ELECTRONIC EXPANSION VALVE

Capacities (design load - R134a) 150 to 750 kW

- WIDE LOAD RANGE
- MICRO STEP CONTROL
- FULL CAPACITY RATED
- LEVEL OR SUPERHEAT CONTROL
- REFRIGERANTS R134a or R22
- COPPER CONNECTIONS
- CORROSION RESISTANT CONSTRUCTION
- BI-DIRECTIONAL VALVE

PowerPax releases a range of electronically controlled expansion valves ideally suited to the demanding requirements of today's high efficiency refrigeration and air-conditioning applications.

Features

WIDE LOAD RANGE

The extremely precise stepper control enables the valve to operate effectively from low capacity at high pressure drops through to large capacities at low pressure drops.

FULL RATED CAPACITY

Published capacity ratings allow for "off design" operating points which demand higher flowrates such as pull down conditions.

MICRO STEP CONTROL

PowerPax valves are driven by a precision stepper motor drive which provides more than 6000 positioning steps over the range of valve movement.

ELECTRONIC CONTROLLER

An optional electronics package is available which can be configured for control of superheat, subcooling, or liquid level using R134a or R22.

VERSATILE APPLICATION

The valve can be configured to control based on a 0 – 20 ma or 0 – 5 vdc input signal from any appropriate transducer. This allows it to be appied as a crankcase pressure regulator or evaporator pressure regulator etc.

EASE OF INSTALLATION

The valve is fitted with copper (ODF) stubs to provide easy soldered connection to system pipe work.

BI-DIRECTIONAL

The valve design is suitable for flow in either direction, providing greater flexibility in application.

CORROSION RESISTANT CONSTRUCTION

Materials are selected for long life and precision function. Brass body, copper stubs, stainless steel modulator, teflon shutoff seat.

LEVEL SENSOR

An optional float type level sensor is available.

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MODEL NUMBERS

PPXV 350 2 20

- Insert size designation
- Valve body size
- Nominal kW refrigeration (R134a)

TABULATED RATINGS

PPXV 150 1 06

deg C evap (sat.) temp	kW nominal capacity at pressure drop across valve (kPa.)								
	300	400	500	600	700	800	900	1000	1100
-10	124	143	160	176	190	203	215	227	238
-5	127	147	164	179	194	207	220	232	243
0	130	150	167	183	198	211	224	236	248
5	132	153	171	187	202	216	229	241	253
10	135	155	174	190	206	220	233	246	258

PPXV 350 2 10

deg C evap (sat.) temp	kW nominal capacity at pressure drop across valve (kPa.)								
	300	400	500	600	700	800	900	1000	1100
-10	224	259	290	317	343	366	389	410	430
-5	229	265	296	324	350	374	397	418	439
0	234	270	302	331	357	382	405	427	448
5	239	275	308	337	364	389	413	435	457
10	243	281	314	344	371	397	421	444	465

PPXV 750 2 20

deg C evap (sat.) temp	kW nominal capacity at pressure drop across valve (kPa.)								
	300	400	500	600	700	800	900	1000	1100
-10	487	562	628	688	744	795	843	889	932
-5	497	574	642	703	760	812	861	908	952
0	507	586	655	718	775	829	879	926	972
5	518	598	668	732	791	845	896	945	991
10	527	609	681	746	806	861	913	963	1010

Correction factors for Liquid temperature

Liq temp.	15	20	25	30	35	40	45	50	55
correction	1.32	1.25	1.18	1.11	1.04	0.97	0.90	0.83	0.76

SELECTION EXAMPLE

Given:

Required system Load = 226 kW using R134a

Condensing temperature = 39 °C (sat.)

Liquid temperature = 33 °C

Evaporating temperature = 5.0 °C (sat.)

High side pressure drop = 20 kPa (estimate discharge line + condenser + liquid line)

Low side pressure drop = 35 kPa (estimate suction line + evaporator + distributor piping)

A **Use refrigerant tables for R134a to find saturation pressures corresponding to 39 °C and 5.0 °C**

High side pressure = 888 kPa

Low side pressure = 248 kPa

B **Calculate the pressure drop across the valve**

= 888 – 248 –20 – 35 = 585 kPa

C **From the tabulated ratings**

a 10 slot valve has a nominal capacity of 308 kW at 5 °C (evap. Temp.) and 500 kPa

Ie at the next lower pressure value tabulated.

This capacity must be corrected for liquid temperature as follows.

D **From the correction factor table read factors of :**

1.11 for 30 °C

and 1.04 for 35 °C

by interpolation the factor for 33 °C is 1.07

E **Apply the correction factor :**

Corrected rating for 600 kPa pressure drop is 1.07 x 308 = 330 kW

Since this is the rating for 500 kPa , and we have 586 kPa available the valve is large enough.

DIMENSIONS

All dimensions are subject to change without notice.

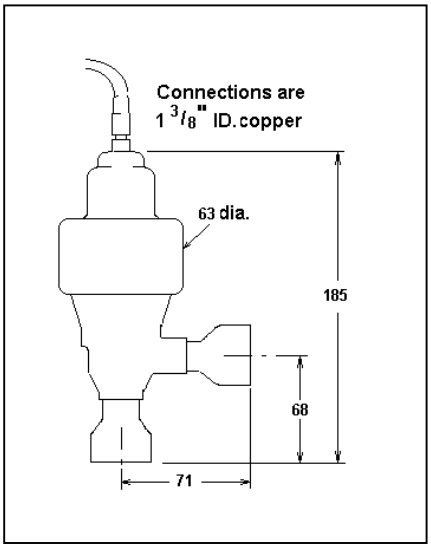


Fig. 1 PPXV 150

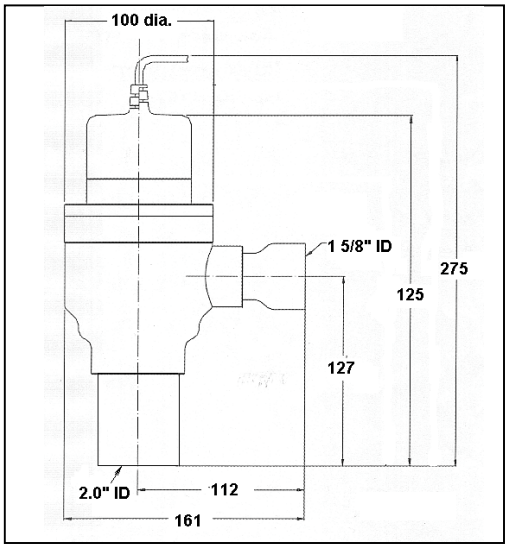


Fig. 2. PPXV 350 and PPXV 750

SPECIFICATIONS OF LEVEL SENSOR

Body	cast brass
Connections	Copper
Seat material	Teflon
Modulator	Stainless steel
Gear assembly	Teflon modified Acetal
Full travel	Approx. 0 to 100 mm.
Output	0 to 90 ohm
Body	Cast Brass
Float	NBR (Acryl-Nitrile Butadiene Rubber)

STEPPER MOTOR

Motor Type:
2 phase bipolar stepper motor

Supply Voltage:
12 VDC nominal

Phase Resistance:
75 ohms per winding ± 10% at 72°F (22°C)

Current Range:
.131 to .215 amps/winding
.262 to .439 amps with 2 windings energized

Inductance:
62 ± 20% mH per winding

Maximum Power Input:
4 watts

Number of Steps:
6386

Resolution:
0.002 mm/step

Full Travel Duration:
30 sec.

ELECTRONIC CONTROLLER

Power Input:
12 v dc 100 va (min.)

Output:
Two bipolar pulse outputs per valve
12 VDC nominal 4 Watt (max.)

Control options:
Superheat *
Sub cooling
Pressure only
Level
Analog position in response to voltage or ma current loop.

* *Choice of R134a or R22*

Control Inputs:
Temperature and pressure
Pressure only
0 to 5vdc
4 to 20 ma current loop

Set point method:
Set point and control parameters are set using PC software and a RS232a (serial port) interface.

Refrigerant choice:
R134a or R22 - Others by request

Dimensions:
122 x 180 mm. PCB enclosure.

Mounting:
Four mounting points TBA

Compressor interface Controller
The compressor is configured to control up to two EXV's responding to level sensor inputs or as a superheat control. The second valve can be configured to slave off the first to doubl valve capacity off a single input reference.

Remote temperature Input:
(applicable to compressor interface controller only).
The TT300 compressor interface uses inbuilt compressor sensors located at the compressor suction. The optional remote temperature sensor is a 1000 ohm (nominal at 20 deg. C) NTC thermistor .

CONNECTION DETAIL

Fig.3 Wire Colours

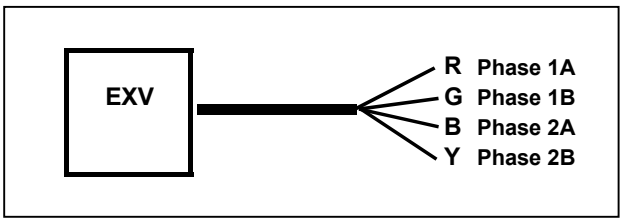
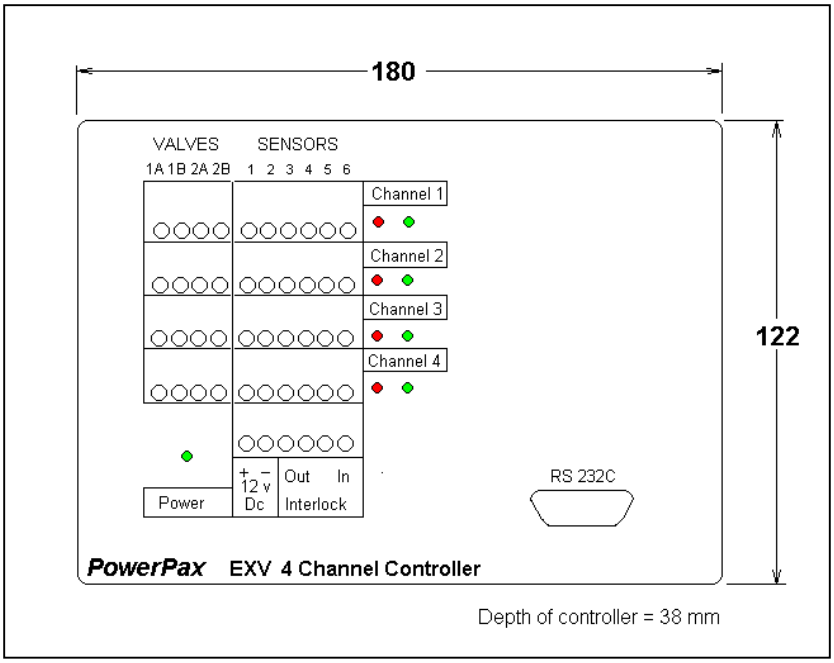


Fig. 4 Four Channel Controller

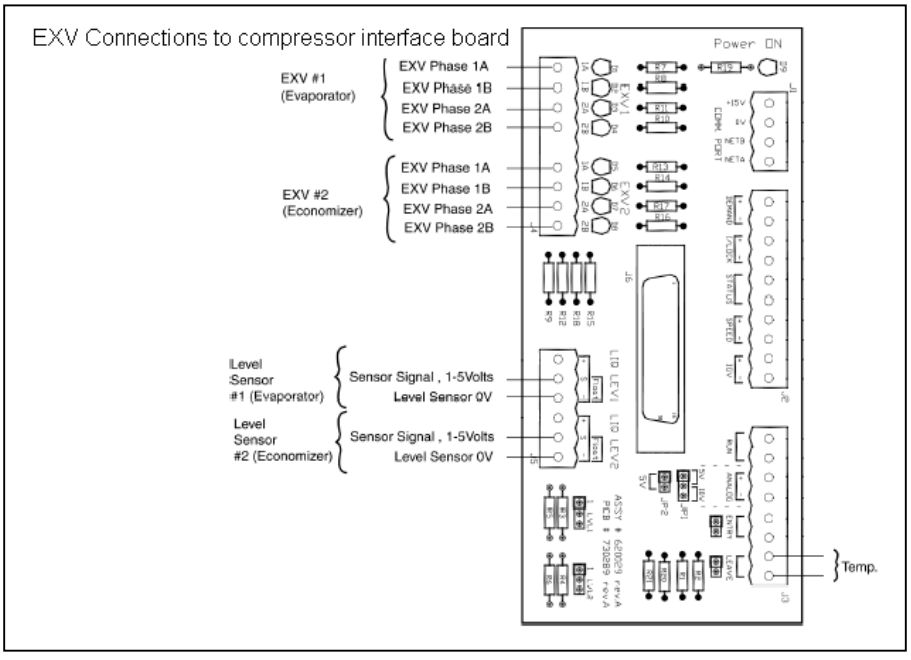


A stand-alone controller capable of managing up to four valves.
Contol options include
Superheat
Subcooling
Level control
Pressure control
Temperature control
Also :
Positioning provision is made for positioning of the valve in response to analog signals of:
0 – 5 v dc OR 4 – 20 ma
to allow use of third party controllers.

Control setup is via the RS232 interface using PC software provided.

LED's provide indications of valve action.

Fig. 5 Compressor Interface Board



Used with TT300 compressor the interface board provides for :
level control of flooded coolers and
superheat control

Note :
Superheat control is referenced to the compressor suction pressure and temperature
Or optionally to a remote temperature sensor
(for full detail refer to the compressor manual)

VALVE INSTALLATION

VALVE and SENSOR LOCATION

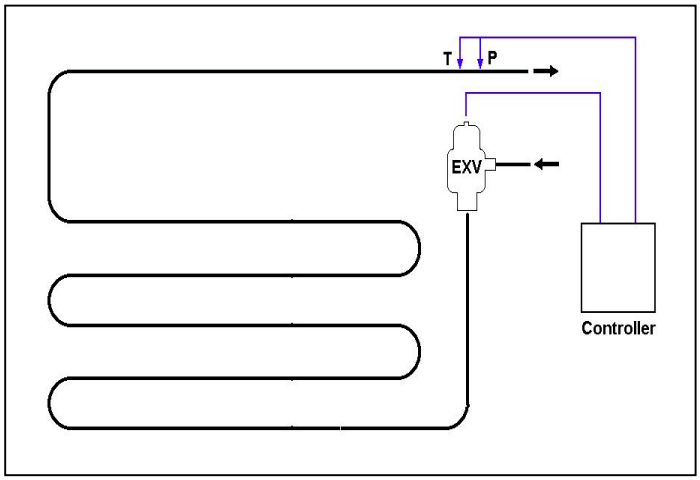


Fig. 6 Superheat control application

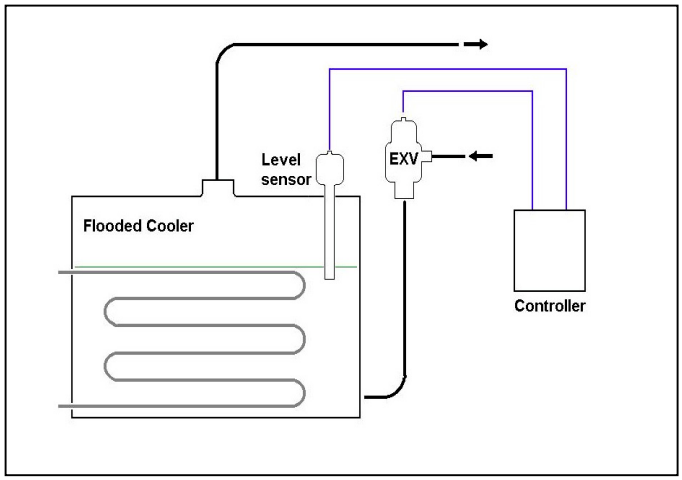


Fig. 7 Level control application

Notes:

1 *In applications where system damage may result from valves failing in an open position, a liquid line solenoid should be placed before the valve.*

2 ***The valve should not be relied upon as a liquid line shutoff valve.***

SOLDERING PROCEDURES

Standard good practice should be applied.
Do not attempt to dismantle the valve.
Protect the valve body from overheating by wrapping with wet rags during soldering.
Use inert gas to prevent oxidization of internal surfaces.
Do not plunge quench the hot valve as this can cause distortion.
Flux should not be required for copper / copper joints.
A 5% (min.) silver solder is preferred.

SENSORS

General

Locate sensors as indicated in the diagrams above.
In general sensors for superheat control should be located in the suction line after the suction accumulator and / or liquid –suction heat exchanger if fitted.

Temperature

Temperature sensors should preferably be located in a suitable pocket to ensure good contact and serviceability.
If temperature sensors are strapped on the external surface of the pipe the contact must be enhanced using thermal paste. In addition the sensor must be insulated with 8 mm foam insulation (or equivalent) to minimise ambient temperature effects. The sensor should be placed at the 9:0 o'clock or 3:0 o'clock position.

Pressure

Install pressure sensors according to their manufacturers instructions.
Important: Ensure the sensor output voltage and pressure range are as specified (ref. Electronics Specification).

Level Sensor

Install according to the manufacturers instructions. Ensure that the output voltage range is as specified (ref. Electronics Specification).

WIRING

Refer to the controller board connection diagram above for detail.

COMMISSIONING

It is very important that the four wires to the valve are connected to the correct terminals on the board (refer fig.3).
Do not disconnect the valve wiring while the controller is powered up.

. check wiring connections to the controller
  - EXV four wires
  - Temperaturre input 2 wires (non polarised)
  - Pressure input
. connect the PC interface
. power up the controller board
. run the PC setup software
. follow the prompts to select
  - superheat or level control
  - refrigerant (if superheat)
  - select default control terms
  - input set point (default 50% level or 5 K superheat)
. start the system and allow to settle
. adjust control terms if required to obtain stable control (refer section – setting control terms)

TROUBLE SHOOTING

Hunting – excess cyclic variation in controlled value
Hunting behaviour may be caused by a poor signal from a sensor. In superheat control mode the temperature may have poor contact. This possibility should be checked before proceeding further.

Hunting may also be caused by inappropriate selection of control terms.
Refer to separate procedure for setting the control terms.

Valve will not control at all
The valve may be stuck or it is not being driven.
It is very rare for these valves to jam so it is most likely that the problem is due to the valve not being driven.

The valve positions only in response to the controller output and will maintain its last position when that output voltage is OFF. The valve does not know whether the OFF condition is intentional (controller has determined that the current valve position is correct) or whether it is caused by a controller, power or output wiring failure.

The LED valve output indicators on the controller board should flash intermittently due to the fact that the valve should be constantly re-positioning to maintain control (exception – when the valve is driven full open or full closed).

Wiring or valve motor faults
If the LED's are flashing but there is no valve response, then the fault must lie in the wiring or connections or in the valve motor itself.
Actual motor failures are very rare so the problem probably lies in the wiring or connections.
Proceed as follows:

. Check that the wires are connected correctly
. Check the screw terminal connections (contact on stripped wire ends not insulation).
  If the above is all correct check the motor and wiring as follows:
. Disconnect power to the controller.
. Remove the wires from the controller output terminals
. With a digital multimeter check the motor winding resistance from the controller end.
. Phase 1A – 1B and Phase 2A – 2B should both be approx. 75 ohms / winding (nominal).
. Check also there is no short circuit to ground (valve body).

An open circuit probably indicates a wire failure or loose connection at the valve.
Proceed as follows:

. Remove the rubber cap which covers the wiring connection at the valve.
. Inspect for loose wires or faulty plug connection.
. Remove the plug (first note the plug position to ensure it can be replaced correctly)
. Repeat the motor winding resistance check at the valve terminals.
. Finally check wire continuity of the four lead wires.

Controller faults
If the LED's are not lit at all proceed as follows:

Check that there is power supplied to the controller board - If there is power supply to the controller and output LED's are not flashing then a controller board fault is indicated.

BACK PAGE

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