INOVANCE

GL10-4PM Local Pulse

Positioning Module User Guide

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This user guide provides information on the GL10-4PM local pulse positioning module developed and manufactured independently by Inovance.

It is a 4-channel positioning output module used together with the H3U series PLC main module. It supports 4-channel pulse output, with the highest output frequency of 200 kHz. Each channel contains 4 digital inputs, which can be used for positive and negative limit, home switch, and normal signal input.

This guide describes the specifications, characteristics and using methods of the product. Read this guide carefully before use to ensure safe operation. For how to use the user program development environment and how to design user programs, see the H3U Series PLC Instructions and Programming Guide (AM600 series main modules do not support this product).

Safety Instructions

Safety precautions are categorized into two levels: "Warning" and "Caution." Operate in strict compliance with safety standards.

WARNING: indicates that failure to comply may cause death or serious injury;

CAUTION: indicates that failure to comply with the notice will result in minor or moderate personal injury or equipment damage.

In some cases, even failure to follow "Cautions" may also lead to serious consequences. Make sure to follow both warnings and cautions, otherwise, it may cause death or serious injury, as well as product and relevant equipment and system damage.

Keep this guide properly for future use and deliver this guide to the end user.

Control System Design

WARNING

- Provide a safety circuit outside the controller so that the control system can still work safely once external power failure or controller fault occurs.
- Add a fuse or circuit breaker because the module may smoke or catch fire due to long-time overcurrent caused by operation above rated current or load short-circuit.

CAUTION

- An emergency stop circuit, a protection circuit, a forward/reverse operation interlocked circuit, and an upper position limit and lower position limit interlocked circuit must be set in the external circuits of controller to prevent damage to the machine.
- To ensure safe operation, for the output signals that may cause critical accidents, please design external protection circuit and safety mechanism.
- Once PLC CPU detects abnormality in the system , all outputs may be closed; however, when a fault occurs in the controller circuit, the output may not be under control. Therefore, it is necessary to design an appropriate external control circuit to ensure normal operation.
- If the PLC output units such as relays or transistors are damaged, the output may fail to switch between ON and OFF states according to the commands.
- The PLC is designed to be used in an indoor electrical environment (overvoltage category II). The power supply must have a system-level surge protector, assuring that overvoltage due to lightning shock can't be applied to the PLC's power supply input terminals, signal input terminals and output terminals, to prevent damage to the equipment.

Installation

WARNING

- Installation must be carried out by qualified professionals.
- Disconnect all external power supplies of the system before disassembling the module. Failure to do so may result in electric shock, module fault or malfunction.
- Do not use the controller in environments with dust, greasy smoke, conductive dust, corrosive or combustible gases, exposed to high temperature, condensation, wind & rain, or subject to vibration and impact. Electric shock, fire and malfunction may also result in damage or deterioration to the product.
- The controller is open-type equipment that must be installed in a control cabinet with lock (IP rating of the control cabinet enclosure > IP20). Only qualified professionals can open the cabinet.

CAUTION

- Prevent metal filings and wire ends from dropping into ventilation holes of the PLC during installation. Failure to comply may result in fire, fault and malfunction.
- Ensure the ventilation surfaces remain free of obstructions after installation. Blockage may cause overheating, fire hazards, malfunctions, or operational errors.
- Ensure the module is connected to the respective connector securely and hook the module firmly. Incorrect installation may cause malfunctions, faults, or detachment.

During Wiring

WARNING

- Wiring must be carried out by qualified professionals.
- Disconnect all external power supplies of the system before wiring. Failure to comply may result in electric shock, module fault or malfunction.
- Install the terminal cover attached to the product before power-on or operation after wiring is done. Failure to comply may result in electric shock.
- Insulate the cable terminals properly to ensure the insulation distance between cables will not be shortened after cables are connected to the terminal block. Failure to comply may result in electric shock or damage to the equipment.

CAUTION

- Do not drop metal filings or wire ends into ventilation holes of the controller during wiring. Failure to comply may result in fire, fault and malfunction.
- The external wiring specifications and installation method must comply with local regulations. For details, see the wiring section in this guide.
- To ensure safety of equipment and operator, use cables with sufficient cross sectional area and connect the cables to ground reliably.
- Wire the module correctly after making clear of the connector type. Failure to comply may result in module and external equipment fault.
- Tighten bolts on the terminal block in the specified torque range. If the terminal bolt is connected improperly, short circuit, fire or malfunction may occur. Tighten the bolts with improper tightening torque may damage the bolts and modules, leading to fall-off, short circuit, fire, or malfunction.
- If a connector is used to connect to the external equipment, perform press-fitting, crimping, or welding with the tools specified by manufacturer. Improper connection may result in short-circuit, fire or malfunction.
- The module is attached with a label on the top to prevent unwanted matters from falling into the module during wiring. Do not remove the label during wiring. Remove this label before system operation to facilitate ventilation.
- Route control cables, communication cables, main circuit cables and power cables through different routes with a clearance of at least 100 mm among different types of cables. Failure to comply may result in malfunction caused by noise.
- Use shielded cables for high-frequency signal inputs or input cables in applications with significant interference.

Operation and Maintenance

WARNING

- Operation and maintenance must be carried out by qualified professionals.
- Do not touch the terminals with power on. Failure to comply may result in electric shock or malfunction.
- Disconnect all external power supplies of the system before cleaning the module or re-tightening screws on the terminal block or screws of the connector. Failure to comply may result in electric shock.
- Disconnect all external power supplies of the system before disassembling the module or connecting/disconnecting the communication cables. Failure to comply may result in electric shock or malfunction.

CAUTION

- Read through the user guide before operation, including online modification, forced output, RUN, and STOP operations.
- Disconnect the power supply before installing/removing the extension card.

Disposal

CAUTION

- Dispose retired batteries as industrial waste, following region-specific disposal regulations.

Product Information

■ Model and nameplate

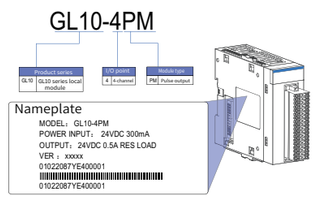


Figure 1 Description of model and nameplate

Model	Type	Description	Applicable model
GL10-4PM	Local pulse output positioning module	4-channel pulse positioning output (requires firmware v24310+).	(Only by the supported H3U series)

■ External interface

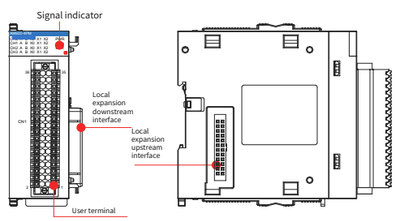


Figure 2 Module interface

Interface name	Definition			
Signal indicator	PWR	Power indicator	Green	ON when power supply is switched on.
	RUN	Running state indicator	Green	ON when the module is in normal operation.
	ERR	Error indicator	Red	ON when error occurs.
I/O signal indicator	For input and output signals ON: signal active OFF: signal inactive			
Local expansion module downstream interface	Connect downstream module, not supporting hot plugging.			
Local expansion module upstream interface	Connects front-end module, not supporting hot plugging.			
User terminal	4-channel pulse output terminal, see "Electrical Design Reference".s			

■ Output specifications

Item	Specification
Output channel	4 (high-speed)
Output type	Transistor, SINK output
Power supply voltage	24 VDC (-15% to +20%)
Output Voltage Class	12 V to 24 V (-5% to +20%)
ON response time	1 us (hardware response time)
OFF response time	1 us (hardware response time)
Output frequency	200 kHz (external equivalent load of 20 mA or more is required when output is above 50 kHz)
Maximum load current	0.5 A/point
Isolation mode	Optocoupler isolation

■ Input specifications

Item	Specification
Input channel	16
Input type	Supports SINK and SOURCE input.
Input voltage	24 VDC (-15% to +20%)
ON current	Higher than 3.5 mA
OFF current	Below 1.5 mA
Input impedance	3.3 KΩ
Isolation mode	Optocoupler isolation

Mechanical Design Reference

■ Installation dimensions

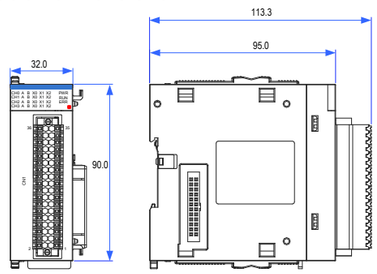


Figure 3 Installation dimensions (mm)

Electrical Design Reference

■ Cable selection

Material name	Model	Applicable cross sectional area of the cable		Manufacturer	Crimping pliers
		Chinese standard/ MM	AWG		
Tubular lug	GTVE07512	0.75	21	Suzhou Yuanli	YAC-5

■ Cable preparation

- Strip 11–14 mm of insulation from the cable to expose the conductor, then thread the cable through the cable sleeve.
- Insert the exposed end into the hole of the cable lug, and then crimp it with recommended crimping tool.

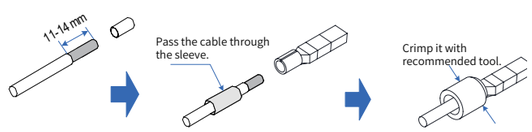


Figure 4 Cable preparation

■ Terminal arrangement

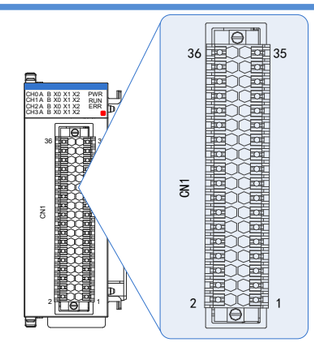
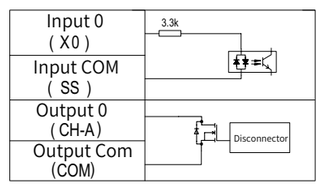


Figure 5 Terminal definition of the module

■ External wiring

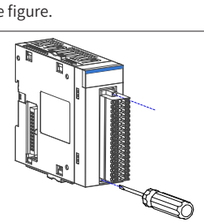
External wiring	Signal name Column B	Terminal number		Signal name Column A	External wiring
	CH1 positive limit (CH1-X0)	36	35	CH0 positive limit (CH0-X0)	
	CH1 negative limit (CH1-X1)	34	33	CH0 negative limit (CH0-X1)	
	CH1 home switch (CH1-X2)	32	31	CH0 home switch (CH0-X2)	
24 VDC	CH1 normal input (CH1-X3)	30	29	CH1 normal input (CH0-X3)	
	CH1 input COM (SS0)	28	27	CH0 input COM (SS0)	24 VDC
	CH3 positive limit (CH3-X0)	26	25	CH 2 positive limit (CH2-X0)	
	CH3 negative limit (CH3-X1)	24	23	CH2 negative limit (CH2-X1)	
	CH3 home switch (CH3-X2)	22	21	CH2 home switch (CH2-X2)	
24 VDC	CH3 normal input (CH3-X3)	20	19	CH2 normal input (CH2-X3)	
	CH3 input COM (SS1)	18	17	CH2 input COM (SS1)	24 VDC
	(Vacant)	16	15	(Vacant)	
Load	CH1 Output A (CH1-A)	14	13	CH0 Output A (CH0-A)	Load
Load	CH1 Output B (CH1-B)	12	11	CH0 ouput B (CH0-B)	Load
Load	CH3 Output A (CH3-A)	10	9	CH2 outputA (CH2-A)	Load
Load	CH3 Output B (CH3-B)	8	7	CH2 output B (CH2-B)	Load
24VDC	Output COM (COM)	6	5	Output COM (COM)	24VDC
	24 V power+ (24V)	4	3	24 Vpower− (GND)	
	24 Vpower+ (24V)	2	1	24 Vpower- (GND)	

■ Internal equivalent circuit



■ Wiring precautions

After the I/O terminal block is mounted to CN1, fix it with a torque of 0.2–0.25 Nm, as shown in the figure.

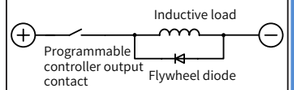


Do not bundle the terminal connection cables together with power cables (high voltage/high current) which produce strong interference signals. Separate it from other cables and avoid cabling in parallel.

Use recommended cables and adapter boards. It is recommended to use shielded cables as terminal cables to increase anti-interference ability.

■ Contact protection in the case of inductive load

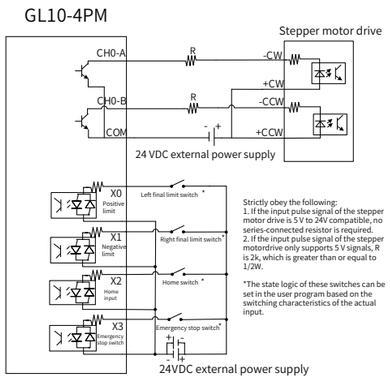
When the inductive load is applied, large back EMF will be produced between contacts and arc discharge is also caused when the inductive load stops. This may result in contact failure or contact sag, shortening the contact lifetime. Therefore, you can use a parallel flywheel diode with the load to extend the lifetime of the product. The freewheel diode must satisfy: ① reverse voltage is 5 to 10 times of load voltage; ② forward current is larger than load current.



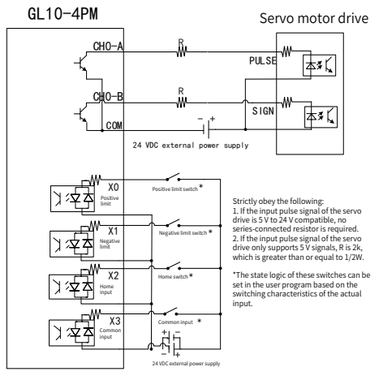
■ Wiring

This module supports CW/CCW and pulse+direction pulse output, and the wiring is as follows.

· Pulse output mode 1: CW/CCW



· Pulse output mode 2: pulse+direction



NOTE

During wiring, follow the specifications of the corresponding servo drive or stepper motor drive.

Programming Reference

■ Supported H3U instructions

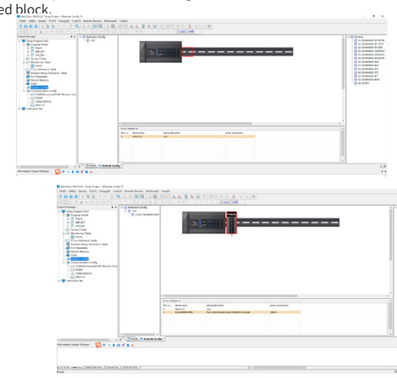
Instruction	Description					
PMDRVA	S1	S2	S3	S4	D1	D2
Absolute positioning	Module bit No. (1–8)	Channel No. (0–3)	Position (absolute position)	Speed	Positioning completed	Error Code
PMDRVI	S1	S2	S3	S4	D1	D2
Relative positioning	Module bit No. (1–8)	Channel No. (0–3)	Position (relative position)	Speed	Positioning completed	Error Code
PMPLSV2	S1	S2	S3	D1	D2	
Speed mode motion	Module bit No. (1–8)	Channel No. (0–3)	Speed	Speed reached	Error Code	
PMHOME	S1	S2	S3	D1	D2	
Homing	Module bit No. (1–8)	Channel No. (0–3)	Position (the target position of homing)	Homing completed	Error Code	
PMSETPOS	S1	S2	S3	D1	D2	
Set current position	Module bit No. (1–8)	Channel No. (0–3)	Position (target position set value)	Homing completed	Error Code	
PMESTOP	S1	S2	D1	D2		
Stop output immediately	Module bit No. (1–8)	Channel No. (0–3)	Completed	Error Code		

Instruction	Description					
PMWRPARA	S1	S2	S3	S4	D1	D2
Write special function parameters	Module bit No. (1–8)	Channel No. (0–3)	Parameter address	Parameter data	Completed	Error code

■ Programming example

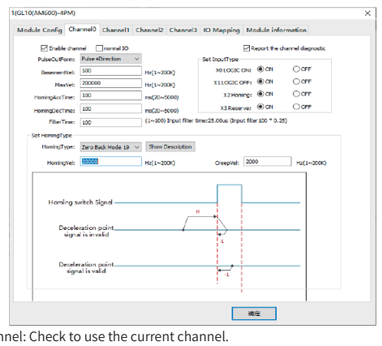
In the following example, this module is used with the H3U series main module to realize the following function: the relative positioning instruction is called to send 10000 pulses in the mode of pulse+direction through channel CH0with a frequency of 10 KHz. The acceleration time is 100 ms and the deceleration time is 100 ms. After the position is reached through trapezoidal deceleration, the enabling signal is disconnected, and the next relative positioning instruction is enabled. -20000 pulses in the mode of pulse+direction is sent through channel CH0 with a frequency of 10 KHz, in which case the acceleration time is 100 ms and the decelerating time is 100 ms. After this instruction is completed through trapezoidal deceleration, channel CH0 stops outputting.

1. Start AutoShop, select Module Configuration, and then select the GL10-4PM module and drag it to the red block.



2. Double-click the GL10-4PM module in the figure to configure it.

Select the channel to be used. As shown in the figure below, the configuration window provides detailed settings including the pulse output mode, input signal positive and negative logic, and speed parameters for each output channel.



· Enable channel: Check to use the current channel.

· GL10-4PM

· Pulse output mode: Two modes are available: CW/CCW and pulse+direction.

· Base speed: limits the minimum speed of the pulse module.

· Maximum speed: limits the maximum pulse output frequency of the current module.

· Acceleration time: the pre-set time for the base speed to reach the target speed, in ms.

· Deceleration time: the pre-set time for the target speed to decelerate to the base speed, in ms.

· Homing:

4 homing modes are available. The user can input positive limit, negative limit, homing and other signals according to the actual mechanical structure to achieve expected homing. As shown in the figure above, when you select "mode 19", there are two types of homing actions depending on the current position.

· Homing speed: the set value of high-speed homing speed.

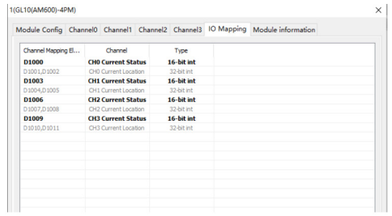
· Approaching speed: the set speed to approach the target position.

· Input filtering: reduces interference with signals such as positive limit, negative limit, and homing.

· Input signal logic:

Configure according to the contactor type of the input terminal. The NO contact is defined as positive logic and the NC contact is defined as negative logic. Note: The default contact type is normally open (positive logic).

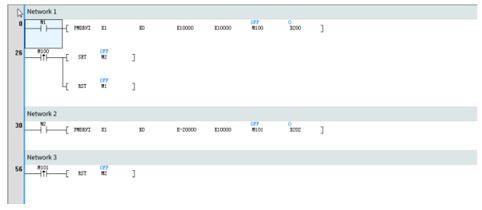
3. After configuring the channel parameters according to the actual application scenario, select I/O mapping to map the D component and R component to the corresponding channel position and state.



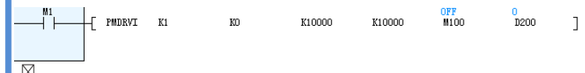
The data of each channel position is a 32-bit signed integer, and the channel state is 16-bit (as shown in the figure above, D1000 is mapped to the current state of CH0, D1003 to CH1, and so on). The meaning of each bit is as shown in the following table [data format: BOOL-(1bit)].

Bit	Buff Definition	Bit	Buff Definition
Bit 0	Pulse output completion flag. The pulse has been output	Bit 9	Reserved input
Bit 1	Pulse output ongoing flag. The pulse is being output	Bit 10	Homing completed
Bit 2	Accelerating	Bit 11	Reserved
Bit 3	Uniform speed	Bit12	Error code, for details, see "Error Codes and Solutions" below.
Bit4	Decelerating	Bit13	
Bit 5	Pulse output direction	Bit14	
Bit 6	Positive limit signal input		
Bit 7	Negative limit signal input	Bit15	
Bit 8	Home switch signal input		

4. PLC programming

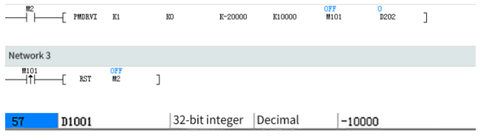


☒ PMDRVI relative positioning, module No.: 1, channel: CH0, pulses: 10000, target speed: 10000 Hz, error flag: D200, positioning completion flag: M100.



☒ Enable M1. After 10000 pulses are output, M100 turns ON, which means the instruction is executed. The position of CH0 is 10000. At this time, M1 will be reset and M2 will be set, which enables the next relative positioning instruction, with the number of pulses being -20000, the target speed being 10000 Hz, the error flag being D202, and the positioning completion flag being M101. After the instruction is completed, the enabling signal is disconnected, CH0 stops outputting, and the position of CH0 is -10000.

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Error Codes and Solutions

By checking Bit12–Bit15 of the channel mapping component (for the mapping component set by the user in the module configuration, see step 3 of Programming Examples above), you can determine the module error type; you can also check the error code information of the PLC program through the software tool to determine the host error type or module error type.

No.	Error code	Description
Module reported errors	1	The module cannot run because the 24 V power supply is off; check if the 24 V power supply is normal
	2	Reserved
	3	Reserved
	4	Reserved
	5	Positive limit error; pulse output stops and forward pulse positioning cannot continue because the positive limit is unexpectedly reached
	6	Negative limit error; pulse output stops and backward pulse positioning cannot continue because the negative limit is unexpectedly reached
	7	Channel output conflict; a new output instruction is received while pulse positioning output is in progress
	8	Reserved
	9	Reserved
	10	Position out of range; the received position parameter exceeds the minimum or maximum allowable range
	11	Speed out of range; the received speed parameter exceeds the minimum or maximum allowable range
	12	Reserved
	13	Reserved
	14	Reserved
	15	Reserved
Host reported errors	1000	Positioning module instruction error: module bit number error, module channel error, module type is not a positioning module
	1001	Positioning module instruction error: position parameter error, the position parameter of the instruction exceeds the minimum or maximum allowable range
	1002	Positioning module instruction error: speed parameter error, the speed parameter of the instruction exceeds the minimum or maximum allowable range
	1003	Positioning module instruction error: channel output conflict; a new channel output positioning instruction is triggered while the channel is in pulse output positioning
	1004	Positioning module instruction error: I/O mapping soft element is not set in the current channel
	1005 to 1099	Reserved
	1100	Positioning module instruction error: unsupported output mode or output instruction
	1101 to 1199	Reserved

INOVANCE Warranty Agreement

Inovance provides an 18-month free warranty (subject to information indicated by the barcode on the product or the contract terms) to the equipment itself from the date of manufacturing for the failure or damage under normal use conditions.

Within the warranty period, maintenance will be charged for the damages caused by the following reasons.

1) Damage caused by improper use and unauthorized disassembly, repair, or retrofit;
2) Damage caused by fire, flood, abnormal voltage, other disasters, and secondary disasters;
3) Hardware damage caused by equipment fall-off or that caused during transportation;
4) Damage caused by operations not following the user guide;
5) Faults and damages caused by external factors, such as peripheral devices;

If there is any failure or damage to the product, properly fill out the Product Warranty Card.

The maintenance fee is charged based on the latest Maintenance Price List of Inovance.

The Product Warranty Card is not re-issued. Keep the card and present it to the maintenance personnel during maintenance.

If there is any problem during the service, contact Inovance or Inovance agents.

Customers purchasing the product are assumed to agree on terms and conditions of drawn this warranty agreement. This agreement shall be interpreted by Inovance.

INOVANCE Product Warranty Card

Customer information	Company address:	
	Company name:	Contact:
	P.C.:	Tel.:
Product Information	Product model:	
	Product barcode (attached here):	
	Product distributor name:	
Fault information	(Service date and description): Serviced by:	

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