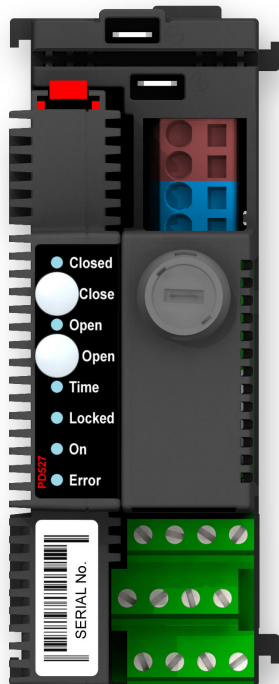


PD 527 Valve Control Module

PD Series 600



Introduction



The PD 527 Valve Control Module is specially designed to control the various types of Damcos valve actuators in the marine environment either by solenoid valve(s) or via an LPU (Local Power Unit).

The PD 527 Valve Control Module is part of the 600 series (M36) controllers and IO modules. The PD 527 Valve Control Module consists of two units. The one being an electronic module including CPU, push buttons for local control, indication LEDs (Light Emitted Diodes), and communication. The other being a base unit BM 015 with mounting facilities to the DIN-rail, terminals for connection of power sources and external equipment and relays.

In the following the PD 527 Valve Control Module is called PD 527.

The PD 527 can be used in complete Marine Tank Management system, MTM, which includes:

- Valve control and operation
- Pump control and operation
- Tank contents gauging and calculation
- Draft, trim and heel measurement and calculation
- Interface to loading / stability computer
- Interface to ISC (Integrated Ship Control) system

If P-NET communication is intended for valve control the PD 527 modules must be installed together with one of the following modules:

- DPI (Distributed Process Intelligence)
- SPI (Simple P-NET Interface)
- RPI (Redundant P-NET Interface)

This is done to enable interconnection of the valve actuator with other P-NET units, such as IO modules, display units, DPI / controllers, workstations for the shared fieldbus P-NET. The units are communicating with each other by means of the galvanic separated Light-Link P-NET Fieldbus. The system will maintain in operation even if one unit is exchanged.

The PD 527 is fitted with two relay outputs to be connected to a solenoid valve or an LPU. There are inputs for connecting either two switches for end position feedback (On/Off) or one potentiometer for intermediate position feedback (analog).

The PD 527 has internal push buttons for local control of the unit.

The PD 527 has built-in LEDs for monitoring status and position feedback.

Due to internal isolation of position feedback inputs, the LPU may be connected with one cable only, without any risk of high voltage to destroy other modules.

Apart from being controlled by the P-NET the PD 527 can be controlled from hardwired input or pushbuttons. It can be used as a stand-alone unit without P-NET but controlled by external hardwired inputs / outputs. P-NET® is then applied in connection with end testing for configuration and test only.

In this case control is done by 24 VDC inputs. Position feedback signal is given from 24 VDC outputs, or on a 4-20 mA indicator for valves with analog position indicator. A PLC can also be used for control and indication.

The two discrete outputs are for On/Off position indication. When an input is high, the corresponding output is set. In intermediate positions both outputs are low. In case of a position indicator error, both outputs are high.

The analogue 4-20 mA output is connected externally to the 0 from the 24 V DC supply. The 4 mA corresponds to 0% open and 20 mA to 100% open. An output current of 0 mA indicates a position indicator error.

There are 4 possible modes (controlling) methods for the PD 527 control inputs:

- PulseMode
- ActiveMode
- DirectionModeOpen
- DirectionModeClose

In “DirectionMode” the valve position (fully open or fully closed) can be controlled from one 24 VDC input, while the other input is used for enabling the valve movement.

A common alarm output is also available on the unit to be used to signal any alarms to the external equipment / PLC.

An ESD (Emergency Shut Down) input is also available on the unit.

There are 3 possible controlling methods for the PD 527 ESD input:

- ESDClose which close the valve when ESD is set
- ESDOpen which open the valve when ESD is set
- ESDFailSet which keeps the valve in the actual position when ESD is set

As long as the ESD input is high, the valve is locked in the relevant position.

The built-in microprocessor executes and manages the actual control. This ensures an optimal control of the connected equipment, which is never overloaded.

Complete MTM systems can be designed on the basis of the PD 527. MTM systems are designed to match the needs and requirements of each individual ship with respect to valve actuators location, cable installation, safety, control of other machinery, data acquisition and control of other measuring points, operation facilities centralised and decentralised.

Supervision / operation of the valve actuators can take place from a P-NET master, i.e. a controller or a workstation. These units can be installed on the P-NET wherever operation is needed, e.g. on the bridge, in the cargo control room, engine control room or from local interface panels.

The connected controllers / workstations can be configured to be redundantly related. This feature being an additional safety for the crew should any unit fail.

Interlocks for the connected controllers / workstations can be implemented. In this way a certain group of valve actuators and attached equipment are operated from one location only, and simultaneous operation from more locations is prevented.

An on-line connection can be established to the vessel's ISC (Integrated Ship Control) system for transfer of commands, status, alarms etc.

The built-in microprocessor intensively monitors the unit, including the following errors / alarms:

- Program / RAM / EEPROM storage errors
- Watch dog run out (P-NET® communication has stopped)
- Invalid set point value
- Invalid position transmitter system
- Position error (ActualPosition differs significantly from PositionSetpoint)
- Max run time (motor and pump protection)
- Motor overload (motor and pump protection) (only for LPU control)
- Max time (valve moves too slowly)
- Min time (valve moves too fast)

The following are measured and displayed:

- Actual position analog feedback 0-100%
- On/Off feedback 0% (closed) 50% (middle) 100% (open)
- Valve status (stopped, opening, closing, settling, floating, ESD-locked)
- Operation mode (P-NET® writing to the PositionSet-point or ValveStatus register), voltage input open, close or ESD), push buttons).

The valve actuator can be controlled from a master in two ways:

- By transfer of a set-point to the PD 527, which takes over the actual control of the connected equipment and stops when the wanted set-point has been reached (Writing to the PositionSet-point)
- Direct control: Open / Close / Stop (Writing to the ValveStatus register)

Another safety feature: The “Block Set-point” blocks the PD 527 so that the set-point cannot be changed from the P-NET. The valve cannot be moved from the HardWire inputs or the internal push buttons either. Control is still possible though, if the P-NET communication falls out for more then the pre-set watchdog, and this watchdog is enabled.

The Block Setpoint is particularly used for protecting automated procedures.

Another control feature: The “Floating Set-point” continuously copies the actual position to the set-point. No PositionError then rises, when the valve is moved. The function can be used when another control system shall be given ability to directly control the valve actuators.

The “Block Set-point” and “Floating Set-point” can be used independently from each other or together.

Features

- 100% protection and control of the various valve LPU / actuators
 - Only one unit for controlling all of the following LPU / solenoid valves:
 - LPU Spring return
 - LPU Double acting (motor two way rotation) **1) and 2)**
 - LPU Double acting 2A (motor one way rotation)
 - 4/3 Double acting solenoid valve
 - 4/3 Single acting with pressure controlled non-return valve (enabling spring return actuators to be stopped in intermediate positions, and still go to safe position if the pressure or electrical power falls out)
 - 4/2 Detent solenoid valve
 - 4/2 Spring return (FO and FC) solenoid valve
 - Being a P-NET slave the PD 527 is an independent unit to be directly controlled from e.g. a workstation
 - From the P-NET indication can be given how the valve was operated the last time
 - From the P-NET change of set point can be blocked
 - From the P-NET set point can be set to floating (the actuator can be controlled from another control system)
 - "AutoCorrection" option (the PD 527 sets the valve back into it's position). This feature can be automatically disabled when no P-NET communication is present, in order to allow emergency operation of the valve if the P-NET fails
 - Intelligent run on system continuously calculates the run on in both open and close direction. This feature is only used for valve actuators with analog feedback, in order to obtain accurate intermediate positions
 - The presence of 24 VDC is displayed on the On LED
 - The presence of internal error in the module, or absence of P-NET communication is displayed on the Error LED if the P-NET Watchdog is enabled.
 - Indication on LED's, of valve position (Open, Closed, intermediate), status and position indicator error if any
 - Good service / starting up facilities as the valve can be operated directly from push buttons, configurable as one-touch or press-while-running push buttons for opening or closing valves
 - ESD function i.e. the 24 VDC control input can be configured for Emergency Shut Down
 - The valve is controlled by using one or two control inputs (open / close) and two feedback outputs (open / closed), or one analogue 4-20 mA position feedback output
 - Control inputs (open / close) can directly be connected to the PLC (24 VDC)
 - Alarm output
 - Possibility to calibrate the analog feedback by means of the Close and Open push buttons.
 - Due to internal isolation of position feedback inputs, the LPU may be connected with one cable only, without any risk of high voltage to destroy other modules mounted on the same DIN Rail.
1. PLC or Power PCB in the LPU can be used. If the end position shall be maintained i.e. the hydraulic pressure in the LPU-S drops, the Power PCB must be selected, and the KeepActive function activated.
 2. Double acting LPU without solenoid valve must be connected via external relays. With the following position feedback:
 - On/Off
 - Analog
 - Remote

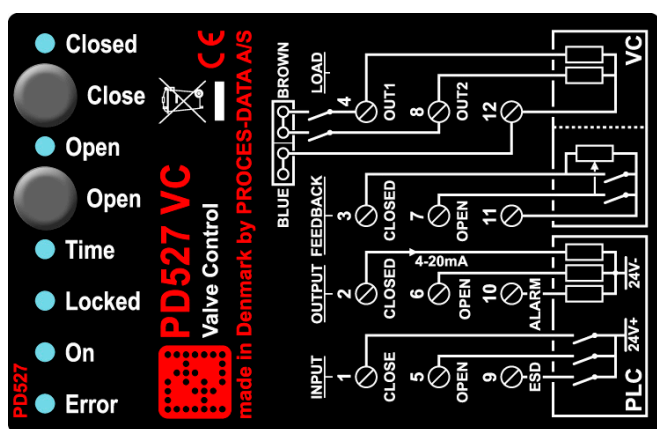
Channel Structure

The PD 527 Channel structure consists of 2 channels as shown in the table.

Channel		
No.	Name	Description
0	Service	Device identification, address and configuration
1	Actuator	General purpose for valve control

Wiring Diagram / Connection

The connections for the PD 527 are shown below.



Note!

1. The Input, Output and Feedback terminals all refer to 24 VDC supply.
2. The max. load on each output is 6 A (230 VAC).

LED Indication

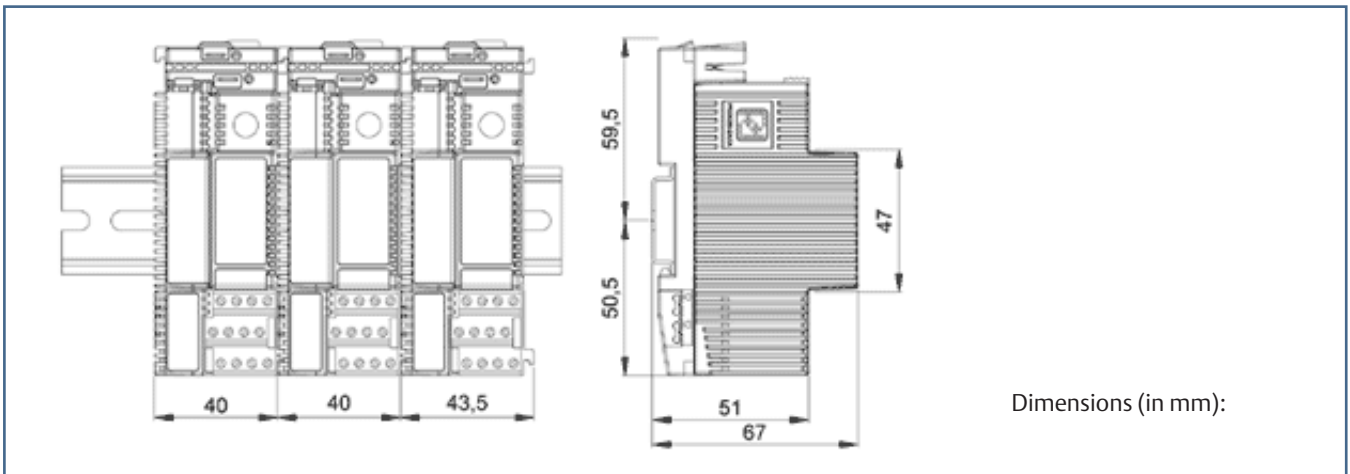
Actual position	Closed	Open
0-3 %	On	Off
3-97 %	On	On
97-100 %	Off	On
Error	Flash 1 Hz	Flash 1 Hz

Note!

If the given setpoint is not achieved (position error) the LED(s) showing the actual position will flash as follows: 250 mS Off and 1750 mS On.

Time	Time will Flash with 250 ms Off and 250 mS On (2 Hz) when the valve is moving too fast. Time will Flash with 250 ms On and 1750 mS Off when the valve is moving too slow.
Locked	When SetPointBlocked or ESDmode is activated, the LED will be On. When the Watchdog has run out while the SetPointBlocked is activated, the valve can be operated by the push buttons or hardwire inputs. Under this condition, The LED will Flash with 250 ms On and 1750 mS Off. If the P-NET communication takes place again, the SetPointBlocked is active again. If the setpoint is changed during the "Watchdog run-out", the SetPointBlocked is permanently reset. If ESDmode is activated the valve cannot be operated.
On	The green On LED is turned on when the electronic module is powered with 24 VDC.
Error	The red Error LED is turned on when the electronic module is monitoring an internal error or if configured watch-dog runs out (P-NET communication has stopped).

Technical Specifications



Dimensions (in mm):

Weight	140 grams approx.
Power supply	18 to 32 VDC
Current at power up	max. 50 mA
Ripple	max. 5%
Power consumption @ 24 VDC	
All outputs / inputs at ON	max. 60 mA
All outputs / inputs at OFF	max. 30 mA
Digital Input	
Switches:	Encapsulated with gold coating max. 100mA
Analog Input	
Potentiometer:	2 K Ohm
Relay Output (BM 015)	
Load current	max. 6 A (230 VAC) BM 015 base module is as standard equipped with a 6 A fuse
PLC	
Digital Input	24 VDC
Digital Output:	24 VDC / Max. 500 mA
Analog Output	4-20 mA
Operation Temperature	-25 °C to + 70 °C
Storage temperature	-40 °C to + 85 °C
Interface:	Light Link

Maritime Approvals

Meets the requirements of all the major international marine classification societies.

For more information see PDS for the PD Series 600 Introduction.

More Information

Please refer to the manufacturers manual for PD 527 Valve control.

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