SeaChange

Changeover Submodule
with 3 x Triac outputs

Main Features

Controls a Pair of Pumps or Fans providing Auto Changeover and Duty Rotation

Can use Contactor status signals or Flow Proving Switches (single or dual)

Hours Run logged for each Pump

Pump Fail alarm output

Summary Features

General

The SeaChange PCO Changeover modules are *Submodules*, which can be used to extend the control capabilities of other SeaChange Modules. They can be used in conjunction with Boiler Controllers, for instance, to control primary or secondary twin pump sets and even twin flue dilution fans; or in conjunction with DHW and Secondary Circuit Controllers, to control associated twin pump sets.

Configuration parameters can be set to allow operation to match the plant control requirements. A full table of configuration and monitoring parameters is detailed later in this data sheet.

A table of available product versions is shown on the back page.

Operation

Changeover Submodules are driven by Control Demand signals from the module that they are registered to.

Different *Driver Types* may be selected to suit boiler, heating, or cooling applications.

Primary and VT pump variants allow twin pump sets to be controlled replacing the single pump outputs on a Boiler Controller.

Other variants allow twin pump sets to be controlled on the basis of Occupancy Times, Heating or Cooling Demand using Control Demand signals from other controllers.

Duty Rotation of the pump set occurs automatically each time the pump set is started, or after a specific number of hours run.

During operation Auto Changeover occurs when any of the monitored signals indicates a fault condition.

Different Failure Modes may be set if pumps fail to run (eg. both run, last to run stays on, both off). Reset after pump failure can be Manual or Automatic.

Features

Fault Indicator

indicates status of pump set during this occupancy period.
Green = duty pump OK
Green / Red flashing = duty pump failed, standby pump running.
Red flashing = both pumps failed.

Connections

for triac outputs controlling pumps and alarm output. See back page for details.

Output Status Lamps

indicate current status of the three triac outputs.

Status Lamp

indicates that parent module is in Occupancy mode if lit steadily, also indicates that Submodule is in Override Mode (see Manual Override section).

Override

is used to change from Normal to Override mode. Override mode will allow the plant to run without demand signals from the Zone Controllers (see Manual Override section). The Override button is also used to change the duty allocation during normal operation, and to reset the pump set from fault mode.

Select

is used during commissioning to allow a Zone Controller to display the Engineering Parameters of this controller.

7   8   9   10   11 12
output   output   spare
1   2

SeaChange
CHANGEOVER
SUBMODULE

select   override   register

network   status 1   status 2
+   −
1   2   3   4   5   6

Registration Button

is used during the commissioning process to build logical links between controllers.
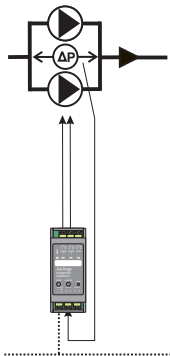
Terminals

are all of two-part construction to facilitate wiring connections.

Connections

for network. Belden 8205 Twisted pair, unscreened cable is required (or exact equivalent).

Connections

for pump flow VFC inputs. Twisted pair, unscreened cable is required.
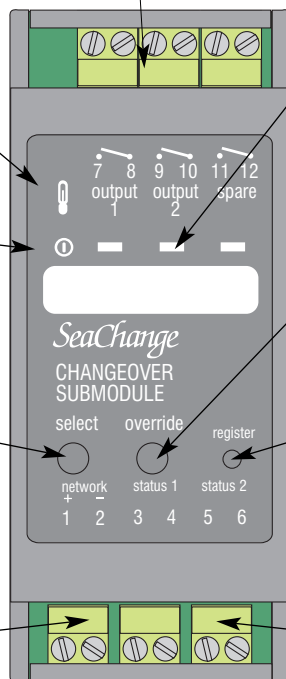
Typical Applications

Twin Pump Set with Single Flow Switch

PCO / DIN / 3T / ...
Use Flow Switch status inputs 1 or 2

Note: Flow switches may be substituted by volt free contactor status signals. Do NOT use pump Trip signals.
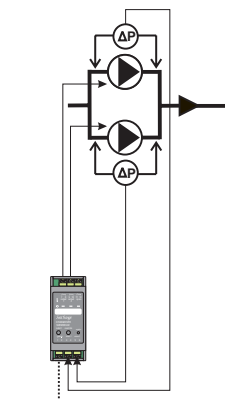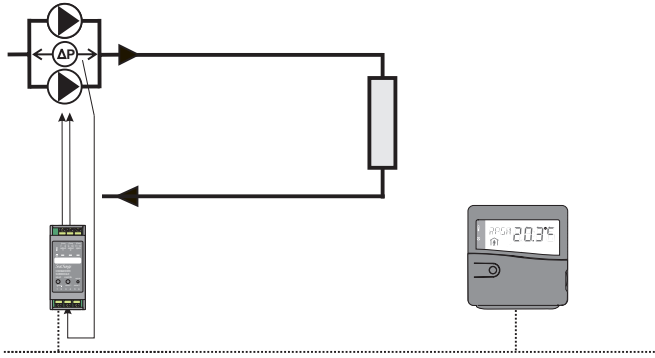
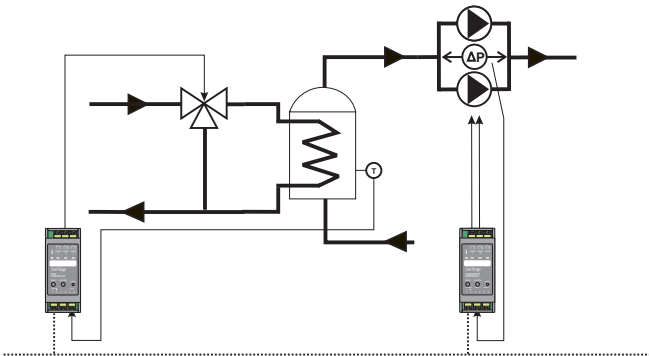**Twin Pump Set with Dual Flow Switch**

PCO / DIN / 3T / ...
Use Flow Switch status inputs 1 and 2

Note: Flow switches may be substituted by volt free contactor status signals. Do NOT use pump Trip signals.

Typical Applications

Zone Heating with Twin Pumps
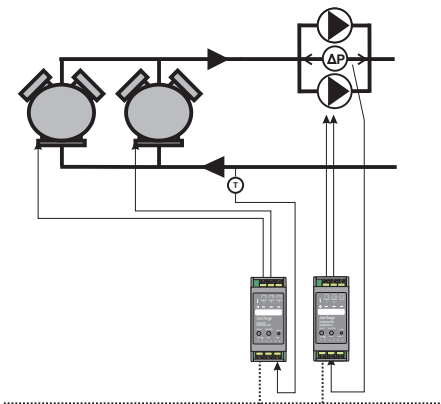PCO / DIN / 3T / 006

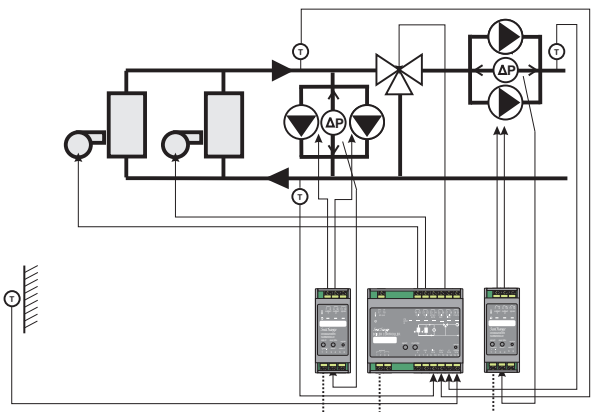## DHW with Twin Secondary Pumps
DHW / DIN / 3T / 105
PCO / DIN / 3T / 004

2 Stage Chiller with interlocked Twin Pumps
CLR / DIN / 3T / 208
PCO / DIN / 3T / 007

2 Boilers or Boiler Stages with Twin Primary and Secondary Pumps and Raise/Lower valve for VT Control
BLR / DIN / STD / SH / 001
Primary Pumps
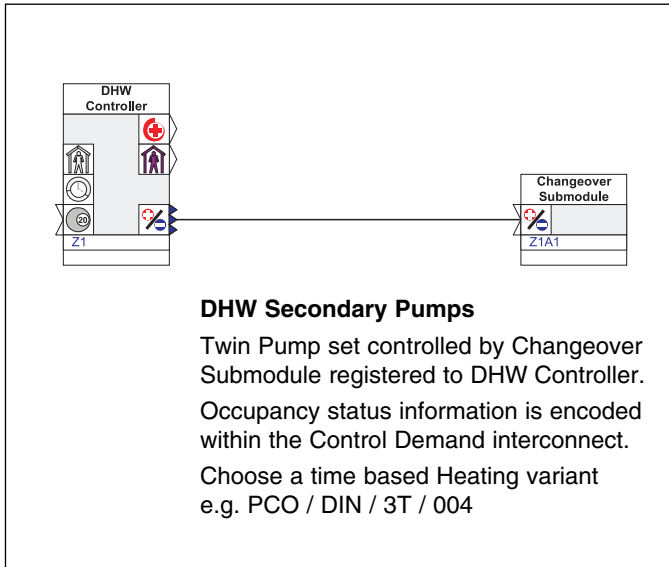PCO / DIN / 3T / 001
Secondary VT Pumps
PCO / DIN / 3T / 002

Demand Control

The Changeover Submodule has no internal Occupation Time Schedules. Its operation is determined only by a Control Demand signal from the parent module it has been registered to.
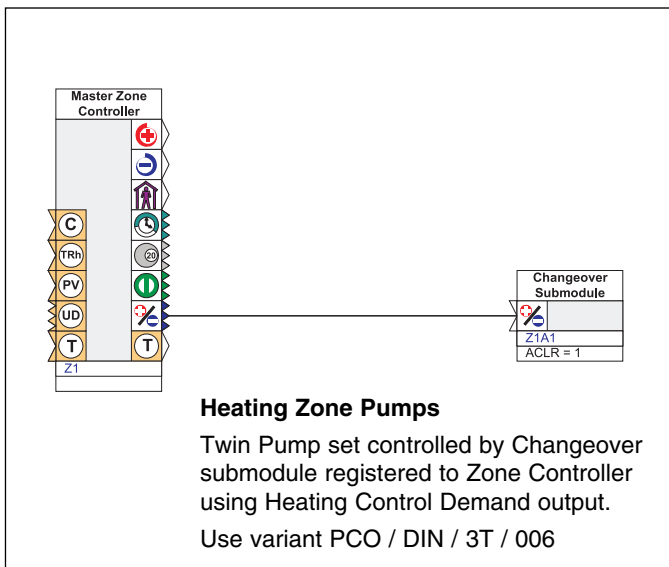
The Control Demand interconnect signal from the parent module carries both the control loop demand output level and the parent module occupancy state.

Control based on Time only

DHW Secondary Pumps

Twin Pump set controlled by Changeover Submodule registered to DHW Controller.

Occupancy status information is encoded within the Control Demand interconnect.

Choose a time based Heating variant e.g. PCO / DIN / 3T / 004

The Changeover Submodule will operate the pump set continuously during the Occupancy Times of the parent module, including Optimum Start and Stop.

Control based on Control Demand

Heating Zone Pumps

Twin Pump set controlled by Changeover submodule registered to Zone Controller using Heating Control Demand output.

Use variant PCO / DIN / 3T / 006

The Changeover Submodule will operate the pump set only when there is a Heating Demand > 5% from the Zone Controller.

Chilled Water CT Circuit Pumps

Twin Pump set controlled by Changeover Submodule registered to Secondary Circuit Controller using Cooling Control Demand output.

Use variant PCO / DIN / 3T / 007

The Changeover Submodule will operate the pump set only when there is a Cooling Demand > 5% from the Secondary Circuit Controller.

The Secondary Circuit Controller outputs can be interlocked with the pump set, so that they are held off until pump flow is proved. If pump set fails, the control outputs can be reset manually at the Secondary Circuit Controller. The pump set can automatically retry at next occupancy period. See **Interlocks**, **Failure Modes** and **Clearing Fault Conditions** sections.

Inputs

One or two VFC inputs can be used for pump flow status; using flow switch, pressure switch, or contactor signals. If a common flow status signal is used, it can be connected to either input **'status 1'** or **'status 2'**.
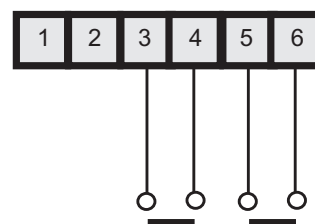
Input 3-4   Pump 1 flow status
Input 5-6   Pump 2 flow status

NOTE - the module requires pump running or flow confirmation signals. Do not use pump trip signals.

Number of Pumps

The Changeover Submodule can control either a Twin Pump Set or a Single Pump, both offering features for flow detection, run on and hours run monitoring. Set **NPMP** =1 if only 1 pump is controlled, using '**output 1**'.

Duty Sharing

The Changeover Submodule shares pump running times by automatically changing the duty pump allocation. This will occur each time the pump set is started, or after running the duty pump for the period set by parameter **MXHR**, whichever occurs first.

The duty pump allocation can be changed by pressing the override button briefly.

Pump Time Interlock Settings

The duty pump will run for the minimum run time set by parameter **MNON**. The pump minimum off time is fixed to 1 minute.

If parameter **RNON** is set, after a period of running the pumps under Control Demand, the duty pump will continue to run for the period set by **MNON**.

Changeover Submodules controlling Primary or VT pump sets will have their pump run on time determined by the Boiler Controller they are registered to.

Pump Exercise

The Changeover Submodule will automatically exercise the duty pump by running it for the minimum run period **MNON** if the pumps have been off for a long period. Parameter **MXDY** sets the number of days which the pumps can be off without being exercised. Setting **MXDY** = 0 disables the pump exercise feature.

Interlocks

Several SeaChange modules can be Interlocked to the Changeover Submodule in order to protect plant from running when there is no pump flow established. Examples are detailed in the **Clearing Fault Conditions** section.

Alarm Handling

The Changeover Submodule may be set to ignore alarm conditions, report them to a SeaChange Doorway Supervisor (either locally connected to the system, or via an autodialling modem), or to both report alarms and send STOP alarm to a Boiler Controller. The **ALRM** parameter is used to select the desired Alarm Mode.

The Changeover Submodule generates an alarm if a pump is called to run and no flow is seen on either input after the grace Delay time. The sense of the flow inputs can be set by parameter **ALST**.

The Changeover Submodule may be set to respond to the **STOP** System Stop Alarm which is generated by another Controller; this can be used to shut down the entire control system, or parts of it, if a particularly critical event occurs. See Boiler Controller datasheets B1 or B2 for more details about the System Stop Alarm. Alarm codes as they appear at Doorway Supervisor and InSite tool:

NOAL   No Alarms.
       All alarm conditions cleared in this Module.

FLFA   Flow Failed pump A output 1.

FLFB   Flow Failed pump B output 2.

DPMF   Dual Pump Failure.
       Duty and Standby pumps both failed.

STOP   System **STOP** alarm received.

See **Failure Modes** and **Clearing Fault Conditions** sections.

Local Indication of Alarms

Failure of the duty pump is indicated by the fault indicator flashing alternately red and green.

Failure of both duty and standby pumps is indicated by the fault indicator flashing red.

Failure Modes

Duty Pump Failure

When the duty pump starts, the submodule waits for a grace period set by **DLAY**. After the grace period has elapsed, if flow status is not seen on either input, the Changeover Submodule will switch off the duty pump output, switch on the standy pump output, and switch on the Sounder output C.

Failure of the duty pump is indicated by the fault indicator flashing alternately red and green.

Duty and Standby Pump Failure

If following a duty pump failure, the standby pump also fails to generate flow status, then the Changeover Submodule will take action according to the Failure Mode set by **FMD**.

FMD = 1   Standby pump output remains on.
Duty pump output turned back on.
Sounder output remains on.

FMD = 2   Standby pump output remains on.
Duty pump output remains off.
Sounder output remains on.

FMD = 3   Standby pump output turned off.
Duty pump output remains off.
Sounder output remains on.

Failure of both duty and standby pumps is indicated by the fault indicator flashing red.

Clearing Fault Conditions

A fault condition can be cleared manually by pressing the Override pushbutton, and will occur automatically at the end of Occupancy if **ACLR** = 1 (default).

In some applications it may be desirable to latch the alarm in a Failure Mode condition, so that manual intervention is required before plant is brought on again.

Where the parent module does not have the facility to latch an alarm condition, the auto clear function in the Changeover Submodule can be disabled by setting **ACLR** = 0.

Examples of Clearing Dual Pump Failure Alarms:

Changeover Submodule (types 004 - 009 only)
Registered to Zone Controller:
In Changeover Submodule: **ACLR** = 1
Pumps reset automatically after Occupancy; if Changeover Submodule Override pressed; or **ALRM** is set to zero.

In Changeover Submodule: **ACLR** = 0
Pumps remain latched in Failure Mode until Changeover Submodule Override pressed or **ALRM** is set to zero.

Changeover Submodule (types 001, 002 only)
Registered to Boiler Controller:
In Changeover Submodule: **ACLR** = 1
In Changeover Submodule: **ALRM** = 2
Changeover Submodule sends special **STOP** alarm on **DPMF** condition.
Boiler outputs held off by latched **STOP** alarm.
Pumps reset automatically as Control Demand from Boiler Controller is removed while parent module remains latched.
Boiler reset if Boiler Override pressed; or **ALRM** is set to zero.

Changeover Submodule (types 004,005,006 only)
Registered to DHW Controller:
In Changeover Submodule: **ACLR** = 1
DHW outputs are not held off while alarms present at Changeover Submodule.
Pumps reset automatically after Occupancy; if Changeover Submodule Override pressed; or **ALRM** is set to zero.

In Changeover Submodule: **ACLR** = 0
DHW outputs are not held off while alarms present at Changeover Submodule.
Pumps remain latched in Failure Mode until Changeover Submodule Override pressed or **ALRM** is set to zero.

Changeover Submodule (types 004,007 only)
Registered to Secondary Circuit or Chiller Controller:
In Changeover Submodule: **ACLR** = 1
In Secondary Circuit Controller: **ILKP** = 1
Secondary Circuit outputs held off by latched Secondary Circuit **PMPF** alarm.
Pumps reset automatically as Control Demand from parent Secondary Circuit Controller is removed while parent module remains latched.
Secondary Circuit reset if Secondary Circuit Override is pressed; or **ALRM** is set to zero.

Commissioning

Manual Override

Allows the outputs to be exercised during comm-issioning and maintenance activities. Holding the *override* button pressed until the Status Lamp flashes green will cause the controller to be switched from automatic control to *Override Mode*. Subsequent pressings of the manual override button will cycle through the available Override modes.

1) **Hold down Override until Status lamp flashes**

Submodule changes to Override Mode and runs pump set.

2) **Press Override again**

Submodule cancels Manual Override and reverts to automatic control.

As this feature does not time out, care should be exercised to ensure the module is returned to the automatic mode on completion of the commissioning or maintenance activities.

Occupancy Override can also be achieved via Doorway and Insite; using **AUTO** and **OVRD** monitoring parameters. The status lamp indication shows a different sequence.

Override from Off to ON :

Status lamp flashes long ON, short Off

Override from ON to Off :

Status lamp flashes long Off, short ON

See our 'Design Guide' publication for details of the Override features.

Registration

Registration is the simple process by which logical connections are made between Controllers in a SeaChange system; it is done during commissioning and involves pressing buttons on the Controllers in a specific sequence.

For further details of the registration process, see our 'Design Guide' publication.

Address Allocation and System Housekeeping

Like all SeaChange Controllers, the Changeover Submodule must be registered with other modules in order to create a working system. During the Registration procedure, the address of each Controller is allocated by the module that contains *System Housekeeping*. Check that you have an appropriate System Housekeeping Module; see our 'Design Guide' publication.

Interconnects

The Changeover Submodule will receive Control Demand signals from other modules to determine when it operates. (see **Demand Control** section).

See our 'Design Guide' publication for details of how to create interconnects.

M2		Monitoring Parameters			

Label	Doorway / InSite Code	Description	Units	Default Value	Range
FL A	I1 (C30)	Flow status pump A	-	-	0 to 1
FL B	I2 (C31)	Flow status pump B	-	-	0 to 1
FAIL	I5 (C34)	Single or Dual Pump Failure	-	-	0 to 1
PMPA	I6 (C35)	Triac output 1 status Pump A	-	-	0 to 1
PMPB	I7 (C36)	Triac output 2 status Pump B	-	-	0 to 1
ALRS	I8 (C37)	Triac output spare status Alarm Sounder	-	-	0 to 1
AUTO	W1 (C38)	Automatic/Manual Status	-	-	0 to 1
OVRD	W2 (C39)	Override	-	-	0 to 1
RSTA	W3 (C40)	Reset hours run pump A	-	-	0 to 1
RSTB	W4 (C41)	Reset hours run pump B	-	-	0 to 1
RNON	W5 (C42)	Enable pump run on	-	1	0 to 1
ACLR	W6 (C43)	Automatically clear alarms	-	1	0 to 1
SERV	W7 (C44)	Service Pin Message (to Doorway and InSite, self resetting)	-	-	0 to 1
HRSA	S1* (C50)	Hours run pump A	hrs	-	-
HRSB	S2* (C51)	Hours run pump B	hrs	-	-
MXDM	S3 (C52)	Control demand from parent module	%	-	-100 to +100
		Engineering Parameters; only accessible via Doorway and InSite			
NOAL	C90	No Alarms; all alarms cleared when set to 1	-	-	0 or 1
FLFA	C91	Flow Failed pump A (when set to 1)	-	-	0 or 1
FLFB	C92	Flow Failed pump B (when set to 1)	-	-	0 or 1
DPMF	C93	Dual Pump Failure (when set to 1)	-	-	0 or 1
STOP	C94	STOP alarm received (when set to 1)	-	-	0 or 1

* 24 hour plots available for these values
Plotting interval and plotted variable are fixed

Parameter details were correct at product software revision 4C1. Details of current version can be seen on website.

Configuration Parameters

Label	Doorway InSite Code	Description	Units	Default Value	Range
ALRM	C1	Alarm Mode 0: Ignore alarms 1: Report all alarms to Doorway/InSite, 2: Report all alarms, shut down on STOP alarm Send special STOP alarm to boiler on DPMF alarm	-	0	0 to 2
ALST	C2	Alarm report sense 0: Alarm if input = 0 (contact open), pump running if input = 1 (closed) 1: Alarm if input = 1 (contact closed), pump running if input = 0 (open)	-	0	0 to 1
FMD	C3	Failure Mode 1: Both pumps remain enabled 2: Last pump remains enabled 3: Both pumps disabled	-	2	1 to 3
DLAY	C4	Delay to wait for proof of flow	secs	10	1 to 250
MXHR	C5	Maximum hours run before duty pump changeover	hrs	24	1 to 200
MNON	C6	Minimum on time	mins	5	0 to 200
MXDY	C7	Maximum days off time for pump exercise	days	7	0 to 10
NPMP	C8	Number of pumps controlled	-	2	1 to 2
TYPE	C9	Output type (for SeaChange use only)	-	-	1 to 9

Parameter details were correct at product software revision 4C1. Details of current version can be seen on website.

M2 — Specification

Dimensions

46   16   39
110   55

all dimensions in mm
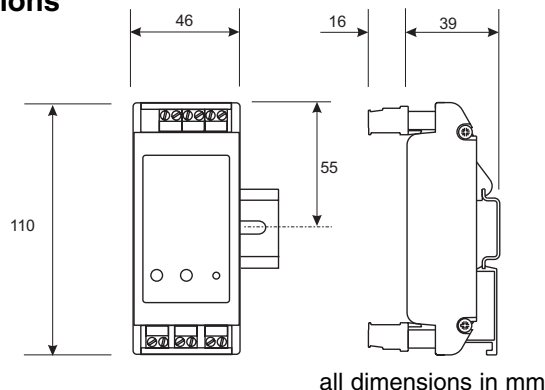
Electrical
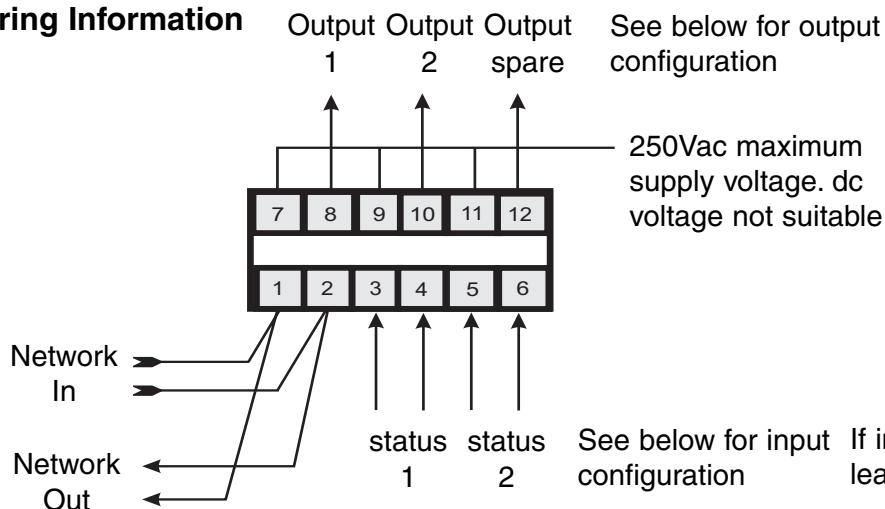|	
Inputs	2 VFC
Outputs	3 Triacs - 1A at 230V
Consumption	25mA from network

Physical
Weight	0.15 kg
Cover Material	PC/ABS alloy Self extinguishing to UL 94 V0/1.60
Base Material	Polyamide 6.6 Self extinguishing to UL 94 VO
Colour	Dark Grey to Pantone 425

CE Conformant product

Wiring Information

Output 1   Output 2   Output spare   See below for output configuration

250Vac maximum supply voltage. dc voltage not suitable

| 7 | 8 | 9 | 10 | 11 | 12 |
| 1 | 2 | 3 | 4 | 5 | 6 |

Network In

Network Out

status 1   status 2   See below for input configuration

If inputs are not being used, leave open circuit

IMPORTANT
All network and input cable from temperature sensors or VFC to be unscreened, twisted pair cable, 20AWG - Belden 8205 or direct equivalent

Options and Product Codes   Changeover SubModule

PCO / DIN / 3T / [driver option]

Driver options				Registered to BLR	Registered to ZON/ZSL/DHW/CLR/ POL/VTC/VTU/CTU
Option	Output 1	Output 2	Output spare		
/ 001	Pump A	Pump B	Alarm Sounder	Primary Pumps	
/ 002	Pump A	Pump B	Alarm Sounder	VT Pumps	
/ 003	Pump A	Pump B	Alarm Sounder	DHW Pumps	
/ 004	Pump A	Pump B	Alarm Sounder		Heating Optimum Start Switch
/ 005	Pump A	Pump B	Alarm Sounder		Heating Occupation Switch
/ 006	Pump A	Pump B	Alarm Sounder		Heating Demand
/ 007	Pump A	Pump B	Alarm Sounder		Cooling Optimum Start Switch
/ 008	Pump A	Pump B	Alarm Sounder		Cooling Occupation Switch
/ 009	Pump A	Pump B	Alarm Sounder		Cooling Demand

Input Configuration	Input 3-4 'status 1'	Input 5-6 'status 2'
	VFC status pump A	VFC status pump B