

Electrical Installation Requirements

Care should be taken to separate the power and signal cables to prevent electrical interference and possible damage due to inadvertent connection.

The power outputs are fitted with suppressors to protect against electrical interference when switching off solenoid valves or contactors. It is therefore essential to observe the output polarity. The line voltage should be connected to the terminals marked LN and the switched loads to DQ.

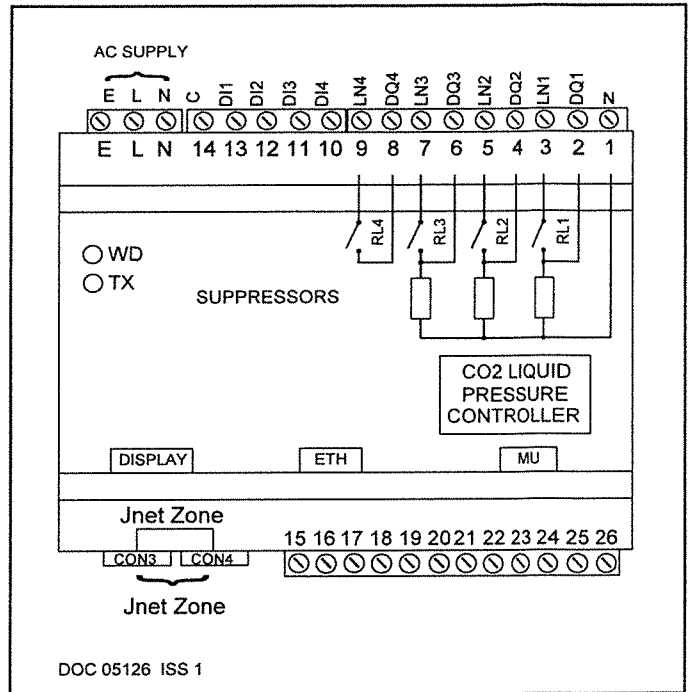
The plant inputs are electrically isolated. A volt free contact should be connected for the logical conditions stated below between the input and common C (14).

The control supply neutral must be connected to terminal 1 for EMC operation.

CE Conformance

This unit conforms with the relevant EU standards when installed according to the JTL Installation Requirements for this product.

Digital Output				
1	LN DQ	3 2	Suppressed	Enable Heat Exchanger
2	LN DQ	5 4	Suppressed	Enable Liquid Valve
3	LN DQ	7 6	Suppressed	Watchdog
4	LN DQ	8 9	Unsuppressed	High Liquid Pressure
Digital Inputs				
1		14 13	Volt Free	Auto
2		14 12	Volt Free	Plant Ok
3		14 11	Volt Free	Unload Heat Exchanger
4		14 10	Volt Free	Not used
Analogue OUTPUT				
1	+ -	19 20	4-20 mA	Heat Exchanger Control
2	+ -	17 20	4-20 mA	Liquid Pressure Control
		26 16	0V +24 V	External Supply Note. The preferred method is to use the internal supply for the outputs. To do this link terminals 15 & 16.
Analogue INPUT				
1	+ -	21 22	5k Thermistor	Suction Temperature
2	+ -	21 23	5k Thermistor	Liquid Temperature
	+ -	15 24	4-20 mA	Suction Pressure
	+ -	15 25	4-20mA	Liquid Pressure



Use of Maintenance Unit

The controller can be checked and the operation adjusted using a JTL portable maintenance unit which plugs into the controller. Each item of information has an item number. The more important items are listed in the tables overleaf.

Examples:

To read item 22 press: **ITEM** **2** **2** **ENTER**

To set item 50 to 650 Press: **ITEM** **5** **0** **ENTER** **SET** **6** **5** **0** **ENTER**

To correct errors press: **CANCL**

To select next or previous items press: **+** and **-**

Initial Commissioning Settings

The controller has 1 set of data built in to its program for use during commissioning. Initialize to this data by setting item 9 to 1234. This loads into the controller a suitable set of data, adjustments should then be made as necessary.

If a JTL communications network is connected to the controller then the unit number should be set on item 1.

Pressure Display

The pressure can be displayed in psi, bar or MPa as selected by item 9393.

The HP370 controller drives the JTL LCD14 display using a CAB75 cable. Various cable lengths are available.

LIQUID PRESSURE CONTROL

The liquid pressure is controlled using a pressure regulating valve using a 4-20 mA output on the HP370. The output is varied by comparing the pressure (item 22) against liquid pressure setpoint (item 5016) using standard PID control. The PID gain settings are on (items 5010-11).

When the pressure is higher than setpoint the valve is opened by increasing the output and vice versa.

Optimised Liquid Pressure

The liquid pressure setpoint can be remotely adjusted by a broadcast. The broadcast data is in a pressure set on item 113. When the data set is set to 0 this function is disabled.

Pressure Healthy

The HP370 can be used in conjunction with other controllers. There is an output which indicates if the liquid pressure is within acceptable limits which can be connected to other systems. The acceptable pressure level is set as item 5027.

Liquid Subcooling Measurement

The CO2 liquid subcooling is calculated using the liquid temperature sensor.

Forcing the Liquid Valve

The liquid valve can be forced to open to a set level or shut as required using items 5008 and 5009 as required.

LIQUID SUBCOOLING

The HP370 drives a valve using a 4-20 mA output to control the superheat of a heat exchanger to maintain the liquid subcooling.

There are three strategies (item 70) associated with liquid subcooling.

- a) Monitoring temperature only.
- b) Controlling the heat exchanger to superheat to a fixed setpoint.
- c) Controlling the heat exchanger to give a fixed value of liquid subcooling.

When the liquid subcooling temperature strategy is chosen there are two control methods.

- i) Fixed superheat (item 142) with deadband control.
 - ii) Floating superheat.
- Floating superheat is selected when the maximum float level (item 73) is set to non zero.

The rate of change of the superheat setpoint (item 72) is controlled by an integral gain (item 74).

The superheat is controlled to a setpoint (item 72) using PI control with adjustable gain (item 50) and (item 51). The rate of change of the output to the valve can be limited (item 52) and the output smoothed to avoid instability if there are discontinuities in the pressure and temperature readings.

The heat exchanger can be turned off when there are no interstage compressors running.

This is achieved by recovering an IP broadcast from the compressor controller. When the broadcast received is a capacity loaded of 0kW and this function is enabled (item 175) then the heat exchanger suction control valve is closed.

Valve Output

The output can be limited by maximum and minimum values. If when the output is at a minimum and the superheat falls below the minimum level the valve is shut.

Manual Control

The heat exchanger can be selected to run in manual control if required using item 145.

Pressure Data Sets

The suction and liquid pressures can be broadcast via IP using pressure set identification numbers set on items 101 to 104. Setting these item numbers to 0 disables broadcasting.

The interstage pressure may also be received by an IP broadcast message. This can be used when the local suction pressure is not available.

Liquid Pressure Alarm

The liquid pressure is constantly compared with the high and low alarm levels (items 5001 & 5002).

If the current liquid pressure goes outside the set range for the adjustable period (5003) then an alarm is given.

Pressure Transducer Alarms

The pressure transducers are constantly checked and if, after a 15 minute time delay, the output goes outside the acceptable range an alarm is given (item 91 & item 901).

Daylight Saving

When connected to a JTL network this controller can operate by displaying daylight saving time for its time and defrost schedule. Daylight saving operation is selected by setting item 18. The connected network controller then adjusts the times automatically during the daylight saving period.

Alarm Display

Various alarms are indicated on the pressure displays. Typical messages displayed are:

P.Fit	Plant fault (auto input not present) - (highest priority)
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The alarm conditions are flashed alternately with the liquid pressure. In the event of there being more than one alarm the highest priority alarm is displayed

ADJUSTABLE PARAMETERS				HP370	
	Item	Function	Range	Units	
LIQUID PRESSURE	Pressure control	5000	Liquid pressure control	0-disabled 1-enabled	psi
		5016	Liquid pressure setpoint	400 - 750	
		5010	Proportional gain	0 - 99.99	
		5011	Integral gain	0 - 1.00	
		5022	Valve smoothing	0 - 5	
		5023	Liquid pressure setpoint (min)	400 - 750	
		5024	Liquid pressure setpoint (max)	500 - 800	
	113	Optimised pressure setpoint data set	0 - 9999		
	Pressure Alarms	5001	High liquid pressure alarm level	550 - 900	psi
		5002	Low liquid pressure alarm level	400 - 750	psi
		5003	Liquid pressure alarm delay	0 - 20	min
		5027	High liquid pressure safety level	700 - 100	psi
5028		High liquid pressure safety level delay	0 - 10	min	
Pressure Transducer	122	Transducer	0-disabled 1-enabled	psi	
	422	Transducer full scale (at 20mA)	500- 2200		
	103	Pressure data set 3	0 - 9999		
	104	Pressure data set 4	0 - 9999		
Temperature	132	Liquid temperature	0-disabled 1-enabled		
LIQUID SUBCOOLING	SUBCOOLING CONTROL	70	Strategy	0 - Monitoring only 1 - Superheat control 2 - Temperature control	K
		71	Setpoint	0 to -10	
	SUPERHEAT CONTROL	140	Strategy	2=superheat monitoring 3=superheat control 4=off	K K %/sec K % %
		142	Superheat setpoint	4.0 - 12.0	
		73	Float limit	0 to 10	
		74	Float integral gain	1 - 99.99	
		145	Enable in manual	0=no 1=yes	
		50	Valve proportional gain	0 - 99.99	
		51	Valve integral gain	0 - 99.99 0=disabled	
		52	Rate of change of output	1 - 20	
		143	Minimum Superheat	0 - 5.0	
		55	Maximum valve opening	10 - 100	
56	Minimum valve opening	0 - 50			
148	Valve smoothing	0 - 5			
75	No interstage load condition	0 = run 1 = stop			
77	Interstage capacity data set	0 - 9999			
Pressure Transducer	121	Transducer	0-disabled 1-enabled	psi	
	421	Transducer full scale @20 mA	500 - 2200		
	101	Pressure data set 1	0 - 9999		
	102	Pressure data set 2	0 - 9999		
Temperature	131	Suction temperature	0=Disabled 1=Enabled		
DISPLAY	9392	Temperature display units	0 - Celsius 1 - Fahrenheit		
	9393	Pressure Display units	1 - psi, 2 - bar, 3- kPa, 4-bar A		
Jnet FUNCTION	1	Unit number liquid	0.1 - 899.7		
	18	Daylight saving operation	0= standard time, 1 daylight saving time		

VIRTUAL BITSWITCH	966	Bitswitch Selection	
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OTHER USEFUL ITEMS			
Item	Function	Item	Function
21	PRESSURE Suction pressure	5018	LIQUID VALVE Valve output (%)
22	Liquid pressure	5014	Proportional output (P)
24	Interstage pressure	5015	Integral output (I)
146	Average suction pressure (1hr)	5008	Forced valve output
147	Average liquid pressure (1hr)	5009	Force valve closed
5025	Optimised pressure setpoint		HEAT EXCHANGER VALVE
5026	Current pressure setpoint	57	Current opening (%)
72	Current superheat setpoint	53	Proportional output (P)
	TEMPERATURE	54	Integral output (I)
31	Suction temperature	58	Forced output (%)
32	Liquid temperature		
5019	Liquid subcooling		

Relay Output Rating

2A resistive

Supply Requirements

Installation Information

24 Vac (optional)

Applicable Documentation

Item Numbers
Doc No. 05118

Firmware Variations
Doc No. 05119

Connections Diagram
Doc No. 05096

85-265 Vac (47-440Hz) 3VA maximum

Note: The information contained in this document applies to the current version of the unit supplied with it. Full operating manuals, item number and software variation information can be obtained from the supplier JTL Systems.



This unit conforms with the relevant EU standards when fitted in accordance with its installation instructions.