0-255	120	
	FSPEED2	Focus motor speed (high)	0-255	200	
	FSPEED3	Focus motor speed (highest)	0-255	255	
PAGE2	ZSPEED0	Zoom motor speed (slowest)	0-255	50	
	ZSPEED1	Zoom motor speed (slow)	0-255	100	
	ZSPEED2	Zoom motor speed (high)	0-255	200	
	ZSPEED3	Zoom motor speed (highest)	0-255	255	
	AMPGAIN	Gain of the focus amplifier	Low/High	High	Do not change
	ZOOM AF	Automatic AF after zoom stopped	ON/OFF	OFF	
	ZOOMAF DELAY	The delay of ZOOM AF (msec)	0-10000	1000	
	PT AF	Automatic AF after Pan-Tilt stopped	ON/OFF	OFF	
	PTAF DELAY	The delay of PT AF (msec)	0-10000	1000	
PAGE3	PT ID	The ID of the Pan-Tilt	01-FF	02	
	AFAREASIZE	AF area size	S/M/L	M	
	AFAREAFRAME	AF area display	OFF/RECT/FILL	OFF	
	MOTOR EXT	External motor control	ON/OFF	OFF	
	MOTOR PRI	The priority of motor control	EXT/INT	INT	
	MOTOR FILTER	The filter frequency of external direct motor control	None/100ns/ 1u/10u	10us	Needs to reboot.
	ZOOM POS INV	Inverse of the zoom potentiometer value direction	ON/OFF	OFF	Needs to reboot.
	FOCUS POS INV	Inverse of the focus potentiometer value direction	ON/OFF	OFF	Needs to reboot.
	AF SEARCH	The range of AF searching	FULL/HALF	FULL	Do not change
PAGE4	RS422T PHASE	The phase of RS422 Tx signal	NORMAL/ INVERSE	NORMAL	Needs to reboot.
	RS422R PHASE	The phase of RS422 Rx signal	NORMAL/ INVERSE	NORMAL	Needs to reboot.
	AFDEMO	Test function	ON/OFF	OFF	Do not change
	H FREQ	The frequency of horizontal	-	-	

		synchronization signal			
	V FREQ	The frequency of vertical synchronization signal	-	-	
	FW VERSION	The Firmware version	-	-	
	FPGA VERSION	The FPGA version	-	-	
PAGE5	DEBUG	Test function	ON/OFF	OFF	Do not change
	AF TIMEOUT	AF Timeout	10-120	30	
	CMD QING AF	Command queueing while AF performing	ON/OFF	ON	
	CMD QING PRESET	Command queueing while preset command performing	ON/OFF	ON	
	PWM FREQ	The frequency of PWM signal for the motor in kHz	1-100	1	
	ZOOM LS POS	The position of the software limit switch for Move Zoom Command	1-1000	50	
	RESET SETTING	Resetting all setting to the default	OFF/RESET	OFF	Do not change *After reset all setting, MODEL should be configured as collect lens modelname.

Table 5 OSD menu

9. Polarity and Direction

model	Inquiry Zoom position (Default)	Inquiry Focus position (Default)	FOCUS CONTROL+/-	ZOOM CONTROL+/-	FOCUS WIPER	ZOOM WIPER
LMZ1236AMPDC-XFAF LMZ0824AMPDC-XFAF	Tele:0x0000 Wide:0xFFFF	Near:0x0000 Far:0xFFFF	Far: Apply +12V to " CONTROL+" Near: Apply +12V to "CONTROL-"	Tele: Apply +12V to "CONTROL+" Wide: Apply +12V to "CONTROL-"	Far: High(+5V) Near: Low(0V)	Tele: High(+5V) Wide: Low(0V)
LMZ1000AMPDC-XFAF	Tele:0x0000 Wide:0xFFFF	Near:0x0000 Far:0xFFFF	Far: Apply +12V to " CONTROL-" Near: Apply +12V to "CONTROL+"	Tele: Apply +12V to "CONTROL+" Wide: Apply +12V to "CONTROL-"	Far: Low(0V) Near: High(+5V)	Tele: Low(0V) Wide: High(+5V)
LMZ20750AMPDC-XFAF LMZ20550AMPDC-IRAF	Tele:0x0000 Wide:0xFFFF	Near:0x0000 Far:0xFFFF	Far: Apply +12V to " CONTROL+" Near: Apply +12V to "CONTROL-"	Tele: Apply +12V to "CONTROL+" Wide: Apply +12V to "CONTROL-"	Far: High(+5V) Near: Low(0V)	Tele: Low(0V) Wide: High(+5V)
LMZ11176AMPDC-IRAF LMZ10360AMPDC-IRAF LMZ14500AMPDC-IRAF LMZ25300AMPDC-IRAF LMZ16160AMPDC-IRAF	Tele:0x0000 Wide:0xFFFF	Near:0x0000 Far:0xFFFF	Far: Apply +12V to " CONTROL+" Near: Apply +12V to "CONTROL-"	Tele: Apply +12V to "CONTROL+" Wide: Apply +12V to "CONTROL-"	Far: Low(0V) Near: High(+5V)	Tele: High(+5V) Wide: Low(0V)
LMZ375AMPDC-XF with external AF PCB	Tele:0x0000 Wide:0xFFFF	Near:0x0000 Far:0xFFFF	Far: Apply +12V to " CONTROL-" Near: Apply +12V to "CONTROL+"	Tele: Apply +12V to "CONTROL+" Wide: Apply +12V to "CONTROL-"	Far: High(+5V) Near: Low(0V)	Tele: High(+5V) Wide: Low(0V)

10. Disclaimer

- KOWA OPTICAL PRODUCTS CO., LTD. shall not be liable for any failure, physical damage, or loss caused by a fire, an earthquake, flood damage, lightening, a conduct of a third party, any other accident, your intentional or unintentional improper handling and/or use of the product, or any other abnormal use condition (even if it is ascribable to a third party).
- KOWA OPTICAL PRODUCTS CO., LTD. shall not be liable for any loss (including a loss of operating profits, a loss due to business interruption, and changes to a loss of stored data) caused by the use of the product or inability to use the product.
- KOWA OPTICAL PRODUCTS CO., LTD. shall not be liable for any loss caused by failure to follow any instruction in this instruction manual.
- KOWA OPTICAL PRODUCTS CO., LTD. shall not be liable for any loss caused by a malfunction ascribable to any device connected with the product.
- The warranty period for the product shall be one year from the delivery date.
- Do not disassemble or alter the product. Doing so voids the warranty even if one year has not passed since the delivery date.
- KOWA OPTICAL PRODUCTS CO., LTD. shall not be liable for any failure or physical damage caused by the maintenance or repair not performed by KOWA OPTICAL PRODUCTS CO., LTD. or the distributer from which you purchased the product.
- Even after the warranty period, KOWA OPTICAL PRODUCTS CO., LTD. will repair the product at cost upon your request if the repair enables the product to maintain its intended functions.
- KOWA OPTICAL PRODUCTS CO., LTD. shall not warrant the product against any problem caused by a factor not mentioned in this instruction manual and therefore shall not be liable for it.

11. Federal Communications Commission

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.