PHu Application Note

REQUIREMENTS

A PHu module is required, with programming cable, and PC with programming Software. Other than these items a load device is required, and Power Supply able to supply voltage and current appropriate to the application, and within the limitations of the PHu module being used.

SOFTWARE INSTALLATION

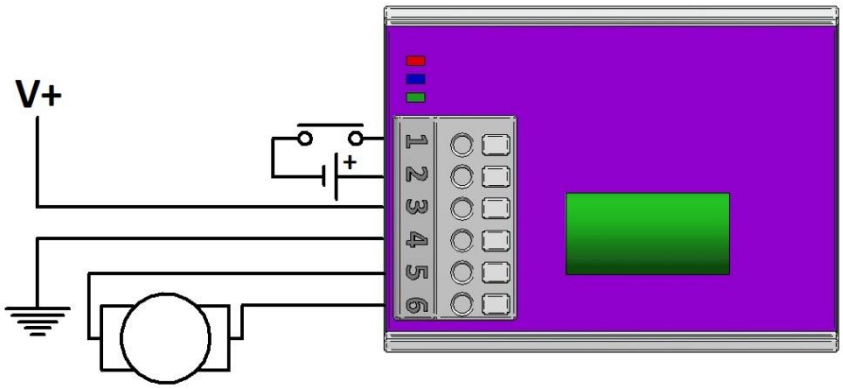
The folder containing software should be copied to the PC being used for programming. It is recommended that the complete folder is copied as it is important that all the programmes are in the same folder on your PC.

The Setup programme "CDM20828_Setup.exe" should be run to install the drivers required to programme the PHu module.

Double clicking the 'Programmer' icon will start the programming software.

PHu CONNECTION

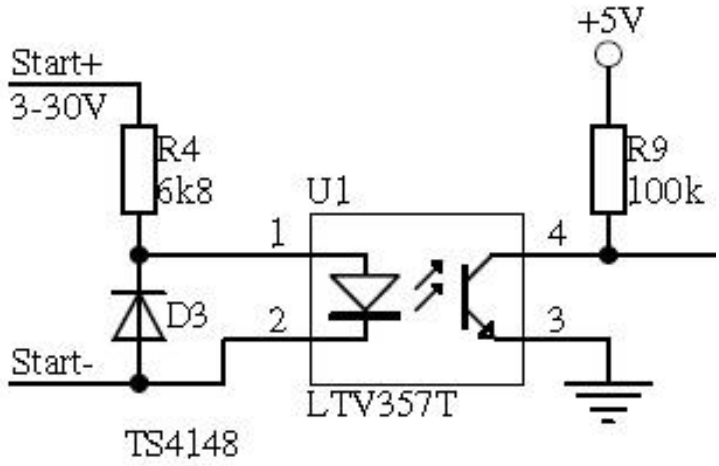
The PHu module has six connections on a WAGO terminal block, to connect to these simply push down the white button on top of the terminal block as stripped lead is inserted in the corresponding hole.



The load is connected between terminals 5 & 6.

The positive supply is connected to terminal 3, and ground to terminal 4. ***DO NOT apply voltage greater than 27v DC as this will damage the module.***

Terminals 1 (Positive) and 2 (Negative) are opto-isolated inputs. The input circuit is as shown below, Applying 5v-28v to this will switch the circuit ‘ON’. Higher control voltage may be used if appropriate resistance is inserted to limit current (see LTV357T data for details).

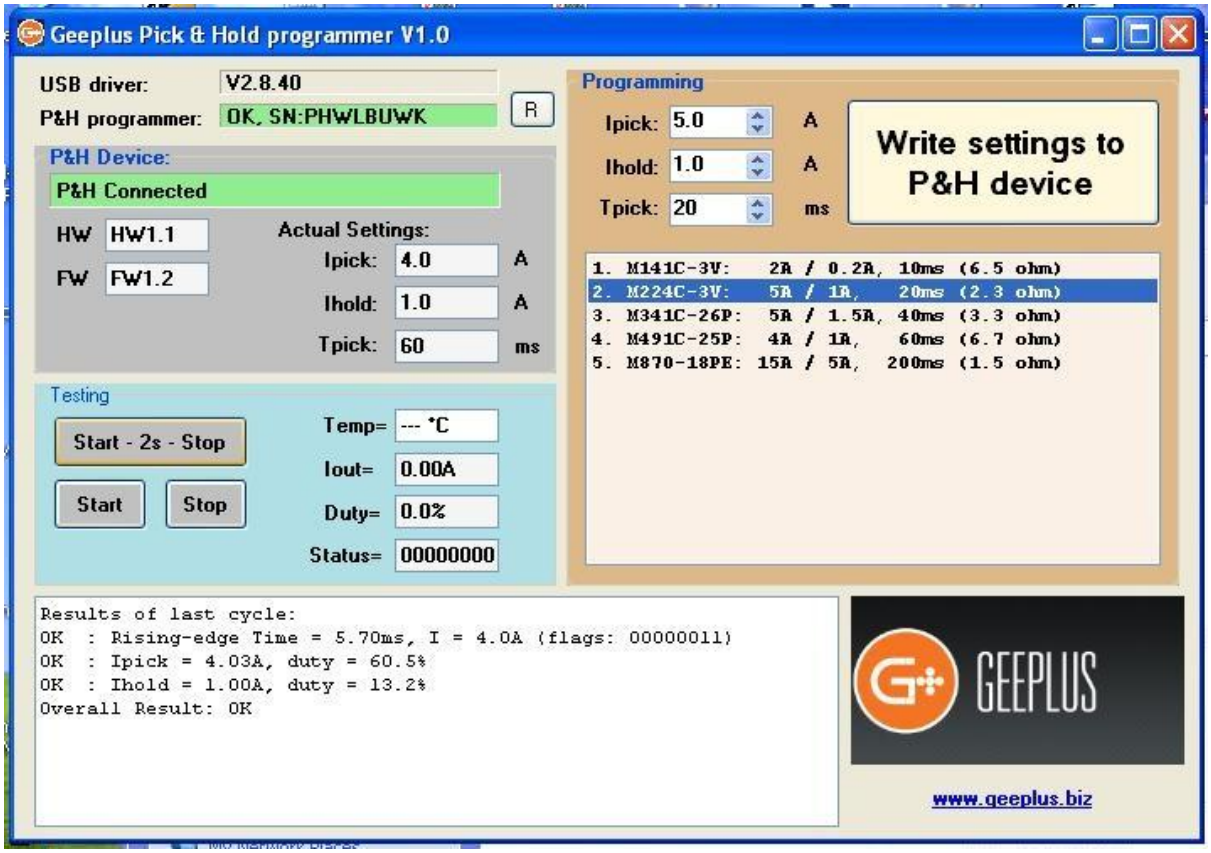


For setup & testing while the module is connected to a PC it is possible to switch the solenoid on (‘START’) and off (‘STOP’) from the PC without using the control input.

In addition to ‘START’ and ‘STOP’ control buttons, the software also has a timed BUTTON ‘START – 2s – STOP’ which energises the test device for 2 seconds only. This function is recommended for initial testing of force as the timed pulse limits the amount of energy delivered, and so limits the self-heating and reduces the possibility of overheating and damaging the solenoid’. Once it has been established that sufficient force can be developed, the thermal behaviour of the system should be considered to ensure the chosen device will not overheat.

PROGRAMMING

The programming cable plugs into a Molex connector above the WAGO terminal block, this connector is polarised and connection should be self-evident. With a load and power supply connected and turned on, the programming software is run. The programme should recognise if a PHu module is connected and powered, if this is not recognised click on the button labelled ‘R’ to reconnect. You should see a screen as below.



As it opens up, the programmer defaults to the smallest values for safety, you can pick a device of appropriate size as a starting point, press the button ‘Write Settings to P&H Device’ to store these settings in the module.

You can edit the ‘Pick’ and ‘Hold’ current settings and ‘Pick Time’ as desired before writing settings to the module.

For setting up current values, you can use the grey buttons to switch the load device ‘On’ and ‘Off’ without using the control input connections.

MONITORING

While the solenoid is energised ('ON' condition), the programme interface monitors the operating conditions.

Temp – this is the internal junction temperature of the switching device, this should not exceed 120 degC when the module is being used in worst-case conditions. If the junction gets much hotter than this internal protection will shut the device down

IOut – the output current

Duty – The duty cycle of PWM waveform

After de-energising the solenoid ('STOP' condition), the operating current and duty cycle for both pick and hold conditions of the last 'ON' cycle are summarised in the white text box.

If the programmed current is too high, then the current will not be able to reach this value as it will be limited by supply voltage and / or coil resistance of the load. Either a lower resistance device, or higher supply voltage may be required. It should be noted that although a device may work OK in the cold condition, as it heats up the coil resistance will rise. In the cold condition, the duty cycle should typically be 70% or less to allow for this.

STATUS INDICATORS

Three LED's provide status indication.

The **BLUE** LED illuminates during 'PICK' operation

The **GREEN** LED illuminates during 'HOLD' operation

The **RED** LED indicates an 'ERROR' conditions.

SELECTION OF SOLENOID FOR PICK & HOLD

This is a general guide as requirements of an application may dictate other constraints on Pick and Hold current levels.

As a very rough guide, a solenoid should be selected which is operating at about 5-10% duty cycle at the system voltage. If the solenoid coil is specified by voltage (at 100% ED), then the coil voltage chosen should correspond to V_{supply} / √10, if the solenoid coil parameters are presented in a table then pick a coil which provides operation at 10% ED at the rated supply voltage.

Ideally, the solenoid should be mounted in the end application, and set up with worst-case operating conditions (maximum ambient temperature, minimum supply voltage).

With the circuit connected to a PC, the 'Pick' and 'Hold' currents and 'Pick Time' duration can be adjusted to determine conditions which satisfy the force, speed, and power requirements of the application.

For applications where high force is required to overcome a large load, the pick time may need to be sufficiently long for the solenoid to pull in to the energised position and settle before current is reduced to the holding level.

For applications requiring high speed, it may be preferable to drive with maximum possible power for a very short 'pick' time, as the initial acceleration has greatest influence on the overall response time.

When the device is switched off, the text box in programming software will display the current and duty cycle for both pick and hold operation. Ideally the duty cycle should be within the range of 10-90%, the module can operate outside this range but this leaves some leeway for variation in supply or temperature conditions.

While the solenoid is 'on' the junction temperature of the switching device is displayed, this should not exceed 130°C max under worst case conditions.

There are four typical application areas where pick and hold circuits offer benefits.

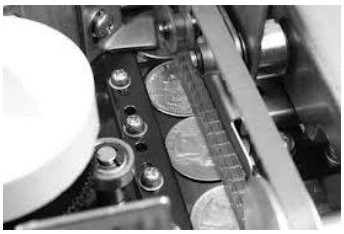
Distributed Systems

Locking systems for railway carriage doors would be a good example of a distributed system, the actuators are distributed through the length of a train, with large voltage

fluctuations possible and big variation in ambient temperature conditions. The Pick and Hold circuit stabilises performance due to these fluctuations, and reduces power consumption and heat dissipation. Other examples could be mail sorting, fruit sorting, or car stacking parking systems.

Fast Actuation

Cash sorting equipment requires very fast actuation and frequent cycling. A high current is applied to achieve high force and rapid acceleration and current is then reduced to avoid excessive heat dissipation.



Reduce Heat Dissipation

Pinch valves are used to control flow of blood in dialysis equipment, or chemical reagents. High force is needed to clamp shut the tubing in these devices. Because blood products and chemicals are very sensitive to heat, pick and hold drive helps maximise the force obtainable with minimal heat generation.

Development Tool

The extreme ease of use of Geeplus PHu module makes it invaluable as a development tool, it allows device excitation conditions to be easily adjusted without hardware changes to establish suitability of a solenoid, and determine optimum driving conditions.