

CONTROLS, AIR-CONDITIONING, REFRIGERATION & BMS PRODUCTS

The UK Products Catalogue 2013



Welcome to the latest edition of Johnson Controls' UK Products Catalogue, which includes new products and features, as well as old favourites and best sellers.

We really value customers taking the time to provide feedback on our products. We never tire of improving our service and are ready to listen to your comments and suggestions.

NEW PRODUCTS

VA-748x Series



Universal Unitary Actuators – see pages 6 & 7

- Fits all leading makes of valves
- Forward or reverse acting
- Floating or modular control
- Variable speed to avoid cycling
- Detachable cabling to ease set-up and maintenance

TUC3 Series



Terminal Unit Controllers – see page 40

- Pre-configured – no software engineering required
- 230Vac power supply – saves transformer cost
- Full BACnet compliant – suited for Trend, Siemens and all other leading BMS
- Dip-switch application selection and unit variables – ideal for FCU, close-control AHU, chilled beam schemes

Bundle option available – consisting of controller, sensor and actuators

FULL BMS Compliant

ER Series



Heating Controller – see page 41

- Heating and ventilating applications by simple selection
- No software application engineering
- Temperature monitoring with clear LCD display
- Easy to set-up and use, with password protection
- Exterior keys for quick adjustment

Suitable for schools, health centres, libraries and other simple commercial applications.

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VALVE SIZING SOFTWARE

A copy of our Control Valve Sizing Software 'HIPPOS' can be obtained by contacting one of our Sales Support Team. This industry leading tool allows the sizing, selection and listing of control valves and actuators – saving huge amounts of time in the selection and records of valves for a project. You can easily export the schedule to the O&M Manual too!

TERMINAL & PIC ACTUATORS

Our actuator range for Terminal and PIC valves has been reduced due to the innovative feature of different stroke settings offered by the VA-748x Series actuators. These new actuators will work on all small Johnson Controls' valves and most other leading terminal valve manufactures in the market. Please refer to selection guide tables on pages 6 & 7.

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Pressure Independent Control Valves

VP1000 Series
DN15-32, PN25

The VP1000 pressure independent control valve is a combination of a differential pressure regulator and a regulating valve for flow adjustment.

Installation costs are considerably reduced as the valve performs the functions of two valves (balancing and adjustment). To adjust the flow rate, just set the selected value using the adjustment knob. Choosing the suitable valve is easy and fast. Flow rate is the only parameter to be considered.



Following actuators are available:

- VA-707x ON/OFF Thermal Actuators
- VA-709x Thermal 0-10Vdc Proportional Actuators
- VA-748x Floating and Proportional Actuators

FEATURES

- Kvs calculation in not necessary
- Valve authority calculation not required
- Specific devices or knowledge are not necessary
- Compact design
- Flow rate adjustment without disassembling the actuators
- Forged brass body

Ordering Codes	Connection	Body Size	Flow Rate	Pressure Port	List Price	
VP100AAA	BSP	15mm	150 l/h - 0.042 l/s	■	£162	
VP101AAA				-	£155	
VP100AAE			600 l/h - 0.167 l/s	■	£162	
VP101AAE				-	£155	
VP100AAG			780 l/h - 0.217 l/s	■	£172	
VP101AAG				-	£166	
VP100BAJ		20mm	1000 l/h - 0.278 l/s	■	£183	
VP101BAJ				-	£189	
VP100BAN			1500 l/h - 0.417 l/s	■	£148	
VP101BAN				-	£143	
VP100CAU			25mm	2200 l/h - 0.611 l/s	■	£209
VP100CAW					■	£225
VP100DAW		32mm	2700 l/h - 0.750 l/s	■	£249	
VP100DAY				■	£256	
				3000 l/h - 0.833 l/s	■	£256

Fluid Temperature - -10-+120°C
Max. working Pressure - 2500 kPa - 25 Bar (max.)
Fittings - BSP female threaded body

ACCESSORY

Ordering Code	Description	Price
T90	Pressure Plug (quantity 2)	£12

VALVE & ACTUATOR TABLES - Key to colours

- Actuators & valves with **M28 x 1.5** fittings
- Actuators & valves with **M30 x 1.5** fittings

Terminal Unit Valves

V5000 Series
DN10-20, PN16

These valves are primarily designed to regulate the flow of water and steam in response to the demand of a controller in zone and terminal unit applications.

Following actuators are available:

- VA-707x Thermal ON/OFF Actuators
- VA-709x Thermal Proportional Actuators
- VA-747x Floating and Proportional Actuators
- VA-748x Floating and Proportional Actuators (refer to Support Team)



FEATURES

- Forged brass body, stainless steel stem and spring
- Inherent flow characteristic: equal percentage
- Rangeability 50:1

Ordering Codes	Connection Size	Body Size	Kvs (Control)	Kvs (By-pass)	Close-off (kPa)	List Price		
2-way PDTC (Normally Open) Configuration								
V5210ZC	15mm	DN10	0.16	-	400	£28		
V5210BC			0.4			£28		
V5210CC			0.63			£28		
V5210DC			1			£28		
V5210EC			1.6			£28		
V5210JC			DN15			2.5	-	110
V5210KC	3.5	£31						
V5210MC	4.5	£50						
V5290BC	Compression **	DN10	0.4	-	400	£28		
V5290CC			0.63			£28		
V5290DC			1			£28		
V5290EC			1.6			£28		
3-way Mixing/Diverting Configuration								
V5810BC	15mm	DN10	0.4	0.3	120	£37		
V5810CC			0.63	0.4		£37		
V5810DC			1	0.63		£37		
V5810EC			1.6	1		£37		
V5810JC			DN15	2.5		1.6	150	£41
V5810KC				4		2.5		£41
V5810MC	28mm	DN20	5	3.5	110	£51		
3-way Mixing/Diverting with Built-in Bypass Configuration								
V5510BC	15mm	DN10	0.4	0.3	180	£41		
V5510CC			0.63	0.4		£41		
V5510DC			1	0.63		£41		
V5510EC			1.6	1		£41		
V5510JC			DN15	2.5		1.6	150	£47
V5510KC				4		2.5		£47
V5510MC	28mm	DN20	5	3.5	110	£57		
V5590BC	Compression **	DN10	0.4	0.3	180	£41		
V5590CC			0.63	0.4		£41		
V5590DC			1	0.63		£41		
V5590EC			1.6	1		£47		

Note: ** Order compression fitting kit (see below)

Fluid Temperatures - 2-120°C
Connections - BSP male, female and compression fittings

VG6000 Series

DN15-25, PN16

These valves are primarily designed to regulate the flow of water in response to the demand of a controller in zone and terminal unit applications.

Following actuators are available:

- VA-7030 ON/OFF Actuators
- VA-707x Thermal ON/OFF Actuators
- VA-709x Thermal Proportional Actuators
- VA-747x Electric Actuators
- VA-748x Floating and Proportional Actuators (refer to Support Team)



FEATURES

- Forged brass body
- 2-way PDTC (normally open), 3-way mixing and diverting, 3-way mixing and diverting with built-in bypass configurations
- Inherent flow characteristic: quick opening

Ordering Codes*	Connec. Size	Body Size	Kvs (Control)	Kvs (By-pass)	Close-off (kPa)	List Price
2-way PDTC (Normally Open) Configuration - Male Thread						
VG6210EC	1/2"	DN15	1.7	-	250	£23
VG6210JC	3/4"	DN20	2.6		150	£31
VG6210LC	1"	DN25	4.5		70	£51
3-way Mixing and Diverting Configuration						
VG6810EC	1/2"	DN15	1.7 (M), 1.7 (D)	1.2 (M), 1.3 (D)	250	£26
VG6810JC	3/4"	DN20	2.5 (M), 2.6 (D)	1.6 (M), 1.8 (D)	150	£36
VG6810LC	1"	DN25	4.5 (M), 4.5 (D)	3.1 (M), 4.5 (D)	70	£57
3-way Mixing and Diverting Configuration with built-in bypass						
VG6510EC	1/2"	DN15	1.7 (M), 1.7 (D)	1.2 (M), 1.3 (D)	250	£37
VG6510JC	3/4"	DN20	2.5 (M), 2.6 (D)	1.6 (M), 1.8 (D)	150	£44
VG6510LC	1"	DN25	4.5 (M), 4.5 (D)	3.1 (M), 4.5 (D)	70	£83

Note: M = Mixing, D = Diverting

Operation

Valve Type	Stem Movement / Flow	
	Actuator Stem down	Actuator Stem up
 2-Way PDTC (NO)		
 3-Way MIXING		
 3-Way DIVERTING		
 3-Way + bypass		
 3-Way + bypass		

Linear Actuators - for Terminal Unit Valves

VA-748x Series **NEW**

120N, Floating or Proportional Control

These actuators provide incremental or proportional control in terminal unit valve applications. Their compact design makes them suitable for installation in confined spaces, such as fan coil, chiller ceiling, manifold etc. applications.

They are designed for field mounting onto VG6000, V5000 and VP1000 terminal unit valves.

FEATURES

- Self calibrating
- Configurable to direct or reverse action
- Configurable stroke on VA-7482 models
- Double colour LED (status and diagnostics)
- Removable cable
- Different cable lengths (ordered separately)



Ordering Codes	Supply Voltage	Action Control	Actuator Speed	Field Config.	Mounting	List Price
VA-7480-0011	24Vac	Floating	13 sec/mm	-	M28 x 1.5 †	£92
VA-7481-0011			8 sec/mm			£92
VA-7480-0013			13 sec/mm			£97
VA-7481-0013			8 sec/mm			£97
VA-7482-0011	24Vac/dc	Proport.	8 sec/mm	-	M30 x 1.5 ††	£97
VA-7480-0001	24Vac	Floating	13 sec/mm			£92
VA-7481-0001			8 sec/mm			£92
VA-7480-0003			13 sec/mm			£97
VA-7481-0003	230Vac	Floating	13 sec/mm			£97
VA-7482-1001			24Vac/dc			Proport.
VA-7482-2001						

† For VG4000 & G5000 valves

†† For V5000, VG6000 & VP1000 (DN15 to DN32)

Size - 80 x 49 x 79.5mm

Cable length - 1.5m (standard)

Max. Fluid Temp. - 90°C

Protection Class - IP43

ACCESSORIES - Extended cable lengths (order separately)

Ordering Codes	Description	Price
VA-7480-CAB21	Floating 24V types - 2 metre length	POA
VA-7480-CAB31	" " - 3 metre length	POA
VA-7480-CAB51	" " - 5 metre length	POA
VA-7480-CAB71	" " - 7 metre length	POA
VA-7480-CAB11	" " - 10 metre length	POA
VA-7480-CAB23	Floating 230V types - 2 metre length	POA
VA-7480-CAB33	" " - 3 metre length	POA
VA-7480-CAB53	" " - 5 metre length	POA
VA-7480-CAB73	" " - 7 metre length	POA
VA-7480-CAB13	" " - 10 metre length	POA
VA-7482-CAB21	Proportional 24V types - 2 metre length	POA
VA-7482-CAB31	" " - 3 metre length	POA
VA-7482-CAB51	" " - 5 metre length	POA
VA-7482-CAB71	" " - 7 metre length	POA

Replacement Actuators

These versatile actuators replace old or obsolete Johnson Controls' actuators and can be used with other leading terminal valve manufactures in the market. Please refer to selection guide tables on this spread.

Old Johnson Controls Actuators	Replacement Actuators
VA-7450-1001 - Floating 24V - M28 x 1.5	VA-7480-0011
VA-7452-1001 - Proportional 24V - M28 x 1.5	VA-7482-0011
VA-7452-9001 - Proportional 24V - M28 x 1.5	VA-7482-0011
VA-7470-1001 - Floating 24V - M30 x 1.5	VA-7480-0001
VA-7472-1001 - Proportional 24V - M30 x 1.5	VA-7482-x001
VA-7472-9001 - Proportional 24V - M30 x 1.5	VA-7482-x001

Johnson Controls VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
VG4000	DN15-20	VA-7480-0011	VA-7480-0013	VA-7482-0011
VG5000	DN15-25	VA-7481-0011	VA-7481-0013	
VG6000	DN15-25			VA-7482-1001
V5000	DN10-20	VA-7480-0001	VA-7480-0003	VA-7482-2001
VP1000	DN15-20	VA-7481-0001	VA-7481-0003	VA-7482-1001
VP1000	DN25-32			VA-7482-3001

OTHER LEADING MANUFACTURERS

Sauter VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
VUL	DN10-20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-2001
BUL				
VXL				VA-7482-1001
BXL				
VCL	DN10-32			VA-7482-2001

Danfoss VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
AB-QM	DN10-20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
	DN25-32			VA-7482-3001

TA Hydronics VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
TBV-C	DN15-20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-2001
	DN25			VA-7482-3001
TBV-CM	DN15-25			
TBV-CMP				VA-7482-2001
KTCM512	DN15-20			

Honeywell VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
V5822A4xx	DN15-20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
V5823A4xx				
V5823C4xxx				

Fratelli Pettinaroli VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
91VL 1/2"	DN15	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
91L 1/2"				
91H 1/2"				
91L 3/4"				
91H 3/4"	DN20			
93L 1"				
93H 1"	DN25	VA-7482-3001		
93L 1 1/4"				
93H 1 1/4"	DN32			

Watts Industries VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
2131	DN15-25	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
3131				
4131				

Siemens VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
VVI46	DN15-25	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
VXI46				
VVP47	DN10-20			
VXP47				
VMP47				

Oventrop VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
CONCON QTZ	DN10-15	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
	DN20 (Low flow)			
	DN20 (High flow)			VA-7482-2001
	DN25-32			
CONCON 2TZ	DN15-20			
Tri-M Plus	DN15			

Schieder Electric VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
VZ28	DN15-20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
VZ38				
VZ48				
VZ28C				
VZ38C				
VZ48C				

Industrie Technik VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
VFX2	DN15-20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
VFX3				
VFX4				

Frese ENERGY SAVING VALVES

Valve Series	Size	Actuator Floating 24V	Actuator Floating 230V	Actuator Proportional 24V
DN10 M/M LOW 2.5	DN10	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
DN10 M/M LOW 5.0		**	**	**
DN10 M/M LOW 2.5	DN15	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
DN10 M/M LOW 5.0		**	**	**
DN15 M/M HIGH 2.5		**	**	**
DN20 M/M HIGH 2.5	DN20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
DN20 M/M HIGH 4.0		**	**	**
DN20 M/M HIGH 5.5		**	**	**
DN15 F/F LOW 2.5	DN15	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
DN15 F/F LOW 5.0		**	**	**
DN15 F/F HIGH 2.5		**	**	**
DN20 F/F HIGH 2.5	DN20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
DN20 F/F HIGH 4.0		**	**	**
DN20 F/F HIGH 5.0		**	**	**

** Item codes not released yet.

Actuator with special spindle (9.00 to 15.3mm) is needed.

Please contact the Sales Support Team in case of business opportunity.

Linear Plant Valves

VG7000 Series

DN15-50, PN16 Globe Valves

The VG7000 Series valves are primarily designed to regulate the flow of water and steam in response to the demand of a controller in heating, ventilating and air-conditioning systems.



FEATURES

- Cast bronze body
- 2-way PDTC (normally open), 2-way PDTO (normally closed), 3-way mixing configurations

BRASS TRIM VALVES

Ordering Codes	Body Size	Kvs (Control)	Slotted Stem*	Valve Stroke	List Price	
2-way PDTC (Normally Open) - Female Thread						
VG7201AS	DN15	0.25	■	8mm	£125	
VG7201AT			-		£125	
VG7201BS		0.4	■		£125	
VG7201BT			-		£125	
VG7201CS		0.63	■		£125	
VG7201CT			-		£125	
VG7201DS		1.0	■		£125	
VG7201DT			-		£125	
VG7201ES		1.6	■		£125	
VG7201ET			-		£125	
VG7201FS		2.5	■		£125	
VG7201FT			-		£125	
VG7201GS		4.0	■		£125	
VG7201GT			-		£125	
VG7201LT	DN20	6.3	-	8mm	£130	
VG7201NT	DN25	10	-	13mm	£186	
VG7201PT	DN32	16	-	19mm	£229	
VG7201RT	DN40	25	-	£353		
VG7201ST	DN50	40	-	£404		
2-way PDTO (Normally Closed) - Female Thread						
VG7401AT	DN15	0.25	-	0.25	£150	
VG7401BS			■		£150	
VG7401BT		-	0.4		£150	
VG7401CS		0.63	■		0.63	£150
VG7401CT			-			£150
VG7401DS		1.0	■		1.0	£150
VG7401DT			-			£150
VG7401ES		1.6	■		1.6	£150
VG7401ET			-			£150
VG7401FS		2.5	■		2.5	£150
VG7401FT			-			£150
VG7401GS		4.0	■		4.0	£150
VG7401GT			-			£150
VG7401LS		6.3	■		20mm	£150
VG7401LT	-		£152			
VG7401NT	DN20	10	-	25mm	£235	
VG7401PT	DN32	16	-	13mm	£255	
VG7401RT	DN40	25	-	£348		
VG7401ST	DN50	40	-	19mm	£441	

Fluid Temperature - 2-140°C (brass trim models), 2-170°C (stainless steel trim models)
Connections - BSP female threaded body

(continued next column)

STAINLESS STEEL TRIM VALVES

Ordering Codes*	Body Size	Kvs (Control)	Slotted Stem	Valve Stroke	List Price
2-way PDTC (Normally Open) - Female Thread					
VG7203AT	DN15	0.25	-	8mm	£207
VG7203BT		0.4			£207
VG7203CT		0.63			£207
VG7203DT		1.0			£207
VG7203ET		1.6			£207
VG7203FT		2.5			£207
VG7203GT		4.0			£207
VG7203LT	DN20	6.3	-	13mm	£235
VG7203NT	DN25	10	-	£298	
VG7203PT	DN32	16	-	£347	
VG7203RT	DN40	25	-	£502	
VG7203ST	DN50	40	-	£670	
2-way PDTO (Normally Closed) - Female Thread					
VG7403AT	DN15	0.25	-	8mm	£194
VG7403BT		0.4			£194
VG7403CT		0.63			£194
VG7403DT		1.0			£194
VG7403ET		1.6			£194
VG7403FT		2.5			£194
VG7403GT		4.0			£207
VG7403LT	DN20	6.3	-	£237	
VG7403NT	DN25	10	-	£307	
VG7403PT	DN32	16	-	£355	
VG7403RT	DN40	25	-	£558	
VG7403ST	DN50	40	-	£662	

Notes: * When using VA-7310 Series actuators a valve with a slotted stem (VG7xxxxS) is required.

Fluid Temperature - 120°C max. (in conjunction with VA-7310).

The valves and actuators can be ordered separately or factory mounted. When factory mounted, please add '+M' to the order code for the actuator. Please contact our Sales Support Team for mounting price.

Please refer to page 13 for 'Actuator Selection Tables'.

3-WAY MIXING CONFIGURATION - BRASS TRIM VALVES

Ordering Codes*	Body Size	Kvs (Control)	Slotted Stem*	Valve Stroke	List Price
3-way Mixing Configuration - Female Thread					
VG7802AS	DN15	0.25	■	8mm	£165
VG7802AT			-		£165
VG7802BS		0.4	■		£165
VG7802BT			-		£165
VG7802CS		0.63	■		£165
VG7802CT			-		£165
VG7802DS		1.0	■		£165
VG7802DT			-		£165
VG7802ES		1.6	■		£165
VG7802ET			-		£165
VG7802FS		2.5	■		£165
VG7802FT			-		£165
VG7802GS		4.0	■		£165
VG7802GT			-		£165
VG7802LS	DN20	6.3	■	£167	
VG7802LT			-	£167	
VG7802NT	DN25	10	-	13mm	£246
VG7802PT	DN32	16	-	£309	
VG7802RT	DN40	25	-	£418	
VG7802ST	DN50	40	-	£561	

(continued next page)

3-WAY MIXING CONFIGURATION - STAINLESS STEEL TRIM VALVES

Ordering Codes	Body Size	Kvs (Control)	Slotted Stem	Valve Stroke	List Price
3-way Mixing Configuration - Female Thread					
VG7804AT	DN15	0.25	-	8mm	£260
VG7804BT		0.4			£260
VG7804CT		0.63			£260
VG7804DT		1.0			£260
VG7804ET		1.6			£260
VG7804FT		2.5			£260
VG7804GT		4.0			£260
VG7804LT	DN20	6.3	-	13mm	£323
VG7804NT	DN25	10			£349
VG7804PT	DN25	16			£470
VG7804RT	DN32	25			£621
VG7804ST	DN40	40			£732

Fluid Temperature - 120°C max. (in conjunction with VA-7310)

The valves and actuators can be ordered separately or factory mounted. When factory mounted, please add '+M' to the order code for the actuator.

Please refer to page 13 for 'Actuator Selection Tables'.

VG8000N Series DN15-150, PN16 Flanged Valves

These valves are primarily designed to regulate the flow of water and steam applications.

A variety of electric and pneumatic actuators are available.

FEATURES

- Modular cast iron body
- Large range of valves
- Fluid temperature 0-180°C (with Glycerine cup -10-+180°C)



Ordering Codes*	Body Size	Kvs (Control)	List Price
2-way PDTC (Normally Open)			
VG82A9S1N	DN15	1.0	£427
VG82A8S1N		0.16	£427
VG82A7S1N		0.25	£427
VG82A6S1N		0.4	£427
VG82A5S1N		0.63	£427
VG82A4S1N		1.0	£427
VG82A3S1N		1.6	£427
VG82A2S1N		2.5	£427
VG82A1S1N		4.0	£427
VG82B1S1N		DN20	6.3
VG82C1S1N	DN25	10	£450
VG82D1S1N	DN32	16	£452
VG82E1S1N	DN40	25	£496
VG82F1S1N	DN50	40	£618
VG82G1S1N	DN65	63	£735
VG82H1S1N	DN80	100	£925
VG82J1S1N	DN100	160	£1,091
VG82K1S1N	DN125	250	£1,777
VG82L1S1N	DN150	350	£2,371

(continued next column)

Ordering Codes*	Body Size	Kvs (Control)	List Price
3-way Mixing Configuration			
VG88A6S1N	DN15	0.4	£587
VG88A5S1N		0.63	£587
VG88A4S1N		1.0	£587
VG88A3S1N		1.6	£587
VG88A2S1N		2.5	£587
VG88A1S1N		4.0	£587
VG88B1S1N	DN20	6.3	£590
VG88C1S1N	DN25	10	£598
VG88D1S1N	DN32	16	£624
VG88E1S1N	DN40	25	£717
VG88F1S1N	DN50	40	£821
VG88G1S1N	DN65	63	£981
VG88H1S1N	DN80	100	£1,255
VG88J1S1N	DN100	160	£1,687
VG88K1S1N	DN125	250	£2,736
VG88L1S1N	DN150	350	£3,260
3-way Diverting Configuration			
VG89A6S1N	DN15	0.4	£545
VG89A5S1N		0.63	£545
VG89A4S1N		1.0	£545
VG89A3S1N		1.6	£545
VG89A2S1N		2.5	£545
VG89A1S1N		4.0	£545
VG89B1S1N	DN20	6.3	£547
VG89C1S1N	DN25	10	£675
VG89D1S1N	DN32	16	£600
VG89E1S1N	DN40	25	£795
VG89F1S1N	DN50	40	£890
VG89G1S1N	DN65	63	£1,038
VG89H1S1N	DN80	100	£1,321
VG89J1S1N	DN100	160	£1,802
VG89K1S1N	DN125	250	£2,873
VG89L1S1N	DN150	350	£3,420

ACCESSORY

Ordering Code	Description	Price
VA1000-EP	Extension mounting kit for VP1000 series actuators when fluid temperature >140°C	£108

Notes: * For factory mounted valve actuators, add suffix '+M' to the actuator ordering code: i.e. VG8xxxS1N+M.

To order a valve with Glycerine cup packing, add suffix '20' to end of ordering code: i.e. VG8xxxS1N20.

Teflon free models are available on request.

Please refer to page 13 for 'Actuator Selection Tables'.

VG9000 Series

DN15-100, PN6 and PN10 Flanged Valves

These flanged valves are primarily designed to regulate the flow of water and low pressure steam in response to the demand of a controller, in heating, ventilating and air-conditioning systems.



Following electric actuators are available:

- VA-7700 for DN15-50 valves
- VA-7810 for DN15-65 valves
- VA-1000 for DN65-100 valves

FEATURES

- Modular cast iron body
- Kvs 0.63-160
- 2-way PDT0 (normally closed) and 3-way mixing configurations
- Fluid temperature 2-140°C
- DIN flanged

Ordering Codes*	Body Size	Kvs (Control)	List Price
PN6 - 2-way PDT0 (Normally Closed) Configuration			
VG94A5S1K	DN15	0.63	£232
VG94A4S1K		1.0	£232
VG94A3S1K		1.6	£232
VG94A2S1K		2.5	£232
VG94A1S1K		4.0	£232
VG94B1S1K	DN20	6.3	£254
VG94C1S1K	DN25	10	£264
VG94D1S1K	DN32	16	£307
VG94E1S1K	DN40	25	£328
VG94F1S1K	DN50	40	£370
VG94G1S1K	DN65	63	£481
VG94H1S1K	DN80	100	£660
VG94J1S1K	DN100	160	£978
PN6 - 3-way (Normally Closed) Configuration			
VG98A5S1K	DN15	0.63	£232
VG98A4S1K		1.0	£232
VG98A3S1K		1.6	£232
VG98A2S1K		2.5	£232
VG98A1S1K		4.0	£232
VG98B1S1K	DN20	6.3	£254
VG98C1S1K	DN25	10	£264
VG98D1S1K	DN32	16	£307
VG98E1S1K	DN40	25	£328
VG98F1S1K	DN50	40	£370
VG98G1S1K	DN65	63	£481
VG98H1S1K	DN80	100	£660
VG98J1S1K	DN100	160	£978

Note:

* For factory mounted valve actuators add '+M' to the actuator ordering code. i.e. VG9xxxS1K+M

Ordering Codes*	Body Size	Kvs (Control)	List Price
PN10 - 2-way PDT0 (Normally Closed) Configuration			
VG94A5S1L	DN15	0.63	£243
VG94A4S1L		1.0	£243
VG94A3S1L		1.6	£243
VG94A2S1L		2.5	£243
VG94A1S1L		4.0	£243
VG94B1S1L	DN20	6.3	£264
VG94C1S1L	DN25	10	£275
VG94D1S1L	DN32	16	£322
VG94E1S1L	DN40	25	£349

(continued next column)

Ordering Codes*	Body Size	Kvs (Control)	List Price
PN10 - 2-way PDT0 (Normally Closed) Configuration			
VG94F1S1L	DN50	40	£386
VG94G1S1L	DN65	63	£507
VG94H1S1L	DN80	100	£692
VG94J1S1L	DN100	160	£1,030
PN10 - 3-way (Normally Closed) Configuration			
VG98A5S1L	DN15	0.63	£243
VG98A4S1L		1.0	£243
VG98A3S1L		1.6	£243
VG98A2S1L		2.5	£243
VG98A1S1L		4.0	£243
VG98B1S1L	DN20	6.3	£264
VG98C1S1L	DN25	10	£275
VG98D1S1L	DN32	16	£322
VG98E1S1L	DN40	25	£349
VG98F1S1L	DN50	40	£386
VG98G1S1L	DN65	63	£507
VG98H1S1L	DN80	100	£692
VG98J1S1L	DN100	160	£1,030

Note:

* For factory mounted valve actuators just add '+M' to the actuator ordering code. i.e. VG94xxxS1K+M

Please refer to page 14 for 'Actuator Selection Tables'.

ACCESSORY

Ordering Code	Description	Price
VA1000-EP	Extension mounting kit for VP1000 series actuators when fluid temperature >140°C	£108

Linear Actuators - for Plant Valves

PA-2000 Series

ON/OFF Control (Pneumatic)

PA-2000 actuators can be combined with VG8000 (H, N, V) and VG8300 (H, N) series in accordance with the maximum close-off pressure ratings specified.

The fail safe position can be changed in-situ with a conversion kit.

FEATURES

- Manual override
- Teflon free series
- Reversible action in-situ
- Accessories available



Ordering Codes*	Spring Range	Diaphragm Area	Stroke	Handwheel	List Price
PA-20xy-Z2K2	20-50 kPa	150cm ²	13mm	-	POA
PA-21xy-Z2K7	70-100 kPa			■	POA
PA-20xy-Z3K2	20-50 kPa	300cm ²	25mm	-	POA
PA-21xy-Z3K7	70-100 kPa			■	POA
PA-20xy-Z6K2	20-50 kPa	600cm ²	42mm	-	POA
PA-21xy-Z6K7	70-100 kPa			■	POA
PA-20xy-Z7K2	20-50 kPa		25mm	-	POA
PA-21xy-Z7K7	70-100 kPa			■	POA

Notes: *x: 0 = Without positioner
3 = With positioner (PR10)

y: 0 = Without switches and potentiometer

Z: 3 = Standard models
9 = Teflon free

K: 1 = DA Actuator stem extend (spring return UP)
2 = RA Actuator stem retract (spring return DOWN)

Please call our Sales Support Team for your requirements and list prices.

RA-3000 Series 1600 and 3000N, Floating or Proportional Control

The RA-3000 series synchronous motor-driven, reversible actuators feature factory calibrated pressure switches to provide specified close-off ratings. These actuators can be used with flanged valves according to maximum close-off pressure ratings specified.

The RA-3000 actuators are designed for field mounting onto VG8000N and VG9000 valves.

FEATURES

- Uses synchronous motor with pressure switches
- Special clamp coupler quick-fit systems
- Positioner with adjustable starting point, span and direct/reverse action
- Optional auxiliary switches, feedback potentiometer and hand crank



Ordering Codes	Supply Voltage	Force	Hand Crank	Variations*		List Price		
				Y	Z			
RA-3000-7126	24V	1600N	-	-	-	£863		
RA-3003-7126			-	■	-	£1,095		
RA-3041-7126			-	-	■	£1,353		
RA-3100-7126			-	-	■	£913		
RA-3000-7127			-	-	-	£750		
RA-3003-7127	230V	1600N	-	■	-	£1,128		
RA-3100-7127			-	-	■	£913		
RA-3103-7127			-	■	-	£1,218		
RA-3000-7226			24V	1800N	-	-	-	£825
RA-3003-7226					-	■	-	£1,095
RA-3041-7226	-	-			■	£1,353		
RA-3100-7226	-	-			■	£847		
RA-3103-7226	-	■			-	£1,057		
RA-3141-7226	230V	1800N	-	-	■	£1,289		
RA-3000-7227			-	-	-	£750		
RA-3003-7227			-	■	-	£1,128		
RA-3103-7227			-	■	-	£1,138		
RA-3000-7325			24V (60Hz)	3000N	-	-	-	£860
RA-3041-7325	-	■			-	£1,374		
RA-3103-7325	-	-			■	£1,215		
RA-3141-7325	-	■			-	£1,448		
RA-3000-7326	24V (50Hz)	3000N			-	-	-	£860
RA-3003-7326			-	■	-	£1,057		
RA-3041-7326			-	-	■	£1,276		
RA-3100-7326			-	-	■	£957		
RA-3103-7326			-	■	-	£1,164		
RA-3141-7326	230V (50Hz)	3000N	-	-	■	£1,383		
RA-3000-7327			-	-	-	£860		
RA-3003-7327			-	■	-	£1,138		
RA-3100-7327			-	-	■	£1,031		
RA-3103-7327			-	■	-	£1,253		

* Variations:

Y = Two auxiliary switches and two 2 kΩ feedback potentiometers

Z = Built-in positioner 0-10Vdc and two auxiliary switches (only 24Vac models)

Supply Voltage - 24V or 230V, 50/60Hz

Nominal Stroke - 13mm (1600N), 25mm (1800N), 42mm (3000N)

Auxiliary Switches - 5(3)A, 230V 50/60Hz

Size - 345 x 186 x 186mm

Protection Class - IP54

VA1000 Series 2000 and 2500N, Floating or Proportional Control

These valve-actuators are of modular construction so that the required type of control signal is achieved simply by fitting a module with the required function in-situ. It can be mounted onto VG8000 (H, N, V), VG8300N&H and VG9000 series valves.

FEATURES

- Manual override and automatic stem coupling
- Actuator fixed to valve with one ring nut
- Self adjusting, automatic stroke adjustment, calibrated pressure control at the end positions
- Two auxiliary switches, feedback potentiometer and split range unit available
- Selectable characteristic curve and running time
- 230Vac power supply module available



Ordering Codes	Supply Voltage	Force	Spring Return *	List Price
VA1125-GGA-1	24Vac	2500N	None	£587
VA1220-GGA-1		2000N	Retracts	£744
VA1420-GGA-1			Extends	£743

* On power failure

ACCESSORIES (for in-situ installation)

Ordering Codes	Description	Price
VA1000-M230N	230Vac Module	£43
VA1000-P2	2 kΩ feedback potentiometer	£101
VA1000-S2	2 x SPDT auxiliary switches	£85
VA1000-SRU	Split range unit module for proportional actuators only	£60
VA1000-EP	Extension kit for applications with temp. 140-200°C	£108

Nominal Stroke - 49mm

Size - 230 x 136/149 x 263mm

Protection Class - IP66

VA-715x Series 500N, Floating or Proportional Control

The VA-7150 series synchronous motor driven actuator provide control with up to 19mm stroke.

These actuators can be easily installed on site or ordered pre-fitted to VG7000, VGS800 and VG9000 flanged valve series in accordance with the specified maximum close-off pressure ratings.

FEATURES

- Compact unit for 500N force
- Magnetic clutch and unique yoke design
- Coupler for simple actuator attachment to flanged valves
- Positioner with adjustable starting point and span, reverse and direct action modes
- "Signal fail" safe position



Ordering Codes	Supply Voltage	Action Control	Coupler Type	Force	List Price
VA-7150-1001	24Vac	Floating	Threaded	500N	£180
VA-7150-1003	230Vac				£180
VA-7150-8201	24Vac		Slotted		£186
VA-7150-8203	230Vac				£186
VA-7152-1001	24Vac	Proportional 0-10V	Threaded	£279	
VA-7152-8201			Slotted	£292	

Supply Voltage - 24V or 230V, 50/60Hz

Nominal Stroke - 19mm max.

Size - 153 x 97.5mmØ

Protection Class - IP40

VA-7200 Series
1000N, Floating or Proportional Control

This synchronous motor driven actuator provides control of valves with up to 19mm stroke.

These actuators can be easily field mounted or ordered factory coupled to VG7000, VG8000 (H, N, V), VG9000 and VGS800 series valves in accordance with the specified maximum close-off pressure ratings.

FEATURES

- Compact unit for 1000N force output
- Magnetic clutch
- 'Signal fail' safe position



Ordering Codes	Supply Voltage	Action Control	Force	List Price
VA-7200-1001	24Vac	Floating	1000N	£308
VA-7202-1001		Proportional		£453

Supply Voltage - 24Vac, 50/60Hz
 Action Control - Floating or Proportional
 0-10Vdc, 0(4)-20mA

Nominal Stroke - 20mm max.
 Size - 198 x 106mmØ, 198 x 225mmØ
 Protection Class - IP40 or IP42

VA-7700 Series
500N, Floating or Proportional Control

The VA-7700 series are designed for mounting onto VG7000, VGS800 and VG9000 valves.

FEATURES

- Manual override
- LED operating status display
- Self calibrating



Ordering Codes	Supply Voltage	Action Control	Override		List Price
			Manual	Electrical	
For VG7000 Series Valves					
VA-7700-1001	24Vac	Floating	-	-	£164
VA-7740-1001			■	-	£206
VA-7700-1003	230Vac		-	-	£144
VA-7740-1003			■	-	£206
VA-7706-1001	24Vac	Proportional	-	■	£332
VA-7746-1001			■	■	£374
VA-7700-8201	24Vac	Floating	-	-	£166
VA-7740-8201			■	-	£209
VA-7700-8203	230Vac		-	-	£166
VA-7740-8203			■	-	£209
VA-7706-8201	24Vac	Proportional	-	■	£277
VA-7746-8201			■	■	£305

Supply Voltage - 24Vac or 230Vac, 50/60Hz
 Stroke - 20mm
 Full Stroke Time - 190 sec.
 Size - 178 x 159 x 131mm
 Protection Class - IP54

VA7800 Series
1000N, ON/OFF, Floating or Proportional Control

Spring return and non-spring return actuator with 1000N thrust for valves in heating, ventilation and air-conditioning applications. All models have manual override as standard. Proportional models are self-calibrating.

This actuator is intended for use with VG7000 and VGS800 threaded valves as well as VG9000, VG8000 (H, N, V) and VG8300N&H flanged valves.

FEATURES

- Proportional actuators are self-calibrating
- Force controlled motor shut-off
- Manual override as standard and status LED
- Models with optional aux. switches or 2 kΩ feedback potentiometer
- Control-signal failure - stem to pre-determined position
- Stroke position indicator



Ordering Codes	Supply Voltage	Action Control	Spring Return**	2 x Aux. Switches	2 KΩ pot.	List Price
For VG7000 Series Valves						
VA7810-ADA-11	230Vac	ON/OFF or Floating	-	-	-	£272
VA7810-ADC-11				■		£356
VA7810-AGA-11	-			£271		
VA7810-AGC-11	■			£338		
VA7810-AGH-11	24Vac	ON/OFF, Floating or Proport.*	-	-	■	£338
VA7810-GGA-11				-	-	£366
VA7810-GGC-11				■	-	£423

For VGS8000 / VG8000 / VG9000 Series Valves						
VA7810-ADA-12	230Vac	ON/OFF or Floating	-	-	-	£288
VA7810-ADC-12				■		£356
VA7810-AGA-12	-			£271		
VA7810-AGC-12	■			£338		
VA7810-AGH-12	24Vac	ON/OFF, Floating or Proport.*	-	-	■	£338
VA7810-GGA-12				-	-	£373
VA7810-GGC-12				■	-	£423

For VG7000 Series Valves						
VA7820-GGA-11	24Vac	ON/OFF, Floating or Proport.*	Retracts	-	-	£388
VA7820-GGC-11				■		£568
VA7830-GGA-11			Extends	-		£397
VA7830-GGC-11				■		£568

For VGS8000 / VG8000 / VG9000 Series Valves						
VA7820-GGA-12	24Vac	ON/OFF, Floating or Proport.*	Retracts	-	-	£397
VA7820-GGC-12				■		£464
VA7830-GGA-12			Extends	-		£395
VA7830-GGC-12				■		£464

* Full stroke time 150 secs (selectable 75 sec.)
 ** On power failure

Supply Voltage - 24Vac or 230Vac, 50/60Hz
 Stroke - 7-25mm
 Auxiliary Switches - 2(1)A, 230V 50/60Hz
 Full Stroke Time - 150 sec. (selectable 75 sec. on proportional models)
 Cable - 1.5m length
 Size - 212 x 115 x 231mm
 Protection Class - IP54

Actuator Selection Tables

VG7000 Series

DN15-50, PN16 Threaded Valves

BRASS TRIM VALVES - 2-WAY & 3-WAY MIXING CONFIGURATIONS

Actuator Codes		VA-77xx	VA-78xx
Force		500N	1000N
Valve Body Size	Kvs	Close-off Pressure (kPa)	
DN15	0.25 / 0.4	1600	-
	0.63 / 1.0 / 1.6		
	2.5 / 4.0		
DN20	6.3	950	
DN25	10	595	1235
DN32	16	360	750
DN40	25	235	480
DN50	40	145	310

STAINLESS STEEL TRIM VALVES - 2-WAY & 3-WAY MIXING CONFIGURATIONS

Actuator Codes		VA-77xx	VA-78xx
Force		500N	1000N
Valve Body Size	Kvs	Close-off Pressure (kPa)	
DN15	0.25 / 0.4	1600	1600
	0.63 / 1.0 / 1.6		
	2.5 / 4.0		
DN20	6.3	595	1220
DN25	10	370	770
DN32	16	230	470
DN40	25	145	300
DN50	40	90	190

Notes: FA-2000 / 3000 heavy duty actuators are available on request if a higher close-off is required.

VG8000N Series

DN15-150, PN16 Flanged Valves

2-WAY PDTC - (Normally Open), 3-WAY MIXING AND 3-WAY DIVERTING CONFIGURATIONS

Actuator Codes		FA-2000-741x	FA-2000-751x	FA-3300	VA-1x20*	VA-1125*	VA-78xx
Force		150N	2200N	6000N	2000N	2500N	1000N
Valve Body Size	Kvs	Close-off Pressure (kPa)					
DN15	0.1 / 0.16 / 0.25	-	-	-	-	1600	1600
	0.4 / 0.63 / 1.0						
	1.6 / 2.5 / 4.0						
DN20	4.0 / 6.3						
DN25	6.3 / 10						1570
DN32	10 / 16						770
DN40	16 / 25						440
DN50	40		1030		800	1080	-
DN65	53		790		630	830	
DN80	100		370		380	390	
DN100	160	190		740	160	230	
DN125	250	110		460	90	140	
DN150	350	50		280	40	75	

Notes: FA-2000 / 3000 heavy duty actuators are available on request if a higher close-off is required.

* For fluid temperature >140°C the extension kit VA1000-EP must be fitted.

Actuator Selection Tables (cont)

VG9000 Series

DIN15-100, PN6 & PN10 Flanged Valves

PN6, 2-WAY PDTC - (Normally Open) CONFIGURATION

Actuator Codes		RA-3000-732x	VA-1x20-GGA-1**	VA-1125-GGA-1**	VA-77xx-820x	VA-78xx-xxx-12			
Torque		3000N	2000N	2500N	500N	1000N			
Valve Body Size	Kvs	Close-off Pressure (kPa)							
DN15	0.63 / 1.0	-	-	-	600	600			
	1.6 / 2.5 / 4.0								
DN20	6.3				590	600			
DN25	10								
DN32	16				360	600			
DN40	25				190	480			
DN50	40				100	290			
DN65	63				470	620	150		
DN80	100				510	300	400	-	-
DN100	160				320	180	240	-	-

PN6, 3-WAY MIXING CONFIGURATION

Actuator Codes		RA-3000-732x	VA-1x20-GGA-1**	VA-1125-GGA-1**	VA-77xx-820x	VA-78xx-xxx-12			
Torque		3000N	2000N	2500N	500N	1000N			
Valve Body Size	Kvs	3-way Mixing Configuration							
DN15	0.63 / 1.0	-	-	-	600	600			
	1.6 / 2.5 / 4.0								
DN20	6.3				490	600			
DN25	10								
DN32	16				280	600			
DN40	25				130	440			
DN50	40				60	260			
DN65	63				470	620	130		
DN80	100				510	300	400	-	-
DN100	160				320	180	240	-	-

Note: ** For fluid temperature >140°C the extension kit VA1000-EP must be mounted.

PN10, 2-WAY PDTC (Normally closed) CONFIGURATION

Actuator Codes		RA-3000-732x	VA-1x20-GGA-1**	VA-1125-GGA-1**	VA-77xx-820x	VA-78xx-xxx-12		
Torque		3000N	2000N	2500N	500N	1000N		
Valve Body Size	Kvs	Close-off Pressure (kPa)						
DN15	0.63 / 1.0	-	-	-	1000	1000		
	1.6 / 2.5 / 4.0							
DN20	6.3				980	1000		
DN25	10							
DN32	16				640	900		
DN40	25				400	510		
DN50	40				210	310		
DN65	63				110	160		
DN80	100				470	620	-	-
DN100	160				510	300	400	-
		320	180	240				

PN10, 3-WAY MIXING CONFIGURATION

Actuator Codes		RA-3000-732x	VA-1x20-GGA-1**	VA-1125-GGA-1**	VA-77xx-820x	VA-78xx-xxx-12		
Torque		3000N	2000N	2500N	500N	1000N		
Valve Body Size	Kvs	Close-off Pressure (kPa)						
DN15	0.63 / 1.0	-	-	-	1000	1000		
	1.6 / 2.5 / 4.0							
DN20	6.3				880	1000		
DN25	10							
DN32	16				430	790		
DN40	25				240	420		
DN50	40				110	240		
DN65	63				40	120		
DN80	100				470	620	-	-
DN100	160				510	300	400	-
		320	180	240				

Note: ** For fluid temperature >140°C the extension kit VA1000-EP must be mounted.

Ball Valves

VG1205, VG1805 Series

2 and 3-way SS Screwed Control Valves with Stainless Steel Ball

These ball valves are primarily designed to regulate the flow of hot or chilled water and low-pressure steam in response to the demand of a controller in heating, ventilating and air-conditioning systems.



Following actuators are available:

ON/OFF, Floating or Proportional actuators - VA9104 Direct Mounted Non-spring Return Actuators, M9108 Non-spring Return Actuators, VA9203 and VA9208 Spring Return Actuators

FEATURES

- Forged brass body
- Inherent equal percentage flow characteristic in the in-line port of all valves

Ordering Codes	Body Size	Kvs (Control Port)	List Price	
2-way Valves - Female Thread				
VG1205AD	DN15	1.0	£65	
VG1205AE		1.6	£65	
VG1205AF		2.5	£65	
VG1205AG		4.0	£65	
VG1205AL		6.3	£65	
VG1205AN		10	£65	
VG1205BL		DN20	6.3	£69
VG1205BN			10	£69
VG1205CN			10	£71
VG1205CP		DN25	16	£71
VG1205DP	16		£130	
VG1205DR	DN32	25	£130	
VG1205ER		25	£170	
VG1205ES		40	£170	
VG1205FS	DN50	40	£230	
VG1205FT		63	£230	
3-way Valves - Female Thread				
VG1805AD	DN15	1.0	£105	
VG1805AE		1.6	£105	
VG1805AF		2.5	£105	
VG1805AG		4.0	£105	
VG1805AL		6.3	£105	
VG1805AN		10	£102	
VG1805BL	DN20	6.3	£109	
VG1805BN		10	£105	
VG1805CN		10	£140	
VG1805CP	DN25	16	£134	
VG1805DP		16	£221	
VG1805DR	DN32	25	£211	
VG1805ER		25	£322	
VG1805ES		40	£308	
VG1805FS	DN50	40	£447	
VG1805FT		63	£427	

(Other sizes on request)

Fluid Temperatures - -30--140°C (-30--100°C with VA9104) stainless steel ball and stem fluid types

Connections - BSP female threaded body

See page 17 for 'Actuator Selection Tables'.

ACCESSORIES

Ordering Codes	Description	Price
M9000-520-5	Ball valve linkage for M9206-xxx-5S	£30
M9000-525-5	Linkage kit for mounting to M9108 series actuators	£30

VG1xE5 Series

DN65-100, DIN Flanged, PN16 Control Ball Valves

With the introduction of this valve we are extending our HVAC control ball family which offers larger valve sizes. This gives significant cost advantages compared to the VG8000 PN16 or VG9000 PN10 series providing high close-off pressure and identical face to face dimensions.

All valves are operated by remote mounted non-spring return and spring return rotary actuators.

FEATURES

- Forged brass body
- Stainless steel ball
- Inherent equal percentage flow characteristic in the in-line port of all valves



Ordering Codes	Body Size	Kvs (Control)	List Price
2-way Valves - Flanged			
VG12E5GT	DN65	63	£458
VG12E5GU		100	£458
VG12E5HU	DN80	180	£496
VG12E5HW			£496
VG12E5JV		DN100	150
3-way Valves - Flanged			
VG18E5GT	DN65	40	£821
VG18E5GU		63	£821
VG18E5HU	DN80	75	£840
VG18E5HW			£840
VG18E5JV		DN100	75

Fluid Temperature Limits - Water: -18--140°C
Steam: max. 172 kPa

Rotary Actuators - Valve Family

VA9104-xGA-1S

Series (Joventa BAD1.4 / BAD1 / BMD1.2)

4 Nm Actuators ON/OFF, Floating or Proportional Control

This series of actuators has been developed for operation of ball valves.

These synchronous, motor driven actuators are used to provide accurate positioning on VG1000 series DN15, DN20 and DN25 ball valves.

FEATURES

- Load-independent running time
- Up to five actuators in parallel operation possible
- Manual release button
- Selectable direction of rotation
- Automatic shut-off at end position



Ordering Codes		Control Signals	Supply Voltage	Connection	List Price
Johnson Contr.	Joventa				
4 Nm Actuators					
VA9104-IGA-1S	BAD1	ON/OFF or Floating*	24Vac	Cable	£124
VA9104-GGA-1S	BMD1.2	Proportional			£159

* With timeout

Supply Voltage - 24Vac, 50/60Hz

Control Signal - ON/OFF, Floating or Proportional 0(2)-10Vdc, 0(4)-20mA

Running Time - 72 sec.

Connection - PVC cable (1.2m)

Size - 67 x 140 x 71mm

Protection Class - IP42 (-1S types)

M9108-xxx-5 Series
(Joventa BAS1 / BAS2 / BMS1.1)
8 Nm Actuators
ON/OFF, Floating or Proportional



This series has been developed for operating VG1000 series ball valves. The actuators can be mounted onto the valves by the means of the M9000-525-5 linkage kit.

FEATURES

- Halogen-free connecting wire
- Load-independent running time
- Easy assembly on the console
- Selectable direction of rotation
- Manual adjustment by pushing the release button and turning the handle with position indicator (the release button does not automatically spring back into position)
- Automatic switching off in the limit positions

Ordering Codes		Control Signals	Supply Voltage	2 x Aux. Switches	List Price
Johnson Contr.	Joventa				
8 Nm Actuators					
M9108-AGA-5	BAS1	ON/OFF or Floating	24Vac/dc	-	£157
M9108-AGC-5	BAS1.S		24Vac/dc	■	£186
M9108-ADA-5	BAS2		230Vac	-	£148
M9108-ADC-5	BAS2.S		230Vac	■	£186
M9108-GGA-5	BMS1.1	Proportional	24Vac/dc	-	£173
M9108-GGC-5	BMS1.1S		24Vac/dc	■	£225

ACCESSORY

Ordering Code	Description	Price
M9000-525-5	Linkage kit for mounting VG1000 series ball valves	£30

Supply Voltage - 24vac/dc, 230Vac, 50/60Hz Size - 180 x 100 x 67.5mm
 Running Time - 30 sec. Protection Class - IP54
 Auxiliary Switches - SPDT

VA9203 Series
3 Nm, Spring Return Actuators
ON/OFF, Floating or Proportional Control



These bi-directional, direct-mount spring return actuators are used to provide accurate positioning on VG1000 series, DN15 up to DN25, ball valves in heating, ventilating and air-conditioning (HVAC) applications.

An integral, line voltage auxiliary switch is available on the VA9203-xxB-1(Z) models, to indicate end-stop position or to perform switching functions within the selected rotation range. When power fails during service, the mechanical spring return system opens or closes the valve ports.

FEATURES

- Mechanical spring return system
- Direct-coupled design
- Reversible mounting
- Double-insulated construction
- Optional integrated auxiliary switch

Ordering Codes	Control Signals	Supply Voltage	1 x Aux. Switches	List Price
3 Nm Actuators				
VA9203-GGA-1Z	Proportional	24Vac/dc	-	£236
VA9203-GGB-1Z			■	£271
VA9203-AGA-1Z	ON/OFF or Floating	24Vac/dc	-	£209
VA9203-AGB-1Z			■	£251

(continued next column)

Ordering Codes	Control Signals	Supply Voltage	1 x Aux. Switches	List Price
VA9203-BGA-1	ON/OFF	24Vac/dc	-	£147
VA9203-BGB-1			■	£197
VA9203-BUA-1		100-240Vac	-	£162
VA9203-BUB-1			■	£205

Supply Voltage - 24Vac/dc, 120Vac, 240Vac, 50/60 Hz
 Control Signals - ON/OFF, Floating or Proportional 0(2)-10V, 0(4)-20mA
 Rotation Range - 95° max. full stroke (adjustable 35-95°)
 Auxiliary Switch - 1 x SPDT 240Vac, 5A / 120Vac, 5.8A and 24Vac, 50VA
 Size - 124 x 82 x 71mm
 Protection Class - IP54

VA9208 Series
8 Nm, Spring Return Actuators
ON/OFF, Floating or Proportional Control



The VA9208 series of electric spring return actuators are direct-mount actuators.

These bi-directional actuators are used to provide accurate positioning on VG1000 series, DN32 up to DN50, ball valves in heating, ventilating and air-conditioning (HVAC) applications.

Two integral, line voltage auxiliary switches are available only on the VA9208-xxC-1 models, to indicate end-stop position or to perform switching functions within the selected rotation range. A graduated scale from 0 to 100% and a position indicator provide visual indication of the valve opening. When power fails during service, the mechanical spring return system opens or closes the valve ports.

FEATURES

- Mechanical spring return system
- Direct-coupled design
- Reversible mounting
- Double-insulated construction
- Optional integrated auxiliary switches

Ordering Codes	Control Signals	Supply Voltage	2 x Aux. Switches	List Price
8 Nm Actuators				
VA9208-GGA-1	Proportional	24Vac/dc	-	£291
VA9208-GGC-1			■	£330
VA9208-AGA-1	ON/OFF or Floating	24Vac/dc	-	£271
VA9208-AGC-1			■	£310
VA9208-BGA-1	ON/OFF	24Vac/dc	-	£211
VA9208-BGC-1			■	£251
VA9208-BDA-1		100-240Vac	-	£231
VA9208-BDC-1			■	£271

Supply Voltage - 24Vac/dc, 120Vac, 240Vac, 50/60 Hz
 Control Signals - ON/OFF, Floating or Proportional 0(2)-10V, 0(4)-20mA
 Rotation Range - 95° max. full stroke (adjustable 35-95°)
 Auxiliary Switch - 2 x SPDT 240Vac, 5A / 120Vac, 5.8A and 24Vac, 50VA
 Size - 124 x 82 x 71mm
 Protection Class - IP54

General Accessories

For VA9203 Series & VA9208 Series

Ordering Codes	Description	Price
M9000-200	Commissioning Tool - control signal to drive 24V on/off, floating, proportional and/or resistive electric actuator	£906
M9000-560	Ball Valve Linkage Kit for applying M9203 and M9208 series ctuators to VG1000 series valves	£17
M9000-561	Thermal Barrier extends M/VA9104, M/VA9203, and M/VA9208 series actuators	£19
M9000-341	Weathershield Kit for VG1000 ball valves of M/VA9104, M/VA9203, and M/VA9208 actuators	£255
M9000-607	Position indicator for VG1000 valve applications (5 off)	£13

Note: Replacement parts are available. Please see data sheet.

Actuator Selection Tables

VG1205, VG1805 Series

DN15-50, Threaded Valves

PROPORTIONAL ACTUATORS (Factory-mounted valve/actuator assemblies)

Spring Return	-				■			
Supply Voltage	24Vac				24Vac			
Torque	4 Nm		8 Nm		3 Nm		8 Nm	
Aux. Switches	-		2 x SPDT		-		1 x SPDT	
Actuator Codes	VA9104-GGA-1S	M9108-GGA-5	M9108-GGC-5	VA9203-GGA-1Z	VA9203-GGB-1Z	VA9208-GGA-1	VA9208-GGC-1	
Linkage Codes	M9000-525-5				-			
Ordering Code Suffix for Assemblies	+5A4GGA +6A4GGA ‡	+5A8GGA	+5A8GGC	+533GGA (SO) +633GGA (SO)‡ +553GGA (SC) +653GGA (SC)‡	+533GGB (SO) +633GGB (SO)‡ +553GGB (SC) +653GGB (SC)‡	+538GGA (SO) +638GGA (SO)‡ +558GGA (SC) +658GGA (SC)‡	+538GGC (SO) +638GGC (SO)‡ +558GGC (SC) +658GGC (SC)‡	
Valve Body Size	Valid combinations of valves, linkages and actuators							
DN15	■	■	■	■	■	-	-	
DN20	■	■	■	■	■	-	-	
DN25	■	■	■	■	■	-	-	
DN32	-	■	■	-	-	■	■	
DN40	-	■	■	-	-	■	■	
DN50	-	■	■	-	-	■	■	

Note: FA-2000 / 3000 heavy duty actuators are available on request if a higher close-off is required. (SO) = Spring opens, (SC) = Spring closes, ‡ M9000-561 Thermal barrier included

FLOATING OR ON/OFF ACTUATORS (Factory-mounted valve/actuator assemblies)

Spring Return	-					■			
Supply Voltage	24Vac *			230Vac **		24Vac *			
Torque	4 Nm		8 Nm			3 Nm		8 Nm	
Aux. Switches	-		2 x SPDT			-		1 x SPDT	
Actuator Codes	VA9104-IGS-1S	M9108-AGA-5	M9108-AGC-5	M9108-ADA-5	M9108-ADC-5	VA9203-AGA-1Z	VA9203-AGB-1Z	VA9208-AGA-1	VA9208-AGC-1
Linkage Codes	M9000-525-5					-			
Ordering Code Suffix for Assemblies	+5A4IGA +6A4IGA ‡	+5A8AGA	+5A8AGC	+5A8ADA	+5A8ADC	+533AGA (SO) +633AGA (SO)‡ +553AGA (SC) +653AGA (SC)‡	+533AGB (SO) +633AGB (SO)‡ +553AGB (SC) +653AGB (SC)‡	+538AGA (SO) +638AGA (SO)‡ +558AGA (SC) +658AGA (SC)‡	+538AGC (SO) +638AGC (SO)‡ +558AGC (SC) +658AGC (SC)‡
Valve Body Size	Valid combinations of valves, linkages and actuators								
DN15	■	■	■	■	■	■	■	-	-
DN20	■	■	■	■	■	■	■	-	-
DN25	■	■	■	■	■	■	■	-	-
DN32	-	■	■	■	■	-	-	■	■
DN40	-	■	■	■	■	-	-	■	■
DN50	-	■	■	■	■	-	-	■	■

Notes: FA-2000 / 3000 heavy duty actuators are available on request if a higher close-off is required. (SO) = Spring opens, (SC) = Spring closes, ‡ M9000-561 Thermal barrier included
* Floating with time-out and On/Off control signal ** Floating and On/Off control signal

ON/OFF ACTUATORS (Factory-mounted valve/actuator assemblies)

Spring Return	■							
Supply Voltage	24Vac/dc				100-240Vac		230Vac	
Torque	3 Nm		8 Nm		3 Nm		8 Nm	
Aux. Switches	-		1 x SPDT		-		1 x SPDT	
Actuator Codes	M9203-BGA-1	VA9203-BGB-1	VA9208-BGA-1	VA9208-BGC-1	VA9203-BUA-1	VA9203-BUB-1	VA9208-BDA-1	VA9208-BDC-1
Linkage Codes	-							
Ordering Code Suffix for Assemblies	+533BGA (SO) +633BGA (SO)‡ +553BGA (SC) +653BGA (SC)‡	+533BGB (SO) +633BGB (SO)‡ +553BGB (SC) +653BGB (SC)‡	+538BGA (SO) +638BGA (SO)‡ +558BGA (SC) +658BGA (SC)‡	+538BGC (SO) +638BGC (SO)‡ +558BGC (SC) +658BGC (SC)‡	+533BUA (SO) +633BUA (SO)‡ +553BUA (SC) +653BUA (SC)‡	+533BUB (SO) +633BUB (SO)‡ +553BUB (SC) +653BUB (SC)‡	+538BDA (SO) +638BDA (SO)‡ +558BDA (SC) +658BDA (SC)‡	+538BDC (SO) +638BDC (SO)‡ +558BDC (SC) +658BDC (SC)‡
Valve Body Size	Valid combinations of valves, linkages and actuators							
DN15	■	■	-	-	■	■	-	-
DN20	■	■	-	-	■	■	-	-
DN25	■	■	-	-	■	■	-	-
DN32	-	-	■	■	-	-	■	■
DN40	-	-	■	■	-	-	■	■
DN50	-	-	■	■	-	-	■	■

Notes: FA-2000 / 3000 heavy duty actuators are available on request if a higher close-off is required. (SO) = Spring opens, (SC) = Spring closes, ‡ M9000-561 Thermal barrier included

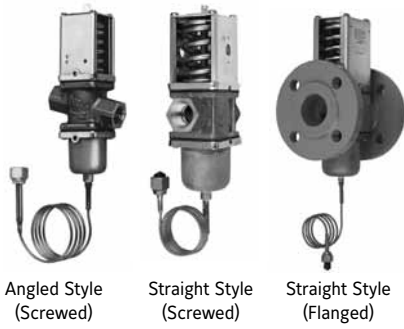
Modulating Water Valves

V46 Series

Two-way, Pressure Actuated

These pressure actuated modulating valves control the quantity of water to a condenser by directly sensing pressure changes in a refrigerant circuit.

The valves can be used in non-corrosive refrigerant systems. Ammonia power elements and valves designed for salt-water applications are available. They also have a quick opening characteristic and open on pressure increase (direct acting). Reverse acting (close on pressure increase) is possible.



FEATURES

- Pressure balanced valve design
- High refrigerant pressure resistant bellows
- 3/8, 1/2, 3/4" are angled body type valves with high Kv value
- 3/8" up to 2" pressure valves 'all range' types
- Quick opening valve characteristics
- No close fitting or sliding parts in water passages
- Easy to disassemble. All parts can be replaced
- Special bronze bodies and monel parts
- Power elements with stainless steel bellows available
- Nickel plated seats available for 3/8, 1/2, and 3/4" valves
- Direct/reverse action

Ordering Codes	Range (bar)	Thread Size	† Style	Capillary Length (mm)	Notes	List Price	
Angled Style - Screwed (ISO 228)							
V46AA-9600	5-18	3/8"	13	75	-	£105	
V46AA-9608*				A	£133		
V46AA-9602*			100	B, C	£137		
V46AA-9950			34	B, D	£126		
V46AA-9951*		34	E, D	£106			
V46AB-9600		1/2"	13	75	-	£111	
V46AB-9950			34	D, F	£118		
V46AC-9600		3/4"	13	-	-	£172	
V46AC-9951			34	D	£168		
V46AA-9300		5-23	3/8"	5	-	-	£124
V46AA-9301*				B, G, A	£99		
V46AA-9606				13	B, G	£140	
V46AA-9609*				75	B, G, A	£133	
V46AA-9510			50	G	£126		
V46AB-9300	1/2"		5	-	-	£131	
V46AB-9605			13	B, G	£123		
V46AB-9951			34	D, G	£147		
V46AB-9510			50	G	£131		
V46AC-9300	3/4"		5	75	-	£168	
V46AC-9605			13	B, G	£149		
V46AC-9510			50	G	£129		
Straight Style - Screwed (ISO 7-RC)							
V46AD-9300	5-18		1"	5	-	-	£312
V46AD-9510		50		75	-	£372	
V46AD-9600		13		-	£379		
V46AE-9300		5		-	£415		
V46AE-9510		1 1/4"	50	75	-	£425	
V46AE-9600			13	-	£432		
V46AD-9511		10-23	1"	-	-	£431	
V46AE-9512			1 1/4"	50	75	G	£397

† See page 46 for 'Style' references
* Bulk packs on request

(continued next column)

Ordering Codes	Range (bar)	Flange Size	† Style	Capillary Length (mm)	Notes	List Price
Straight Style - Flanged (DIN 2533)						
V46AR-9300	5-18	1 1/2"	5	-	-	£501
V46AR-9600			13	75	-	£520
V46AS-9300	5-11.5	2"	5	-	-	£922
V46AS-9301	11-18					£940
V46AT-9300	5-11.5	2 1/2"				£1,302
V46AT-9301	11-18	2 1/2"				£1,302

ACCESSORY

Ordering Code	Description	Price
KIT031N600	Kit for changing Style 13 into Style 45A	£95

Notes:

- A = With special washer to prevent waterhammer at low flow capacity
- B = Nickel plated seat
- C = Longer capillary
- D = Solder connection
- E = 0.040" i.d.cap.
- F = 0.062" i.d.cap.
- G = High Range
- H = For ammonia applications

MARITIME versions and other specifications are available on request. Please contact the Sales Support Team.

V47 Series

Temperature Actuated

These modulating water valves can be used for heating applications. It does have a heating element which means that the bulb temperature always must be higher than the valve body (power element).

The valve opens at increasing bulb temperature. The bulb must be mounted pointing downwards up to horizontal.

FEATURES

- Pressure balanced valve design
- 3/8", 1/2", 3/4" are angled body type valves with high Kv value
- Quick opening valve characteristics
- No close fitting or sliding parts in water passages
- Easy to disassemble. All parts can be replaced
- Special bronze bodies



Ordering Codes	Range (°C)	Thread Size	Capillary Length	Bulb Style † (Length)	List Price	
Angled Valves - Screwed (ISO 228)						
V47AA-9161	46-82	3/8"	1.8 m plain	Style 4 (82mm)	£265	
V47AB-9160	24-57	1/2"			£325	
V47AC-9160		3/4"			£363	
Straight Valves - Screwed (ISO 7-RC)						
V47AD-9160	24-57	1"	1.8 m armoured	Style 4 (152mm)	£481	
V47AD-9161	46-82				£383	
V47AE-9160	24-57				1 1/4"	£587
V47AE-9161	46-82				1 1/4"	£706
Straight Valves - Flanged (DIN 2533)						
V47AR-9160	24-57	1 1/2"	1.8 m armoured	Style 4 (152mm)	£734	
V47AR-9161	46-82				£734	

† See page 46 for 'Style' references

V48 Series

Three-way, Pressure Actuated

These water valves are especially designed for condensing units cooled either by atmospheric or forced draft cooling towers. They may be used on single, or multiple condenser hook-ups to the tower. The valve senses the compressor head pressure and allows cooling water to flow to the condenser, by-pass the condenser, or to allow waterflow to both condenser and by-pass line in order to maintain correct refrigerant head pressure.

A further advantage of this system is that the 3-way permits a continuous water flow to the tower so the can operate efficiently with a minimum of maintenance nozzles and wetting surfaces. The valves can be used in non-corrosive refrigerant systems. Ammonia power elements and valves designed salt-water applications are available. The valves have a quick opening characteristic.

FEATURES

- Pressure balanced design
- Free movement of all parts
- Easy manual flushing
- High Kv values
- Pressure actuated
- Can be used as mixing or diverting valve



Ordering Codes	Thread Size	Range (bar)	† Style	Capillary Length (mm)	Notes	List Price		
Straight Valves - Screwed (ISO 228)								
V48AB-9510	1/2"	4-20	50	750	-	£282		
V48AB-9600		4-16	13			£282		
V48AC-9510	3/4"	4-20	50			£319		
V48AC-9600		4-16	13			£323		
Straight Valves - Screwed (ISO 7-RC)								
V48AD-9510	1"	6-20	50			750	-	£835
V48AD-9600		4-16	13	£654				
V48AD-9602	1 1/4"	6-20	50	A	£654			
V48AE-9510		4-16	13	-	£873			
V48AE-9600					£685			
Maritime Type (ISO 228)								
V48BC-9600	3/4"	4-16	13	750	B	£825		
Commercial Type (ISO 228)								
V48AF-9300	1 1/2"	6-14	5	-	C	£926		

† See page 46 for 'Style' references

Notes:

A = Bodies in-line (port 3 below port 2)

B = Seawater resistant

C = Commercial type

Gas Valves

GH-5000 Series

Electro-Hydraulic Actuator Gas Valves

These sturdy and reliable, single seat valves are fast closing and slow opening. Valves are normally closed (NC). EC type-tested and certified as safety shut-off valve Class A (EN 161).

APPLICATIONS

Typical applications include commercial and industrial boilers, burners, ovens, rooftop units, make up air heaters, hot water heaters, kilns, and paint booths.



Flanged Types

Screwed Types

Ordering Codes	Size	Max. Operating Pressure (mbar)	Opening Time	Stroke	List Price
Flanged Connections with Closed Position Indicator					
GH-5229-2610	2"	1,000	≤8 sec.	22mm	£906
GH-5629-3611	2 1/2"				£1,496
GH-5629-4611	3"	800	≤13 sec.	36mm	£1,531
GH-5729-5610	4"				£1,911
GH-5729-6610	5"	650			£2,113
GH-5729-7610	6"	350			£2,679
Screwed Connections with Closed Position Indicator					
GH-5119-5610	1 1/2"	800	≤13 sec.	36mm	£1,091
GH-5219-6610	2"	650			£953
GH-5619-7611	2 1/2"	350			£1,335

Power Supply - 230Vac, 50/60Hz

Compression Fitting - EN 50262

Media - Gas families to DVGW - G 260/1, 2 and 3. Gas family.

Protection Class - IP54 (NEMA 1)

Rotary Actuators - Silence and Small Family

M910x-xGA-xS Series (Joventa DAB / DAD / DMD)

2 and 4 Nm, Non-Spring Return ON/OFF, Floating or Proportional Control



The 'Small Family' electric damper actuator series has been developed to operate small air dampers in ventilation and air-conditioning systems. The compact design make this actuator highly versatile.

FEATURES

- Load-independent running time
- Up to five actuators in parallel operation is possible
- Actuators available with PVC cable or with plug-in terminal block connection
- Simple direct mounting with universal adapter
- Manual release button

Ordering Codes		Control Signals	Supply Voltage	Connection	List Price
Johnson Contr.	Joventa				
2 Nm Actuators					
M9102-AGA-1S	DAB1.4	Floating	24Vac	Cable	£72
M9102-AGA-5S	DAB1.4C			Terminal	£63
M9102-IGA-1S	DAB1	ON/OFF or Floating*		Cable	£78
M9102-IGA-5S	DAB1C			Terminal	£83
4 Nm Actuators					
M9104-AGA-1S	DAD1.4	Floating	24Vac	Cable	£71
M9104-AGA-5S	DAD1.4C			Terminal	£67
M9104-IGA-1S	DAD1	ON/OFF or Floating*		Cable	£78
M9104-IGA-5S	DAD1C			Terminal	£83
M9104-GGA-1S	DMD1.2	Proportional	Cable	£134	
M9104-GGA-5S	DMD1.2C		Terminal	£138	

Supply Voltage - 24Vac, 50/60Hz

* With timeout

Control Signals - ON/OFF, Floating and Proportional 0-10Vdc

Running Time - 36 sec. (2 Nm types), 72 sec. (4 Nm types)

Universal Adapter - for 8-13mmØ or 8-10mm square shaft. 45mm min. shaft length

Damper Sizes - 0.4 m² (2 Nm types), 0.8 m² (4 Nm types)

Size - 71 x 52 x 131mm

Protection Class - IP42 (-1S types), IP40 (-5S types)

M9304-xxx-1N Series
(Joventa DAN / DAN2 / DMN)

4 Nm, Non-Spring Return
ON/OFF, Floating or Proportional Control

The 'Silence Electric' damper actuator series has been developed to operate small and medium air dampers in ventilation and air-conditioning systems. The compact design and universal adapter fitted with limitation of rotation angle make this actuator highly versatile.

A key feature of the design is the stem adapter which also incorporates angle-of-rotation limiting and position indication.



FEATURES

- Load-independent running time
- Up to five actuators in parallel operation is possible
- Simple direct mounting with universal adapter
- Selectable direction of rotation and limitation of rotation angle
- Manual release button
- Automatic shut-off at end position (overload switch)

Ordering Codes		Control Signals	Supply Voltage	2 x Aux. Switches**	List Price
Johnson Contr.	Joventa*				
4 Nm Actuators					
M9304-AGA-1N	DAN1N	ON/OFF or Floating	24Vac/dc	-	£120
M9304-AGC-1N	DAN1.SN		24Vac/dc	■	£143
M9304-ADA-1N	DAN2N		230Vac	-	£123
M9304-ADC-1N	DAN2.SN	ON/OFF or Floating	230Vac	■	£146
M9304-AKA-1N	DAN5N	ON/OFF or Floating	48Vdc	-	£99
M9304-GGA-1N	DMN1.2N	Proportional	24Vac/dc	-	£176

* Add 'K' after order code for Halogen free cable (1m)

** Adjustable auxiliary contacts

Supply Voltage - 24Vac/dc, 230Vac, 48Vac/dc, 50/60Hz

Control Signals - ON/OFF, Floating or Proportional 0-10Vdc

Running Time - 35 sec.

Universal Adapter - for 6-16mmØ or 8-10mm square shaft or with M9000-Z01DN adapter kit for 8, 10, 11 and 12mm square shaft. Min. damper shaft length of 45mm.

Auxiliary Switches - 3(1.5)A, 230V 50/60Hz Size - 85 x 65 x 166mm

Damper Size - 0.8 m² Protection Class - IP42

ACCESSORY

Ordering Codes	Description	Price
M9000-Z01DN	Adapter Kit for 8, 10, 11 and 12mm square shaft	£60

Rotary Actuators - Standard Family

M91xx-xxx-1N(1) Series
(Joventa DAS-DMS / DA-DM / DAL-DML / DAG-DMG)

8, 16, 24 and 32 Nm, Non-Spring Return
ON/OFF, Floating or Proportional Control

The 'Standard Electric' actuators have been specially designed for use with small and medium-sized air dampers and for terminal control units.

The very small size and clever construction make them ideal for applications where space is limited. A key feature of the design is the special spindle adapter which also incorporates angle-of-rotation limiting and position indication.



FEATURES

- Load independent running time
- Paralleling of up to five actuators is possible
- Simple direct-mount with universal adapter
- Angle-of-rotation limiting and manual control by pushbutton
- Two auxiliary switches

Ordering Codes		Control Signals	Supply Voltage	Feedback Potentio.	2 x Aux. Switches	List Price
Johnson Contr.	Joventa*					
8 Nm Actuators						
M9108-AGA-1N	DAS1	ON/OFF or Floating	24V ac/dc	-	-	£120
M9108-AGC-1N	DAS1.S			■	£183	
M9108-AGE-1N	DAS1.P1			1 kΩ	£191	
M9108-AGD-1N	DAS1.P2			140 Ω	£194	
M9108-AGF-1N	DAS1.P4			2 KΩ	-	£158
M9108-ADA-1N	DAS2		-	■	£146	
M9108-ADC-1N	DAS2.S		230Vac	-	■	£183
M9108-ADE-1N	DAS2.P1			1 KΩ	-	£158
M9108-ADD-1N	DAS2.P2			140 Ω	-	£158
M9108-ADF-1N	DAS2.P4			2 KΩ	-	£158
M9108-GGA-1N	DMS1.1	Proport.		24V ac/dc	-	-
M9108-GGC-1N	DMS1.1S	■	-	-	£195	
M9108-GDA-1N	DMS2.2	Proport.	230Vac	-	-	£217
M9108-GDC-1N	DMS2.2S	0(2)-10Vdc		■	£233	
M9108-GDA-1N1	DMS2.5	Proport.		-	£217	
M9108-GDC-1N1	DMS2.5S	0(4)-20mA		■	£233	
16 Nm Actuators						
M9116-AGA-1N	DA1	ON/OFF or Floating	24V ac/dc	-	-	£139
M9116-AGC-1N	DA1.S			■	£160	
M9116-AGE-1N	DA1.P1			1 kΩ	£204	
M9116-AGD-1N	DA1.P2			140 Ω	£207	
M9116-AGF-1N	DA1.P4		2 KΩ	-	£207	
M9116-ADA-1N	DA2		230V	-	£133	
16 Nm Actuators (cont)						
M9116-ADC-1N	DA2.S	ON/OFF or Floating	230V	-	■	£170
M9116-ADE-1N	DA2.P1			1 kΩ	£212	
M9116-ADD-1N	DA2.P2			140 Ω	-	£184
M9116-ADF-1N	DA2.P4			2 KΩ	-	£216
M9116-GGA-1N	DM1.1	Proport.	24V ac/dc	-	-	£202
M9116-GGC-1N	DM1.1S	■	-	-	£230	
M9116-GDA-1N	DM2.2	Proport.	230Vac	-	-	£221
M9116-GDC-1N	DM2.2S	0(2)-10Vdc		■	£254	
M9116-GDA-1N1	DM2.5	Proport.		-	£221	
M9116-GDC-1N1	DM2.5S	0(4)-20mA		■	£254	
24 Nm Actuators						
M9124-AGA-1N	DAL1	ON/OFF or Floating	24V ac/dc	-	-	£266
M9124-AGC-1N	DAL1.S			■	£300	
M9124-AGE-1N	DAL1.P1			1 kΩ	£321	
M9124-AGD-1N	DAL1.P2			140 Ω	£321	
M9124-AGF-1N	DAL1.P4			2 KΩ	-	£321
M9124-ADA-1N	DAL2		-	■	£275	
M9124-ADC-1N	DAL2.S		230Vac	-	■	£312
M9124-ADE-1N	DAL2.P1			1 KΩ	-	£330
M9124-ADD-1N	DAL2.P2			140 Ω	-	£330
M9124-ADF-1N	DAL2.P4			2 KΩ	-	£330
M9124-GGA-1N	DML1.1	Proport.		24V ac/dc	-	-
M9124-GGC-1N	DML1.1S	■	-	-	£314	
M9124-GDA-1N	DML2.2	Proport.	230Vac	-	-	£288
M9124-GDC-1N	DML2.2S	0(2)-10Vdc		■	£318	
M9124-GDA-1N1	DML2.5	Proport.		-	£288	
M9124-GDC-1N1	DML2.5S	0(4)-20mA		■	£318	

(continued next page)

Ordering Codes		Control Signals	Supply Voltage	Feedback Potentio.	2 x Aux. Switches	List Price
Johnson Contr.	Joventa*					
32 Nm Actuators						
M9132-AGA-1N	DAG1	ON/OFF or Floating	24V ac/dc	-	-	£234
M9132-AGC-1N	DAG1.S			-	■	£246
M9132-AGE-1N	DAG1.P1			1 kΩ	-	£321
M9132-AGD-1N	DAG1.P2			140 Ω	-	£321
M9132-AGF-1N	DAG1.P4			2 KΩ	-	£321
M9132-ADA-1N	DAG2		-	■	£231	
M9132-ADC-1N	DAG2.S		-	■	£251	
M9132-ADE-1N	DAG2.P1		1 KΩ	-	£330	
M9132-ADD-1N	DAG2.P2		140 Ω	-	£330	
M9132-ADF-1N	DAG2.P4		2 KΩ	-	£330	
M9132-GGA-1N	DMG1.1	Proport. **	24V ac/dc	-	-	£322
M9132-GGC-1N	DMG1.1S			-	■	£343

* Add 'K' after code for Halogen free cable (1m)

Control Signals - ON/OFF, Floating or Proportional 0(2)-10Vdc, 0(4)-20mA
Running Time - 30 sec. (8 Nm types), 80 sec. (16 Nm types), 125 sec. (24 Nm types), 140 sec. and 200 sec.** (32 Nm types)
Auxiliary Switch - 3(1.5)A, 230V 50/60Hz
Universal Adapter - for 10-20mmØ or 10-16mm square spindle. Min. damper shaft length of 45mm.
Damper Size - 1.5m² (8 Nm types), 3m² (16 Nm types), 4.5m² (24 Nm types), 6m² (32 Nm types)
Connections - Terminal screw
Size - 68 x 100 x 180mm
Protection Class - IP54

Rotary Actuators - Spring Return Family

M9203-xxx-1x Series

3 Nm, Spring Return ON/OFF, Floating or Proportional Control

The M9203 series electric spring return actuators are direct-mount actuators. These bi-directional actuators do not require a damper linkage, and are easily installed on round shafts or square shafts using the standard shaft clamp included with the actuator.

A single M9203 series electric spring return actuator provides 3 Nm running and spring return torque. An integral line voltage auxiliary switch, available only on the M9203-xxB-1(Z) models, indicates end-stop position, or performs switching functions within the selected rotation range.

FEATURES

- Direct-coupled design
- Reversible mounting
- Electric stall detection
- Double-insulated construction
- Optional integrated auxiliary switch



Ordering Codes	Control Signals	Supply Voltage	1 x Aux. Switch	Running Time	List Price
M9203-GGA-1Z	Proportional	24Vac/dc	-	90 sec	£224
M9203-GGB-1Z			■		£259
M9203-GGA-1			-	150 sec	£217
M9203-GGB-1			■		£251
M9203-AGA-1Z	ON/OFF or Floating	24Vac/dc	-	90 sec	£197
M9203-AGB-1Z			■		£240
M9203-AGA-1			-	150 sec	£190
M9203-AGB-1	■	£232			
M9203-BGA-1	ON/OFF	24Vac/dc	-	60 sec	£135
M9203-BGB-1			■		£186
M9203-BUA-1		100-240Vac	-	27 sec	£151
M9203-BUB-1			■		£193
M9203-BUA-1Z					£159
M9203-BUB-1Z					£201

(continued next column)

Supply Voltage - 24Vac/dc, 100-240Vac, 50/60 Hz
Control Signals - ON/OFF, Floating or Proportional 0(2)-10V, 0(4)-20mA
Rotation Range - 95° max. full stroke (adjustable 35-95°)
Universal Adapter - 6-12mm Ø round shafts or 6-8mm square shafts.
Auxiliary Switch - 1 x SPDT 240Vac,5A / 120Vac, 5.8A and 24Vac, 50VA
Size - 162 x 82 x 58mm
Protection Class - IP54

ACCESSORIES AND REPLACEMENT PARTS

Order. Codes	Description	Price
DMPR-KC003*	178mm Blade Pin Extension (without bracket) for direct mount damper applications	POA
M9000-158	Tandem Mounting Kit - to mount two models of M9220-xxx-3 series actuators	£67
M9000-153	Crank Arm	£1
M9000-170	Remote Mounting Kit, Horizontal - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£72
M9000-171	Remote Mounting Kit, Vertical - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£72
M9000-200	Commissioning Tool - provides control signal to drive 24V floating, floating, proportional and/or resistive electric actuators	£906
M9000-604	Anti-rotation Bracket Kit (with screws) - for M9220-xxx-3 series actuators	£16
M9220-600	25mm Jackshaft Coupler Kit (with locking clip) - for mounting M9220-xxx-3 series actuators on to dampers with 19-27mmØ, or 16, 18 and 19mm square shafts	£12
M9220-601	Replacement Coupler Kit (with locking clip) - for mounting M9220-xxx-3 series actuators on to dampers with 12-19mmØ, or 10, 12 and 14mm square shafts	£14
M9220-602	Locking Clips for M9220-xxx-3 series actuators (5 per bag)	£7
M9220-603	Adjustable Stop Kit - for M9220-xxx-3 series spring return actuators	£11
M9220-610	Shaft Gripper - 10mm square shaft with locking clip	£9
M9220-612	Shaft Gripper - 12mm square shaft with locking clip	£8
M9220-614	Shaft Gripper - 14mm square shaft with locking clip	£9

* Furnished with the damper and may be ordered separately.

M9208-xxx-1 Series
(Joventa DBF1.08 / DAFx.08 / DMF1.08)
8 Nm, Spring Return
ON/OFF, Floating or Proportional Control



This new range of electric damper-actuators has been specially developed for the motorised operation of air dampers in air-conditioning systems.

Manual operation is automatically cancelled when the actuator is in electrical operation. The compact design and universal adapter, fitted with limitation of rotation angle, makes this actuator highly versatile.

FEATURES

- Up to five actuators in parallel operation is possible
- Electrical connection with halogen-free cable
- Simple direct mounting with universal adapter
- Limitation of rotation angle
- Manual positioning with crank handle
- Two auxiliary switches (one adjustable) with 'Gold Flash' contacts

Ordering Codes		Control Signals	2 x Aux.* Switches	Supply Voltage	Running Time Motor (Spring)	List Price
Johnson Contr.	Joventa					
8 Nm Actuators						
M9208-AGA-1	DBF1.08N	ON/OFF or Floating	-	24Vac/dc	150s	£272
M9208-AGC-1	DBF1.08SN		■		(17-25s)	£313
M9208-BGA-1	DAF1.08N	ON/OFF	-	24Vac/dc	55-71s	£209
M9208-BGC-1	DAF1.08SN		■		(13-26s)	£251
M9208-BDA-1	DAF2.08N		-	230Vac	55-71s	£230
M9208-BDC-1	DAF2.08SN		■		(13-26s)	£272
M9208-GGA-1	DMF1.08N		Proport.		150s	£292
M9208-GGC-1	DMF1.08SN	**	■	24Vac/dc	(17-25s)	£334

* Includes one adjustable auxiliary switch

** Direct or reverse action with signal increase (switch selectable)

Supply Voltage - 24Vac/dc, 230Vac, 50/60 Hz

Control Signals - ON/OFF, Floating or Proportional 0(2)-10V, 0(4)-20mA

Rotation Range - 95° max. full stroke (adjustable 35-95°)

Universal Adapter - 8-16mm Ø round shafts or 6-12mm square shafts. Optional 'Jackshaft Coupler Kit' (M9208-600) for 12-19mmØ or 10-14mm square shafts

Auxiliary Switches - 2 x SPDT 240Vac, 5A and 24Vac, 50VA

Size - 161 x 99 x 58mm

Protection Class - IP54

ACCESSORIES AND REPLACEMENT PARTS

Order. Codes	Description	Price
M9000-604	Replacement Anti-Rotation Bracket Kit for M9208, M9210 and M9220 series actuators	£16
M9208-100	Remote Mounting Kit, including mounting bracket, M9208-150 crankarm, ball joint and mounting fastener	£24
M9208-150	Crankarm	£24
M9208-600	Large Shaft Coupler Kit (with locking clip) for mounting M9208-xxx-1 series actuators on dampers with 12-19mmØ or 10-14mm square shafts	£24
M9208-601	Replacement Standard Coupler Kit (with locking clip) for mounting M9208-xxx-1 series on dampers with 8-16mmØ or 6-12mm square shafts	£24
M9208-602	Replacement Locking Clips for M9208-xxx-1 series actuators (quantity 5)	£24
M9208-603	Adjustable Stop Kit for M9208-xxx-1 series actuators	£24
M9208-604	Replacement Manual Override Cranks for M9208 series electric actuators with long crank radius: 72mm (quantity 5)	£24
M9208-605	Replacement Manual Override Cranks for M9208 series actuators with short crank radius: 46.5mm (quantity 5)	£24

M92x0-xxx-1 Series
(Joventa DAFx.10 / DBF1.10 / DMF1.10)
20 Nm, Spring Return
ON/OFF, Floating or Proportional Control



These actuators are direct mount, spring return, providing reliable control of dampers and valves. These bi-directional actuators do not require a damper linkage and are easily installed on dampers.

FEATURES

- Two or three models mounted in tandem deliver twice or triple the torque
- Up to five actuators in parallel operation is possible
- Optional adjustable end stops.
- Integrated cables halogen-free cables
- Rated aluminium enclosure
- Easy-to-use locking manual override with auto release and crank storage
- Two Integral 'Gold' auxiliary switches (xxC models)

Ordering Codes		Control Signals	Supply Voltage	2 x Aux. Switches	Running Time Motor (Spring)	List Price
Johnson Contr.	Joventa*					
20 Nm Actuators						
M9220-AGA-1	DBF1.20	ON/OFF or Floating	24V ac/dc	-	150s	£323
M9220-AGC-1	DBF1.20S			■	(20s)	£370
M9220-BDA-1	DAF2.20	ON/OFF	230Vac	-	25-57s	£289
M9220-BDC-1	DAF2.20S			■		(11-15s)
M9220-BGA-1	DAF1.20		-	24V ac/dc		£259
M9220-BGC-1	DAF1.20S		■		£309	
M9220-GGA-1	DMF1.20		Proport.	24V ac/dc	-	150s
M9220-GGC-1	DMF1.20S	■			(26s)	£368
M9220-HGA-1	DHF1.20	Proport.	24V ac/dc	-	150s	£341
M9220-HGC-1	DHF1.20S			**		■

* Add 'K' after order code for Halogen free cable (1m)

** With span offset

Supply Voltage - 24Vac/dc, 230Vac, 50/60Hz

Control Signals - ON/OFF, Floating or Proportional 0(2)-10Vdc

Auxiliary Switches - 3(1.5)A, 230V 50/60Hz

Damper Size - 2.0m² (All 10Nm types and 20Nm - ON/OFF or Floating types), 4.0m² (20Nm - ON/OFF and Proportional types)

Size - 262 x 102 x 84mm

Protection Class - IP54 (NEMA2)

ACCESSORIES AND REPLACEMENT PARTS

Order. Codes	Description	Price
DMPR-KC003*	178mm Blade Pin Extension (without bracket) for direct mount damper applications	POA
M9000-158	Tandem Mounting Kit - to mount two models of M9220-xxx-3 series actuators	£67
M9000-153	Crank Arm	£1
M9000-170	Remote Mounting Kit, Horizontal - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£72
M9000-171	Remote Mounting Kit, Vertical - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£72
M9000-200	Commissioning Tool - provides control signal to drive 24V floating, floating, proportional and/or resistive electric actuators	£906
M9000-604	Anti-rotation Bracket Kit (with screws) - for M9220-xxx-3 series actuators	£15
M9220-600	25mm Jackshaft Coupler Kit (with locking clip) - for mounting M9220-xxx-3 series actuators on dampers with 19-27mmØ, or 16, 18 and 19mm square shafts	£12
M9220-602	Locking Clips for M9220-xxx-3 series actuators (5 per bag)	£7
M9220-603	Adjustable Stop Kit - for M9220-xxx-3 series spring return actuators	£11
M9220-605	Ball Joint for M8x1.25 threaded rod, M8x1.25 x 16.5mm thread mount	£38
M9220-610	Shaft Gripper - 10mm square shaft with locking clip	£9
M9220-612	Shaft Gripper - 12mm square shaft with locking clip	£8

* Furnished with the damper and may be ordered separately.

Note: Replacement parts are available. Please see data sheet.

Rotary Actuators - Special and Security

M91xx-xxx-1N4 Series (Joventa SAx.1xxx / SM1.1x)

8 and 16 Nm, Fast Running Time ON/OFF, Floating or Proportional

The 'Special Electric' actuators have been specially designed for use with small and medium-sized air dampers and for terminal control units in air volume control systems.

The very small size and clever construction make these ideal for applications where space is limited. A key feature of the design is the special spindle adapter which also incorporates angle-of-rotation limiting and position indication.

FEATURES

- Paralleling of up to five actuators is possible
- Angle-of-rotation limiting
- Universal adapter
- Manual control by pushbutton
- Choice of rotation



Ordering Codes		Control Signals	2 x Aux. Switches	Feedback Potentio.	Supply Voltage	List Price	
Johnson Contr.	Joventa*						
8 Nm Actuators							
M9108-AGA-1N4	SA1.12	ON/OFF or Floating	-	-	24V ac/dc	£191	
M9108-AGC-1N4	SA1.12S		■	-		£226	
M9108-AGE-1N4	SA1.12P1		-	1 kΩ		£240	
M9108-AGD-1N4	SA1.12P2		-	140 Ω		£240	
M9108-AGF-1N4	SA1.12P4		-	2 KΩ		£240	
M9108-ADA-1N4	SA2.12		-	-		£205	
M9108-ADC-1N4	SA2.12S		■	-	£255		
M9108-ADE-1N4	SA2.12P1		-	1 kΩ	230Vac	£255	
M9108-ADD-1N4	SA2.12P2		-	140 Ω	£255		
M9108-ADF-1N4	SA2.12P4		-	2 kΩ	£255		
M9108-GGA-1N4	SM1.12		Proport.	-	-	24V ac/dc	£273
M9108-GGC-1N4	SM1.12S			■	-	£308	
16 Nm Actuators							
M9116-AGA-1N4	SA1.10	ON/OFF or Floating	-	-	24V ac/dc	£191	
M9116-AGC-1N4	SA1.10S		■	-		£208	
M9116-AGE-1N4	SA1.10P1		-	1 kΩ		£240	
M9116-AGD-1N4	SA1.10P2		-	140 Ω		£240	
M9116-AGF-1N4	SA1.10P4		-	2 KΩ		£240	
M9116-ADA-1N4	SA2.10		-	-		£205	
M9116-ADC-1N4	SA2.10S		■	-	£255		
M9116-ADE-1N4	SA2.10P1		-	1 kΩ	230Vac	£255	
M9116-ADD-1N4	SA2.10P2		-	140 Ω	£255		
M9116-ADF-1N4	SA2.10P4		-	2 KΩ	£255		
M9116-GGA-1N4	SM1.10		Proport.	-	-	24V ac/dc	£273
M9116-GGC-1N4	SM1.10S			■	-	£326	

*Add 'K' after order code for Halogen free cable (1m)

Supply Voltage - 24Vac/dc, 230Vac, 50/60Hz
Control Signals - ON/OFF, Floating or Proportional 0(2)-10Vdc, 0(4)-20mA
Running Time - 8 sec. (8 Nm types), 16 sec. (16 Nm types)
Auxiliary Switches - 3(1.5)A, 230V 50/60Hz
Universal Adapter - 10-20mm Ø shafts or 10-16mm square shafts with Z01DN- adapter. Minimum shaft length 48mm.

Connections - Screw terminal
Damper Size - 1.5m² (8 Nm types), 3.0m² (16 Nm types)

Size - 195 x 100 x 68mm
Protection Class - IP54

M91xx-GAx-1.01 Series (Joventa SMxx.5)

8 Nm, Proportional Control (110Vac supply)

The 'Special Electric' actuators have been specially designed for use with medium and large air dampers.

The very small size and clever construction make them ideal for applications where space is limited. A key feature of the design is the special spindle adapter which also incorporates angle-of-rotation limiting and position indication.

FEATURES

- Paralleling of up to five actuators is possible
- Universal adapter
- Choice of rotation and angle-of-rotation limiting
- Manual control by pushbutton
- Two floating auxiliary switches



Ordering Codes		Control Signal	Supply Voltage	2 x Aux. Switches	List Price
Johnson Contr.	Joventa*				
8 Nm Actuators					
M9108-GAA-1.01	SMS4.5	Proportional	110Vac	-	£241
M9108-GAC-1.01	SMS4.5S			■	£305

* Add 'K' after order code for Halogen free cable (1m)
Note: 16 and 24Nm actuators are available on request.

Supply Voltage - 110Vac, 50/60Hz
Control Signal - Proportional 0(4)-20mA
Auxiliary Switch - 3(1.5)A, 230V 50/60Hz
Running Time - 30-45 sec.
Universal Adapter - 10-20mm Ø shafts and 10-16mm square shafts. Minimum shaft length 48mm.

Damper Size - 1.5m²
Connection - Screw terminal
Size - 195 x 100 x 68mm
Protection Class - IP54

M9116-Axx-1 Series (Joventa SAx.30)

16 Nm, ON/OFF or Floating Control (100Vac Supply)

The 'Special Electric' actuators have been specially designed for use with medium and large air dampers.

The very small size and clever construction make them ideal for applications where space is limited. A key feature of the design is the special spindle adapter which also incorporates angle-of-rotation limiting and position indication.

FEATURES

- Paralleling of up to five actuators is possible
- Universal adapter
- Low noise level
- Choice of rotation and angle-of-rotation limiting
- Manual control by pushbutton
- Two floating auxiliary switches



Ordering Codes		Control Signals	Supply Voltage	2 x Aux. Switches	List Price
Johnson Contr.	Joventa*				
16 Nm Actuators					
M9116-AAA-1	SA4.30	ON/OFF or Floating	110Vac	-	£189
M9116-AAC-1	SA4.30S			■	£227

Note: * Add 'K' after order code for Halogen free cable (1m)

Supply Voltage - 110Vac, 50/60Hz
Running Time - 80-110 sec.
Auxiliary Switches - 3(1.5)A, 230V 50/60Hz
Damper Size - 3.0m²
Universal Adapter - 10-20mm Ø shafts and 10-16mm square shafts. Minimum shaft length 48mm.

Connection - Screw terminal
Size - 195 x 100 x 68mm
Protection Class - IP54

Flow and Float Controls

F61 Series

Flow Switches for Liquid

These switches can be used in liquid lines carrying water, sea water, swimming pool water, ethylene glycol or other liquids not harmful to the specified materials.

The SPDT contacts can be wired to energise one device and de-energise another when liquid flow either exceeds or drops below the set flow rate. Pipe insert models and the T-body types for low-flow applications are available.

Typical applications: to shut down the compressor on liquid chiller systems, to prove flow on electric immersion heaters and to give a signal or alarm when the pump on condenser cooling system shuts down.

FEATURES

- T-body and pipe-insert types
- Vapour tight IP67 enclosures
- Stainless steel pipe-insert type
- Large wiring space
- Range screw easy accessible



Note: DM³/s = Decimeter/p same as l/s

Ordering Codes	Range (bar)	Connection	Notes	List Price
IP43 Types				
F61SB-9100	0.15-46 l/s	R1" DIN2999 (ISO R7)	A	£171
F61SD-9150	0.04-0.07 l/s	1/2 -14 NPTF	T-body	£168
F61SD-9175		3/4 -14 NPTF		£171
IP67 Types				
F61TB-9100	0.15-46 l/s	R1" DIN2999 (ISO R7)	B	£205
F61TB-9200			C	£433
F61TD-9150	0.04-0.07 dm³/s	1/2 -14 NPTF	T-body	£200

Notes:

- A = Includes three paddles 1", 2", 3" stainless steel AISI 301
 - B = Includes four paddles, 1", 2", 3" and 6" stainless steel AISI 301
 - C = Stainless steel body, bellows, rod with three st.st. AISI 304 paddles 1", 2", 3"
- Switch Action - SPDT, 15(8)a, 230Vac (220Vac on IP67 types)
 Size - 100 x 60 x 90mm
 Protection Class - As table

ACCESSORIES

Ordering Codes	Description	Price
PLT69-11R	6" Stainless steel AISI 301 paddle	£2
KIT21A602	Four paddles 1", 2", 3" and 6" St.St. AISI 301	£11

F62 Series

Air Flow Switch



The F62 switch detects air flow, or the absence of air flow, by responding only to the velocity of air movement within a duct. The control can be wired to open one circuit and close a second circuit (SPDT) for either signaling or interlock purposes. Failure of air flow during normal operation of air handling systems may cause over-heating, coil icing and other conditions that may be detrimental to the equipment.

Typical applications include: Make-up air systems, air-cooling or heating processes and exhaust systems.

FEATURES

- Polycarbonate carbonate IP43 enclosure
- Large wiring space
- Range screw easily accessible.

Ordering Codes	Max. Air Velocity	Note	List Price
F62SA-9100	10 m/sec	A	£124

Note: A = With 55mm paddle (mounted) and separate 80mm paddle

Switch Action - SPDT, 15(8)A, 230Vac
 Enclosure - Plastic polycarbonate
 Size - 100 x 60 x 62mm (blade 196mm)
 Protection Class - IP43

ACCESSORIES

Ordering Codes	Description	Price
PLT112-1R	Air Flow Paddle - 55 x 175mm	£7
PLT112-2R	Air Flow Paddle - 80 x 175mm	£6

F63 Series

Liquid Level Float Switches



These switches can be used in open or closed tanks where a desired liquid level has to be maintained and installations handling water, swimming pool water, sea water, brine, ethylene glycol or other liquids not harmful to the specified materials.

The SPDT contacts can be wired to close one circuit and open a second circuit when the liquid level rises above or falls below the required level. The switch maintains the liquid level within (approx.) 13mm.

There are three different types available. These float switches should not be used for liquids lighter than water (density less than 0.95 kg/dm³).

FEATURES

- Solid polycarbonate float
- Vapour tight IP67 enclosure
- Convenient wiring terminals

Ordering Codes	Connection	Notes	List Price
F63BT-9101	1-11 1/2 NPT	A	£243
F63BT-9102		B	£268
F63BT-9200	R1" DIN2999 (ISO R7)	C	£524

Notes:

- A = Plastic float, brass body, phosphor bronze bellows (used with non corrosive liquid)
- B = Plastic float, stainless steel bellows (for water with high calcium content)
- C = Plastic float, stainless steel body, rod, bellows (AISI 316L version)

Switch Action - SPDT, 15(8)A, 230Vac
 Size - 100 x 60 x 61mm (head), 215-225mm (float length)
 Protection Class - IP67

ACCESSORY

Ordering Codes	Description	Price
FLT001N001R	Plastic Float	£47

Capillary and Space Thermostats

A19 Series

Capillary and Space, IP30 & IP65

These thermostats are available with fixed or adjustable differential. The various control ranges cover a broad range of temperature applications with a minimum number of models. On request a built-in high or low limit stop is possible and can be adjusted quickly and easily in the field. All models have a universal way of adjustment. For this purpose a knob and sealing cap are enclosed.

FEATURES

- Liquid filled sensing element
- Dust tight PENN switch

APPLICATION

These thermostats are designed for refrigeration, cooling, heating, ventilation and air-conditioning applications. Standard models are provided for remote sensing or room sensing. Models with manual reset are available for low or high limit functions.



Style 1b Type

Ordering Codes	Range (°C)	Diff. (K)**	† Style	Capillary (Bulb)	SPDT Switch*	Notes	List Price
Capillary Thermostats - IP30							
A19AAC-9005	-5-+28	2	1b	2m (135mm)	OL	-	£49
A19AAC-9009	40-120	3.5		2m (100mm)	OH	-	£43
Capillary Thermostat, Lock-out Low with Manual Reset - IP30							
A19ACC-9100	-35-+10	6	1b	2m (110mm)	OL	-	£60
A19ACC-9101	-5-+28	4		2m (135mm)		-	£70
Capillary Thermostats - IP65							
A19AQC-9101	-5-+5	2	1a	2m (80mm)	OL	A	£52
A19AQC-9102	-5-+28		1b	2m (135mm)		B	£56
A19AQC-9200	-5-+55	2.5	2	-	-	-	£112

* Auto recycle, SPDT, 8A

† See page 46 for 'Style' references

** Fixed

OL = Open low, OH = Open high

Notes:

A = 5A switch, ice bank control, bulb dia. 9.3mm, case compensation, concealed scale, screwdriver adjustment, scale calibrated at increasing temperature.

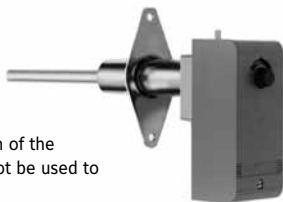
B = 8A switch, calibrated and set at 2°C, case compensation, pointer adjust, PG16 connect, 1/2"- 14NPT WELL connector.

Other styles and specifications available. Please contact the Sales Support Team.

A25 Series

Rod and Tube Sensing Element, IP30

A rod and tube type sensing element actuate the switch contacts. Main contacts (1-2) are normally closed, and open when the temperature at the element rises to the dial setpoint. Contacts are re-closed only by operation of the reset lever. The reset lever is 'trip-free' and cannot be used to block contacts in a closed position.



FEATURES

- Rod and tube type of element
- Adjustable duct mounting flange
- Trip-free manual reset
- Dust-tight PENN switch

APPLICATION

These warm air limit controls 'lock out' on a temperature increase to the control setpoint. Manual reset is required to re-close the electrical contacts. A typical application is to stop air-conditioning or ventilating fans in the event of excessive return air temperature, as from a fire.

Ordering Codes	Range (°C)	Switch. 8A, Manual Reset	List Price
A25CN-9001	0-100	SPDT, Open High	£162

Note: Visible scale, knob adjustment, NEMA 1 enclosure, with flange for duct mounting.

A28 Series

2-Stage Thermostats, IP30 & IP65

Controls are compact with fixed differential per stage and (on most models) adjustable differential between stages. Liquid filled element provides wide range, constant differential over whole range and no influence from barometric pressure. Since the bulb contains the major portion of the total fill the thermostat may be considered as cross-ambient, capillary and cup temperature variations affect the operating point only slightly due to the small amount of fill they contain.

For quantity orders it is possible to have the below stated optional constructions:

- Without case and cover for panel mounting
- Close differential per stage
- Different capillary lengths

All standard IP30 enclosure models have a universal way of adjustment. For this purpose a knob and sealing cap are enclosed.



IP30 Model
Style 1b and 3

IP65 Model
Style 1b

FEATURES

- Liquid filled sensing element
- Dust tight PENN switch
- IP65 protection class models available
- Front adjustment

APPLICATION

These thermostats are designed for various types of heating, cooling, ventilation, or air-conditioning applications. All models have two SPDT switches providing the following control possibilities:

- 2 stage heating
- 2 stage cooling
- Heating/cooling with automatic changeover

Ordering Codes	Range (°C)	Diff. (K)		† Style	Capillary (Bulb mm)	Switch	Notes	List Price
		Stg	Bet					
IP30 Thermostats								
A28AA-9006	-35-+10	2	1-4	1b	2m (110mm)	OL	A	£165
A28AA-9007	-5-+28	1.5			2m (135mm)			£150
A28AA-9106	-5-+28	1.5		5m (135mm)	£283			
A28AA-9113	0- 43	3	1-4	3	-	OH	A, B	£181
A28AA-9118	1-60	2			1b			3m (115mm)
IP65 Thermostats								
A28QA-9101	5 -50	2	4	1b	2m (110mm)	OL	D, E	£283
A28QA-9110	-35-+10				2m (135mm)			£184
A28QA-9111	-5-+28	1.5	1-4	3	2m (135mm)	OL	-	£195
A28QA-9114	-35-+40	2			3.5m (110mm)			£219
A28QA-9113	0-43	1.5	1-4	3	-	OH	B	£230
A28QA-9115	1-60	2			1b			3m (115mm)
A28QA-9117	20-40	1.5	1-5	3	-	OH	B	£234
A28QJ-9100	0-95				1b			3m (100mm)

Notes:

† See page 46 for 'Styles and Wiring Diagrams'

A = General purpose

Stg = Stage, Bet = Between

B = Bulb stainless steel

C = Max. bulb temp. 85°C

D = Concealed scale

E = Screwdriver adjustment

F = 3A switch

Sizes - 125 x 55 x 46.5mm (IP30 types), 125 x 60 x 59mm (IP65 types)

Switch Contact - SPDT

GENERAL ACCESSORIES for A19 & A28

Ordering Codes	Description	Price
FTG13A-600R	Closed tank connector Style 1b elements, Max. 10 bar, 120 °C, Min. -40 °C	£23
KIT012N600	Capillary Brackets (6 pieces)	£14
WEL003N602R	Bulb Well, max. pressure 70 bar, temp. 370 °C	£122

A36 Series

3 and 4-Stage Thermostats

Models are available in 'open' construction for panel mounting. Single knob adjustment moves the entire staging band up and down within the range of the control. The differential on each stage and sequencing between stages are factory set.

This permits the OEM to completely engineer the cycling of their equipment without the hazard of field mis-adjustments and erratic sequencing.

FEATURES

- Dust-tight SPDT switches
- Cushion mounted
- Operation from a single, liquid filled element
- Case compensation standard on all models

APPLICATION

Designed for multi-stage thermostatic operation of electrically controlled equipment such as:

- Packaged liquid chillers
- Heat pumps
- Electric duct heaters
- Computer room air-conditioners



4-Stage Type

Ordering Codes	Range (°C)	Adjust Code	Capillary (Bulb)	SPDT*	Notes	List Price
3-Stage Thermostats						
A36AGA-9101	-18-+20	B1	5m (125mm)	5A	A	£298
A36AGA-9102			3.5m (125mm)			£272
A36AGA-9103	15-35	C1	3.5m (140mm)			£239
A36AGB-9103	-18-+20	B2	3.5m (125mm)	3A		£248
4-Stage Thermostats						
A36AHA-9105	-18-+20	B1	3.5m (125mm)	5A	A	£266
A36AHA-9107	-16-+20		5m (125mm)			£334
A36AHA-9108	15-35	C1	3.5m (140mm)			£312
A36AHB-9103	10-95	D2	3m (100mm)		B	£316
A36AHB-9104	-18-+20	B2	3.5m (125mm)	3A	A	£312
A36AHB-9105			5m (125mm)		C	£448
A36AHB-9109			-15-+30		5m (110mm)	D

Notes:

- A = Armoured PVC capillary
- B = Max. bulb temp. 115°C
- C = Braided copper capillary
- D = Max. bulb temp. 75°C

Switch Contact - SPDT
Size - 173 x 69 x 62mm
Protection Class - IP20

* Auto recycle

270XT Series

Freeze Protection Thermostats

Sensing element is 3 or 6 metres long to permit attaching across the surface of a coil to guard against freezing at any point. When any 30cm or more of this element senses a temperature as low as the control setpoint, it will 'switch off'. A special version is available with bulb and 2m capillary, range -24-+18°C for clamp on or immersion purposes.

SPDT change over contacts permit the use of an alarm signal.

FEATURES

- Dust tight PENN switch
- 270XTAN provided with trip-free manual reset
- Controls have adjustable range

APPLICATION

These controls are designed for protection against freeze up of hydronic heating coils, cooling coils and similar application.



(continued next column)

Ordering Codes	Range (°C)	Diff. (K) Fixed	† Style	Capillary	Bulb	List Price
Automatic Recycle						
270XT-95008	-10-+12	3	9	-	3.2 x 6000mm	£168
270XT-95078					3.2 x 3000mm	£155
270XT-95068	-24-+18	4	1	2m	9.5 x 80mm	£153
Trip-free Manual Reset						
270XTAN-95008	-10-+12	-	9	-	3.2 x 6000mm	£176
270XTAN-95088					3.2 x 3000mm	£163
270XTAN-95048	-24-+18		1 (bulb)	2m	9.5 x 80mm	£161

† See page 46 for 'Style' references

Power Supply - 230V, 50/60Hz

Switch Contact - SPDT 8A, open low

Size - 62 x 53 x 101mm (head)

Protection Class - IP20

GENERAL ACCESSORIES for A19 & 270XT

Ordering Codes	Description	Price
FTG13A-600R	Closed tank connector Style 1b elements, Max. 10 bar, 120 °C, Min. -40°C	£23
KIT012N600	Capillary Brackets (6 pieces)	£14
WEL003N602R	Bulb Well, max. pressure 70 bar, temp. 370°C	£122

Pressure Transmitters

DP2500, DP0100, DP0250 Series Differential Pressure Transmitters

The DP Low Differential Pressure Transmitter series is an accurate and cost competitive solution for measuring low pressures of air and non-aggressive gases. Ideal for monitoring and controlling pressures in building automation, HVAC and clean room systems.

The DP series accurately measures low differential pressure and converts the measurement into a standard proportional 0-10V signal or 4-20mA. Pressure ranges are selected using the internal jumper switches.

FEATURES

- Eight measurement ranges in one device (DP2500)
- Four digit display
- AutoZero option (maintenance free)
- Selectable response time
- Easy mounting
- Now with adjustable span



Ordering Codes	Operating Ranges	Auto Zero	Display	Span Adj.	List Price
DP2500-R8	-100-+100 Pa, 0-100 Pa, 0-250 Pa, 0-500 Pa, 0-1000 Pa, 0-1500 Pa, 0-2000 Pa, 0-2500 Pa	-	-	-	£247
DP2500-R8-AZ		■	-	-	£323
DP2500-R8-D		-	■	-	£298
DP2500-R8-AZ-D		■	■	-	£373
DP0250-AZ	0-100 Pa, 0-250 Pa	■	-	-	£323
DP0250-AZ-D		■	■	-	£373
DP0100-AZ	-50-+50 Pa, -100-+100 Pa	■	-	-	£323
DP0100-AZ-D		■	■	-	£373
DP0100-AZ-SP		■	-	■	£374
DP0100-AZ-D-SP		■	■	■	£445

Power Supply - 24Vac/dc ±10%

Output Signal - 0-10Vdc (1kΩ min) or 4-20mA (500Ω max)

Response Time - 0.8/4 secs (selectable by jumper)

Bursting Pressure - 50 kPa

Media - Suitable for air and non-aggressive gases

Protection Class - IP54

Accessories include fixing screws, two plastic tube connectors and 2m tube Ø 4 / 7mm. Customised models are available upon request to Sales Support Team.

PT-5217 Series Pressure Transmitters

These transmitters accurately measure pressure and converts the measurement into a 0-10V signal. They are especially adapted to measure air, water and inert gases pressure.

It can also be used in pneumatic control systems to convert pneumatic into electric standard signals.



FEATURES

- Low zero drift/time
- Low sensibility to ambient temperature change
- Low hysteresis
- High accuracy
- Splash proof enclosure

Ordering Codes	Operating Range	Max. Overload Pressure	Output Signal	List Price
PT-5217-7011	0-100 kPa	200 kPa	0-10V	£405
PT-5217-7101	0-1000 kPa	2000 kPa		£405

Supply Voltage - 24Vac $\pm 15\%$ -10%, 50/60Hz or 13.5-33Vdc, max. 5 mA

Mounting - Direct mounting, 1.5m cable included

Size - 86 x 40mm ϕ

Protection Class - IP65

ACCESSORIES

Ordering Codes	Description	Price
EQ-6056-7000	Mounting Kit for plastic hose 4 x 6mm	£77
EQ-0100-7001	Mounting Kit for DIN-rail	£35

Pressure Switches

P232 Series Sensitive Differential Switch

This switch senses a change in the differential pressure (either velocity pressure or pressure drop across a restriction) as the air flow changes. The pressure (as sensed by two sensing ports) is applied to the two sides of a diaphragm in the control. The spring loaded diaphragm moves and actuates the switch.



The series P232 can also be used to detect small positive gauge pressure by using only the high pressure connection and leaving the low pressure connector open, or to detect a vacuum by using only the low pressure connection and leaving the high pressure connector open to ambient pressure.

FEATURES

- Easy to read setpoint scale
- Wide range (1-125mm water column)
- Small differential (1mm water column) at bottom of range
- Large wiring space
- Versatile mounting options

APPLICATIONS

This (differential) pressure switch is used to sense flow of air, single or differential air pressure. **Typical applications include:** Clogged filter detection, detection of frost on air-conditioning coils and initiation of defrost cycle, air proving in heating or ventilation ducts, maximum air flow controller for variable air volume system.

Ordering Codes	Switch point Range (in. wc)	Switching Differential (in. wc)	List Price
P232A-B-AAC	0.2-1.6	< 0.1	£37

Size - 72 x 72 x 52mm

P233 Series Sensitive Differential Switches

This switch senses a change in the (differential) pressure as the airflow changes. The (differential) pressure is applied to the two sides of a diaphragm in the control.



The spring-loaded diaphragm moves and actuates the switch. They can also be used to detect small positive gauge pressure or to detect a vacuum.

FEATURES

- One switch to measure relative differential pressure
- Various accessories available
- Compact and durable construction
- Easy mounting and wiring, various
- Standard PG 11 nipple and optional DIN 43650 connector
- Accurate and stable switch
- SPDT contact standard

APPLICATIONS

This (differential) pressure switch is used to sense flow of air, single or differential air pressure. **Typical uses include:** Detect clogged filter, detect frost or ice build-up on air-conditioning coils, air proving in heating or ventilation ducts, maximum airflow controller for variable air volume system, detect blocked flue or vent, monitor fan operation.

Ordering Codes	Switch Point Range (mbar)	Switching Differential (mbar)*	Notes	List Price	
P233F-P3-AAC	0.3 fixed	< 0.3	-	£44	
P233A-4-AAC	0.5-4		-	£45	
P233A-4-AHC			A	£46	
P233A-4-PAC	50-400 Pa		-	£45	
P233A-4-PHC			A, B	£43	
P233A-4-PKC			B, C	£55	
P233A-4-AKC	0.5-4		C	£44	
P233A-10-AAC	1.4-10		< 0.5	-	£36
P233A-10-AHC	140-1000 Pa			A	£55
P233A-10-PAC				-	£40
P233A-10-PKC	B, C	£55			
P233-10-AKC	1.4-10	C		£44	
P233A-50-AAC	6-50	< 1		C	£36
P233A-10-PHC	140-1000 Pa	< 0.5	A, B	£44	

* Switching differential is maximum value mid-range

Bulk packs on request

Notes:

A = GMT008N600R + BKT024N001R

B = Scale in Pa

C = FTG015N602R (2x) + 2m tube 4/7mm

Contact Rating - SPDT, 5(2)A, 250Vac

Size - 72 x 72 x 52mm

P28 Series Oil Protection Switches

These controls measure the pressure differential between the pressure generated by the oil pump and the refrigerant pressure at the crankcase.

A built-in time delay switch allows for pressure-pick up on start and avoids nuisance shutdowns on pressure drops of short duration during the running cycle.

The compressor can never run longer than the pre-determined time on low oil pressure. Controls are available only for manual reset after cut-out.

FEATURES

- Heavy duty pressure elements
- Safety lock-out with trip-free manual reset
- Ambient compensated timing
- Dust-tight PENN switch

APPLICATION

These oil protection controls are designed to give protection against low net lube oil pressure on pressure lubricated refrigeration compressors.



Ordering Codes	Range (bar)	† Style	Time Delay (s)	Refrigerant	Notes	List Price	
Voltage 115/230							
P28DA-9341	0.6-4.8	5	50	non-corr.	A	£295	
P28DA-9660		13	90		-	£307	
Voltage 230							
P28DJ-9360	0.6-4.8	5	90	non-corr.	B	£480	
P28DJ-9861				NH3	B, D	£470	
P28DP-9300				-	C	£228	
P28DP-9340		5	90	non-corr.	-	-	£262
P28DP-9360							£262
P28DP-9380							£236
P28DP-9381		13	90	non-corr.	-	-	£315
P28DP-9640							£244
P28DP-9660							£244
P28DP-9680		15	50	NH3	-	-	£253
P28DP-9840							£292
P28DP-9860		-	15	90	NH3	H	£334
Voltage 115/230							
P28DN-9750		-	15	50	NH3	E, G, H	£361

† See page 46 for 'Style' references

Notes:

- A = Includes plastic PG nipple 13.5 + two flare nuts
- B = IP66 enclosure
- C = Without time relay
- D = Includes two connectors CNR003N001
- E = Concealed adjustment
- F = Set 0.65 bar
- G = Set 1.5 bar
- H = No switch action

Switch Action - Open low, alarm and safe light contacts
 Contact Rating - 15(8)A, 230Vac
 Size - 134 x 144 x 53mm

REPLACEMENT TIME RELAYS

Ordering Codes	Timing (s)	Voltage	Switch Action	List Price
RLY13A603R	90	120/240	Manual reset, dual voltage (AC)	£143
RLY13A627R	120	24	Manual reset, 24Vac/dc	£189
RLY13A635R	90			£186

P45 Series Oil Protection Switches

The series P45 controls are designed to give protection against low lube-oil pressure on pressure lubricated refrigeration compressors.

There are several million in use today. The controls measure the pressure differential (net oil pressure) between the pressure generated by the oil pump and the refrigerant pressure at the crankcase. A built-in time delay switch allows pressure build-up during start and avoids nuisance shut-down on pressure drops of short duration during the running cycle.

FEATURES

- Heavy duty pressure elements
- Key specifications match/exceed other brands
- Accurate 0.2 bar switch differential standard
- Adjustable or fixed setpoint
- Safelight output standard
- Trip-free manual reset
- High current rated output
- Ambient compensated timing



Ordering Codes	Range (bar)	Setting (bar)	Time Delay (s)	† Style	List Price
Voltage 230Vac					
P45NBB-9361B	0.5-4	0.6	90	5	£250
P45NBB-9381B			120		£234
P45NBB-9640C		13	0.7	50	£212
P45NBB-9660C				90	£213
P45NBB-9660Q			1.8	£280	
P45NBB-9680C			0.7	120	£212
Voltage 115/230					
P45NCA-9056	0.5-4	0.45	50	13	£260
P45NCA-9104		0.7	120		£254

Switch Action - Open low, alarm and safe light contacts

Switch Rating - 15(8)A, 230Vac

Size - 83 x 144 x 58mm

† See page 46 for 'Styles'

P74 Series Differential Pressure Switches

These pressure switches incorporate two opposing pressure elements and an adjustable range setpoint spring with a calibrated scale. The control switches at the indicated setpoint on an increase in differential pressure and switches back to the normal position when the different pressure decreases to the setpoint less the mechanical switching differential.

FEATURES

- Heavy duty pressure elements
- These controls may be used in combination with series P28 lube oil protection control on two compressor, single motor units

APPLICATIONS

These controls are designed to sense pressure differences between two points and may be used as operating or limit controls. Typical applications are to detect flow across a chiller or water cooled condenser, to detect flow in a heating system and sensing lube oil pressure differential on refrigeration compressors.



Ordering Codes	Range (bar)	Mech. Diff. (bar)	† Style	Switch Action	Notes	List Price	
P74DA-9300	0.6-4.8	0.7-2 adjustable	5	DPST, 10A, contacts Open Low	-	£194	
P74DA-9600			13			£201	
P74EA-9300		0.3 fixed	15	5	SPDT, 5A, contact Open High	A	£185
P74EA-9600				13			£229
P74EA-9700				A, B, C			£290
P74EA-9701				A, B, C			£318
P74FA-9700	0-1	0.1 fixed	15	SPDT, 3A, contact Open High	D	£289	
P74FA-9701	2-8	0.7 fixed	A			£410	

Notes:

- A = For NH3
 - B = Set 1 bar
 - C = Concealed adjustment
 - D = For water
- Size - 172 x 101 x 53mm

† See page 46 for 'Style' references

P48 Series Steam Pressure Switches

The P48 series has been developed for special applications where pressure must be controlled. All models have an adjustable differential depending on the range (see type number selection table). The P48AAA-9110 and P48AAA-9120 has the power element outside the case.



All the models have phosphor bronze bellows and brass pressure connections except the P48AAA-9150. This model has a stainless steel bellows and pressure connection and is provided with a brass adapter 1/4"-18 NPT female to R3/8 male.

FEATURES

- Splash-proof enclosure (IP54)
- SPDT contacts are provided as standard on single pressure control
- Trip-free manual reset

APPLICATION

The series P48 pressure controls are designed for high/low cut-out control on steam, air or (hot) water applications. Also for non-combustible gases which are not harmful to the materials in contact with these mediums. On steam applications a steam trap is recommended (see Accessories).

Ordering Codes	Range (bar)	Differential (bar)	† Style	Notes	List Price
P48AAA-9110	0-1	0.16-0.55	29a	A	£150
P48AAA-9120	0.2-4	0.25-0.8			£103
P48AAA-9130	-0.2-+10	1-4.5			£103
P48AAA-9140	1-16	1.3-2.5			£103
P48AAA-9150	3-30	3-12			A, B
P48BEA-9140*	4-16	-		C	£141

* Quantity orders only

† See page 46 for 'Style' references

Notes:

A = Automatic Reset
B = Stainless steel bellows
C = Manual Reset

Switch Action - SPDT, Open high
Switch Rating - 16(10)A, 220-400Vdc,
12W (pilot duty only)
Pressure Connection - G 3/8" male
Size - 146 x 88 x 53mm

P735 Series Single Pressure Switches

This series of pressure controls may be used for control functions or limit functions, depending on model number. All models are provided with alarm contacts. All standard models have phosphor bronze bellows and brass pressure connections. Models for use with ammonia are provided with stainless steel bellows and connectors.



FEATURES

- SPDT contacts are provided as standard on single pressure controls
- Trip-free manual reset

APPLICATION

These pressure controls are designed for use in a variety of applications involving refrigeration high or low pressure. Models supplied have a 'whole range' design, enabling them to be used with all non-corrosive refrigerants which are within the operating range of the control. They may also be used for other high or low pressure applications such as air, water etc. Models which can be used with ammonia are included in the program.

Ordering Codes	Range (bar)	Differential (bar)	Switch † Action (wire diag.)	Max. Bellows Pressure	† Style	List Price
For Water						
P735AAA-9200	-0.2-+10	1-4.5	1	15	***	£69
P735AAA-9201	-0.5-+7	0.5-3		22		£68
For Non-corrosive Refrigerants (Alerter, safety pressure limiter)						
P735AAA-9300	-0.5-+7	0.5-3	1	22	5	£52
P735AAA-9400					30	£55
P735AAA-9301	-0.2-+10	1-4.5		15	5	£50

(continued next column)

Ordering Codes	Range (bar)	Differential (bar)	Switch † Action (wire diag.)	Max. Bellows Pressure	† Style	List Price
For Non-corrosive Refrigerants (Alerter, safety pressure limiter)						
P735AAA-9350	3-30	3-12	2	33	5	£54
P735AAA-9351	3.5-21	2.1-5.5		30		£52
P735BCA-9300	-0.5-+7	Man. res.**	1	22		£51
P735BEA-9350	3-30	Man. res.*	3	33	£53	
For Non-corrosive Refrigerants						
P735AAW-9300	-0.5-+7	0.6 to 3	1	20	5	£54
P735AAW-9350	3-30	3.5 to 12	2	33		£48
P735AAW-9850					28	£54
P735BCB-9300	-0.5-+7	Man. res.**	1	20	5	£51
P735BEB-9350	3-30	Man. res.*	3	33		£70
P735BEB-9850					28	£70

Notes:

* Resettable at 3 bar below cut-out point
** Resettable at 0.5 bar above cut-out point
*** Special pressure connection G 1/4" female
100 kPa = 1 bar = 14.5 psi

† See page 46 for 'Style' reference

Contact Rating - SPDT
Size - 92 x 70 x 51mm
Protection Class - IP30

P736 Series Dual Pressure Switches

The P736 series pressure controls may be used for control functions or limit functions, depending on model number. All models are provided with alarm contacts (except P736ALA). All standard models have phosphor bronze bellows and brass pressure connections. Models for use with ammonia are provided with stainless steel bellows and connectors.



FEATURES

- Trip-free manual reset
- Separate alarm contacts for both low pressure and high pressure cut-out (except P736ALA)

APPLICATION

These dual pressure controls are designed for use in a variety of applications involving refrigeration high or low pressure. Models supplied have a 'whole range' design, enabling them to be used all non-corrosive refrigerants which are within the operating range of the control. They may also be used for other high or low pressure applications such as air, water etc. Models which can be used with ammonia are included in the program.

Ordering Codes	Left Side (bar)		Right Side (bar)		† Style	List Price	
	Range	Diff.	Range	Diff.			
For Non-corrosive Refrigerants (LP: 22 bar, HP: 33 bar max.)							
P736LCA-9300	-0.5-+7	0.5-3	3-30	3 (fixed)	5	£77	
P736LCA-9400					30	£87	
P736MCA-9300				Man. Res.**	Man. Res.**	5	£79
P736PGA-9300							£83
For Fan Cycling - Air-cooled Condensers, Non-corrosive (HP/HP: 30 bar max.)							
P736ALA-9351	3.5-21	1.8 (fixed)	3.5-21	1.8 (fixed)	5	£79	
For Non-corrosive Refrigerants (LP: 22 bar, HP: 33 bar max.)							
P736LCW-9300	-0.5-+7	0.6-3	3-30	3 (fixed)	5	£87	
P736LCW-9800					28	£93	
P736MCB-9300				Man. Res.**	Man. Res.**	5	£93
P736MCS-9300							£87
P736PGB-9300							£92
Manual Reset, Safety Pressure Limiter (HP/HP: 30 bar max.)							
P736PLM-9370	3-30	Man. Res.**	3-30	Man. Res.**	5	£95	

Notes:

* Resettable at 0.5 bar above cut-out point
** Resettable at 3 bar below cut-out point
100 kPa = 1 bar = 14.5 psi

Contact - SPST
Size - 132 x 77 x 51mm
Protection Class - IP30

† See page 46 for 'Styles and Wiring Diagrams'

P77 Series
Single Pressure Switches (IP54)

These controls may be used for control functions or limit functions, depending on model number. All models are provided with alarm contacts. All standard models have phosphor bronze bellows and brass pressure connections. Models for use with ammonia are provided with stainless steel bellows and connectors. Devices conforming to PED 97/23/EC Cat. IV (HP models) have the fail-safe function with double bellows.



FEATURES

- Splash-proof enclosure (IP54)
- SPDT contacts are provided as standard on single pressure controls
- Trip-free manual reset

APPLICATION

These pressure controls are designed for use in a variety of applications involving refrigeration high or low pressure. Models supplied have a 'whole range' design, enabling them to be used with refrigerants R22, R134A, R404A, R410A and all other non-corrosive refrigerants which are within the operating range of the control. They may also be used for other high or low pressure applications such as air, water etc. Models which can be used with ammonia are included in the program. Also models tested and approved to PED 97/23/EC Cat. IV (supersedes DIN and TUV approval) are included in the program.

Ordering Codes	Range (bar)	Diff. (bar)	Wiring/ Action †	† Style	Refr.	Notes	List Price
P77AAA-9300	-0.5-+7	0.5-3					£58
P77AAA-9301	-0.2-+10	1-4.5	1	5	non-corr.	-	£59
P77AAA-9302	-0.3-+2	0.4-1.5					£59
P77AAA-9350	3-30	3-12	2				£58
P77AAA-9351	3.5-21	2-5.5		2			£57
P77AAA-9400	-0.5-+7	0.5-3	1	30	-	A	£68
P77AAA-9450	3-30	3-12					£68
P77AAA-9451	3.5-21	2-5.5	2				£58
P77AAA-9700	-0.5-+7	0.5-3		15	NH3	-	£99
P77AAA-9750	3-30	3-12					£99
P77AAA-9800	-0.5-+7	0.5-3	1	28	non-corr.	B	£69
P77AAA-9850	3-30	3-12	2				£69
Automatic Recycle (Alerter, including lockplate assembly)							
P77AAW-9300	-0.5-+7	0.5-3	1	-	non-corr.	-	£72
P77AAW-9350	3-30	3.5-12	2				£65
P77AAW-9355	3-42	4-12					5
P77AAW-9700	-0.5-+7	0.5-3	1	15	NH3	-	£119
P77AAW-9750	3-30	3.5-12	2				£170
P77AAW-9800	-0.5-+7	0.5-3	1	28	non-corr.	B	£72
P77AAW-9850	3-30	3.5-12	2				£87
P77AAW-9855	3-42	4-12					£91
Manual Reset (LP)							
P77BCA-9300				5	non-corr.	-	£65
P77BCA-9400				30	non-corr.	A	£78
P77BCA-9700	-0.5-+7	-	1	15	NH3	-	£108
P77BCB-9300				5	non-corr.	-	£80
P77BCB-9800				28	non-corr.	B	£81
Manual Reset (HP)							
P77BEA-9350				5	non-corr.	-	£57
P77BEA-9450	3-30	-	3	30	non-corr.	A	£74
P77BEA-9750				15	NH3	-	£109
Limiters, including lockplate assembly							
P77BEB-9350	3-30			5	non-corr.	-	£77
P77BEB-9355	3-42						£98
P77BEB-9750	3-30	-	3	15	NH3	-	£162
P77BEB-9850				28	non-corr.	B	£76
P77BEB-9855	3-40						£102

(continued next column)

Ordering Codes	Range (bar)	Diff. (bar)	Wiring/ Action †	† Style	Refr.	Notes	List Price
Safety pressure limiter, including lockplate assembly							
P77BES-9350				5	non-corr.	-	£80
P77BES-9750	3-30	-	3	15	NH3	-	£97
P77BES-9850				28	non-corr.	B	£102

Notes:

- A = Solder connection 1/4" ODF
- B = Solder connection 6mm ODM

† See page 46 for 'Styles and Wiring Diagrams'

Contact - SPST
Size - 88 x 80 x 53mm
Protection Class - IP54

P78 Series
Dual Pressure for IP54 Applications

The P78 series pressure controls may be used for control functions or limit functions, depending on model number. All models are provided with alarm contacts (except P78ALA). All standard models have phosphor bronze bellows and brass pressure connections. Models for use with ammonia are provided with stainless steel bellows and connectors. Devices conforming to DIN 32733 have a double bellows on the high pressure versions.



FEATURES

- Splash-proof enclosure (IP54)
- Trip-free manual reset
- Patented separate alarm contacts for both low pressure and high pressure cut-out (except P78ALA)

APPLICATION

These pressure controls are designed for use in a variety of applications involving refrigeration high or low pressure. Models supplied have a 'whole range' design, enabling them to be used with refrigerants R22, R134A, R404A, R410A and all other non-corrosive refrigerants which are within the operating range of the control. They may also be used for other high or low pressure applications such as air, water etc. Models which can be used with ammonia are included in the program. Also models tested and approved to PED 97/23/EC Cat. IV (supersedes DIN and TUV approval) are included in the program.

Ordering Codes	Range (bar)	Diff. (bar)	Wiring/ Action†	† Style	Refr.	Notes	List Price
Automatic Recycle							
P78LCA-9300				5	non-corr.	-	£79
P78LCA-9400	-0.5-+7 LP	0.5-3 LP	4	30	-	A	£79
P78LCA-9500	3-30 HP			35	-	B	£99
P78LCA-9700				15	NH3	-	£172
Automatic Recycle, Technical Inspection Agency							
P78LCW-9300				5	non-corr.	-	£191
P78LCW-9302*	-0.5-+7 LP	0.5-3 LP	4	28	-	C	£138
P78LCW-9800	3-30 HP					D	£98
P78LCW-9801*						E	£148
Manual Reset (HP)							
P78MCA-9300	-0.5-+7 LP	0.5-3 LP	4	5	non-corr.	-	£83
P78MCA-9400	3-30 HP			30	-	A	£83
P78MCA-9700				15	NH3	-	£177
Manual Reset (LP)/Auto. Reset (HP)							
P78PGA-9300				5	non-corr.	-	£93
P78PGA-9400	-0.5-+7 LP	-	4	30	-	A	£109
P78PGA-9700	3-30 HP			28	NH3	-	£206
Manual Reset (LP/HP)							
P78PGB-9300	-0.5-+7 LP	-	4	5	non-corr.	-	£117
P78PGB-9800	3-30 HP			28	-	D	£106
Manual Reset (HP) Limiter, including lockplate assembly							
P78MCB-9300	-0.5-+7 LP	0.5-3 LP	4	5	non-corr.	-	£100
P78MCB-9800	3-30 HP			28	-	D	£106

(continued next page)

Ordering Codes	Range (bar)	Diff. (bar)	Wiring/ Action†	† Style	Refr.	Notes	List Price
Manual Reset (HP) Safety Pressure Limiter, including lockplate assembly							
P78MCS-9300	-0.5-+7 LP 3-30 HP	0.5- 3 LP	4	5	non-corr.	-	£94
Manual Reset (HP/HP) Safety Pressure Limiter, including lockplate assembly							
P78PLM-9350	3-30 LP	-	5	5	non-corr.	-	£128
P78PLM-9850	3-30 HP	-	5	28	non-corr.	D	£152
Dual Fan Cycling Control							
P78ALA-9351	3.5-21 LP	-	6	5	non-corr.	-	£102
P78ALA-9451	3.5-21 HP	-	6	30	non-corr.	A	£100

† See page 46 for 'Styles and Wiring Diagrams'
* Quantity orders only

Notes:

- A = Solder connection 1/4" ODF
- B = With 90cm capillary pressure connection
- C = Gold plated contacts
- D = Solder connection 6mm ODM
- E = Gold plated contacts, fixed settings LP 0.3 bar; HP 22.5 bar

- Contact - SPST
- Size - 88 x 80 x 53mm
- Protection Class - IP54

P100 Series Direct Mount Pressure Switches

These encapsulated, non-adjustable, direct mount pressure controls typically used for low and high pressure cut-outs for OEM applications. The P100 series are produced according to switchpoint requirements of customers.

The small dimensions, weight and protection class makes the P100 series applicable for use without the need of additional mounting brackets. They can be used for all non-corrosive refrigerants like R134a; R22; R404, R410A and others.

FEATURES

- Compact size and light weight
- Encapsulated, dust tight switch IP67
- Broad variety of electrical and pressure connections.

APPLICATIONS

- Computer room air-conditioning
- Refrigeration/ air-conditioning condensers
- Commercial refrigeration
- Ice machines
- Food service equipment



Manual Reset Models

Ordering Codes	Appl.	Refr.	P (bar)		Notes	List Price
			Open (Close)	Open (Close)		
Auto Reset Models						
P100AP-300D	Low Press.	R134A	2.5 (4)	0.5 (0.5)	A, D	£20
P100AP-301D					B, D	£13
P100AP-302D		R407C	4 (6)	A, D	£13	
P100AP-306D		R404A	0.3 (2.8)	0.4 (0.4)	A, D	£13
P100AP-308D	Norm. Open	-	0.5 (1.5)	0.3 (0.3)	A, C	£12
P100AP-309D					A, F	£13
P100AP-310D					A, E	£12
P100CP-102D	High Press.	R134A	16 (11)	0.7 (1.4)	A, D	£17
P100CP-103D					B, D	£20
P100CP-104D		R407C	24 (18)	A, D	£14	
P100CP-106D		R404A	28 (23)	A, D	£14	
P100CP-107D	Norm. Closed	R410A	38 (28)	0.7 (0.7)	B, D	£14
P100CP-108D					A, D	£14
P100CP-110D					A, C	£10
P100CP-111D	-	-	27.6 (20.7)	-	A, D	£20
			26 (20)		A, D	£20

Notes:

- A = 1/4" SAE Fem Flare
- B = 50mm straight, 6mm dia. x 7mm reduced end, copper clad brazing tube (TIF5)
- C = Faston termination
- D = 2 metre cable
- E = 3 metre cable
- F = 1.2 metre cable

(continued next column)



Auto Reset Models

FEATURES

- Compact size and light weight
- Encapsulated, dust tight switch IP67
- Manual reset models have a trip-free design
- Models with gold-plated contacts available
- Broad variety of electrical and pressure connections

Ordering Codes	Appl.	Refr.	P (bar)		Notes	List Price			
			Open (Close)	Open (Close)					
Manual Reset Models									
P100DA-66D	High Pressure	R134A	16 (-)	0.7 (-)	A, D	£17			
P100DA-67D					B, D	£20			
P100DA-68D		R407C	26 (-)	0.7 (-)	A, E	£22			
P100DA-69D					B, E	£22			
P100DA-70D		R404A	28 (-)	1.0 (-)	A, E	£19			
P100DA-71D					B, E	£22			
P100DA-72D					R410A	38 (-)	1.0 (-)	A, D	£20
P100DA-73D								B, D	£20
P100DA-74D		R407C	26 (-)	0.7 (-)	A, F	£18			
P100DA-75D		R410A	42 (-)	0.7 (-)	A, D	£20			
P100DA-76D	B, D				£20				
Heavy Duty Models - Auto Reset									
P100EE-17D	HP	R404A	20 (25)	1.0 (1.0)	A, H	£29			
P100EE-18D		R134A	15 (11)			£24			
P100EE-60D	Norm. Closed	R404A	28 (21)	0.7 (0.7)	A, D	£21			
P100EE-61D					B, D	£26			
P100EE-68D					R134A	3 (25)	0.35 (0.35)	A, G	£23

Notes:

- A = 1/4" SAE Fem Flare
- B = 50mm straight, 6mm dia. x 7mm reduced end, copper clad brazing tube (TIF5)
- C = Faston termination
- D = 2 metre cable
- E = 3 metre cable
- F = 1.2 metre cable
- G = 1.8 metre cable
- H = 1.5 metre cable

General Accessories

for Pressure Switches

Ordering Codes	Description	Price
BKT034N602R	Mounting bracket + screws for P35AC transducer	£6
210-25R	Mounting bracket for P20/P35 (single)	£5
WRN12-1	Wrench P20/P21	£16
210-604R	Terminal cover P20/P21 (50 off)	£5
BKT024N002R	Mounting bracket for P233	£5
FTG015N602R	Duct mounting kit 'staight'	£23
FTG015N603R	Duct mounting kit 'bent'	£28
GMT008N600R	Duct kit for P233, self locking grommet and tubing	£11
CNR003N001R	Connector 6mm for P77/P78	£12
CNR003N002R	Connector 8mm for P77/P78	£13
CNR012N001R	Adapter R3/8 female to 1/4-18 NPT male for P48	£19
CNR013N001R	Adapter R 3/8 female to 1/4-18 NPT female for P48	£23
TBG16A-600R	Steam trap assembly P48	£33
KIT023N600	Locking kit for P48, P77/P78 - for field installation	£4
KIT031N600	Valve depressors for conversion style 13 - style 45a (100 off-1 box)	£95
KIT034N600	Seal rings for style 50/51 (250 off-1 box)	£93
271-51L	Mounting bracket for P28, P45, P48, P74, P77/P78 (50 off)	£4
SEC002N600	Capillary kit, 90cm, 2 x style 13 (100 off-1 box)	£9
SEC002N602	" " 90cm, style 13 - style 45a (100 off-1 box)	£10
SEC002N606	" " 200cm, style 13 - style 45a (75 off)	£15
SEC002N607	" " 200cm, 2 x style 13 (75 off)	£13
SEC002N616	" " 90cm, style 13 - cap. (150 off-1 box)	£9
SEC002N617	" " 100cm, style 13 - style 13 (100 off-1 box)	£11
SEC002N621	" " 90cm, style 34 - style 34 (100 off-1 box)	£9
SEC002N622	" " 90cm, style 50 - style 50 (100 off-1 box)	£15
SEC002N624	Capillary kit, 200cm, style 50 - style 50	£20
SEC002N626	" " 90cm, style 50 - style 51	£13
SEC002N627	" " 200cm, style 50 - style 51	£16
SEC002N628	" " 300cm, style 50 - style 51	£17
SEC002N631	" " 50cm, style 13 - style 34	£9

Pressure Transducers

P35 Series

Mechanical Transducers



The P35 is a single pressure input fan speed controller for air cooled condensers. The controller varies the fan speed by directly sensing the pressure changes in a refrigerant circuit. The setpoint of each pressure transducer can be separately adjusted. The controller selects the input with the greatest cooling demand to control the fan speed.

The controllers can be used in non corrosive refrigerant systems and vary the supply voltage to the motor from 45% to ≥ 95% of the supplied voltage using the phase cutting principle. If the pressure drops below the adjusted setpoint minus the proportional band, the output to the motor is zero volt or the adjusted min. speed setting.

This provides speed variation of permanent split capacitor or shaded pole motors which do not draw more than 3A (rms) full load current. The motor manufacturer should have approved his product for this speed control principle. It is recommended to confirm with the electric motor manufacturer, that the motor can be used with a controller, using the phase cutting principle for speed variation.

FEATURES

- Condenser pressure control by fan speed variation
- Pressure input / dual pressure input (BR models)
- Transducers with proven reliability
- Built-in suppression filter
- Adjustable minimum speed or cut-off selection

Ordering Codes	Range	Setting (bar)	† Style	Notes	List Price
Replacement Pressure Transducers for P215 version (300 KΩ)					
P35AC-9100	14-24	16	45A	-	£142
P35AC-9202			47		£174
P35AC-9203	8-14	10			£176
P35AC-9500	14-24	16			£151
P35AC-9501	8-14	10	50		£183
P35AC-9512	22-42	30		A	£185
P35AC-9600	14-24	16	13	B	£142
P35AC-9601	8-14	10			£106
Replacement Pressure Transducers for P255 version (100 KΩ)					
P35AC-9200	14-24	16	47	-	£176
P35AC-9201	8-14	10			£176
P35AC-9106	3.5-10	16	45A	-	£138
P35AC-9604	8-14		13		£146
P35AC-9505	14-24	10			£155
P35AC-9506	22	16	50		£153
P35AC-9511	8-14	30		A	£179
Replacement Pressure Transducers for P255 version (500 KΩ)					
P35AC-9200	14-24	16	50	C	£176
P35AC-9201	22-40	30		D	£176

Notes:

A = For R410A applications

B = Also used for replacement P15/P215 series fan speed controllers

C = Special 500 KΩ for P215LR-400V version

D = Special 500 KΩ version for R410A applications

† See page 46 for 'Style' references

Capillary Length - 90cm

P499 Series Electronic Transducers

The P499 Series is a new global Pressure Transducer with an excellent price performance ratio. The P499 exceeds the latest industrial CE/UL requirements including surge protection, and is over voltage protected in both positive and reverse polarity.



The P499 is designed to produce a linear analogue signal based on the sensed pressure. The pressure port is machined from a solid piece of 17-4PH stainless steel. There are no O-rings or welds that are exposed to the pressure media. This results in a leak proof, all metal sealed pressure system which withstand more than 10 million pressure cycles without failure.

FEATURES

- Single-piece machined steel pressure port
- Environmentally sealed electronics
- Reliable, repeatable performance and long operating life
- Slender body design

Ordering Codes	Range (bar)	Output	Supply	Press Connection	Note	List Price
P499ABS-401C	-1+8	0.4-20 mA	9-32Vdc	Male	A	£73
P499ABS-404C	0-30			Female		£73
P499ACS-401C	-1+8	0-30	12-30Vdc	Female		£52
P499ACS-404C	0-30			Male		£42
P499VBS-401C	-1+8	0-10Vdc	12-30Vdc	Male		£61
P499VBS-404C	0-30			Female		£61
P499VCS-401C	-1+8	0-30		Female		£56
P499VCS-404C	0-30					£46

Notes:

A = Maximum (short) overpressure: Range -1-8 bar: 16 bar Range 0-30 bar: 60 bar Range 0-50 bar: 100 bar.

Can be used with all media which are compatible with stainless steel type 17-4PH.

Accuracy: +/- 0.25% FS BFSL

Total Error: +/- 1% FS

Electro-Pneumatic Transducers

EP-1000 Series Electro-Pneumatic Transducers

The EP-1110 is an electric to air Pressure Transducer. The unit is designed to convert an electrical input signal into a pressure output with a linear relationship.

These service and data information sheets (in brief SDI) are operating instructions for the safe installation and operation of the EP-1110-700x (EP-1110) electro-pneumatic transformer. Should difficulties occur during installation which, cannot be solved with the help of this SDI please ask the Sales Support Team.



Ordering Codes	Input *	Output **	List Price
EP-1110-7001	0-10Vdc, Ri ≥ 1 kΩ	20-100 kPa	£737
EP-1110-7002	2-10Vdc, 0-10Vdc, Ri ≥ 1 kΩ	20-100 kPa, 3-100 kPa	£776
EP-1110-7003	0-20 mAdc, Ri ≤ 450Ω	20-100 kPa	£749
EP-1110-7004	4-20Vdc, 0-20 mA(dc) Ri ≤ 450Ω	20-100 kPa, 3-100 kPa	£776

* Current through coil approx. 10 mA

** Linearly proportional to input

Size - 188 x 62 x 74.5mm

EP-2000 Series Electro-Pneumatic Transducers

The EP-2000 Electro-Pneumatic Transducer with motor drive, is used for converting an electrical contact signal into a 0.2-1 bar pneumatic standard signal.

These service and data information sheets (in brief SDI) are operating instructions for the safe installation and operation of the EP-2000-70xx (EP-2000) Electro-Pneumatic transducer. Should difficulties occur during installation which, cannot be solved with the help of this SDI please ask the Sales Support Team.



FEATURES

- High linearity and low hysteresis
- High accuracy
- Small supply air influence and air consumption

Ordering Codes	Limit Switch & Potentiometer **	Accessories	Voltage Supply	List Price
EP-2000-7001	120 sec.	-	230V	£898
EP-2000-7004			24V	£885
EP-2000-7021		2 kΩ pot.	230V	£960
EP-2000-7024			24V	£954

* Option upon request

** 2 kΩ Feedback potentiometer

Supply Voltage - 230V, 50/60Hz, +6/-10% or 24V, 50Hz, ±10%

Size - 198 x 62 x 75mm

EP-8000 Series Electro-Pneumatic Transducers

These transducers convert a voltage or current signal from an electronic controller into a pneumatic output pressure signal. An increase or decrease in the input signal proportionally increases or decreases (respectively) the output pressure signal from the EP-8000.

Sequencing of pneumatic valve or damper actuators can be accomplished using a V-9502 (Valve) or D-9502 (Damper) Actuator Positioner.



FEATURES

- Compact, simple design
- Hypodermic needle test point
- Factory set, fully adjustable zero and span
- High accuracy with low hysteresis

Ordering Codes	Input Range	Output	Factory Output	List Price
EP-8000-1	0.5-9Vdc	Low Volume (non-relay)	7-126 kPa (1-18 psig)	£158
EP-8000-2	0.25-9.5Vdc	High Volume (relay)	3.5-133 kPa (0.5-19 psig)	£148
EP-8000-3	4-20 mAdc	Low Volume (non-relay)	21-105 kPa (3-15 psig)	£158
EP-8000-4		High Volume (relay)		

ACCESSORIES

Ordering Codes	Description	Price
R-3710-8205	0.18mm Restrictor (required for low volume models)	£17
EP-8000-101	Electro-Pneumatic Transducer Mounting Kit	£20
A-4000-8001	Inline Air Filter (required for all models)	£31
JC 5361	Hypodermic Needle Test Probe Assembly	£40
G-2010 Series	0-210 kPa (0-30 psig) Gauge	POA

Connections - Barbed air connections for 5/32 or 1/4 inch o.d. polytubing.

Room Controllers

TC-8900, PM-8900 & ES-89xx Series Room Controllers

This family of analogue controllers is designed for control of fan coils with 2-pipe, 2-pipe with change-over, 2-pipe with electrical coil or 4-pipe configurations.

For applications without fan speed control the family includes stand alone units (TC-890x), local controllers (TC-893x) with remote setpoint module (ES-8930) and local controllers (TC-894x) with central setpoint module (ES-8940).

For applications with fan speed control the family includes the PM-8900 power modules in connection with TC-894x with or without central setpoint module (ES-8940).



FEATURES

- 2-pipe, 2-pipe with change-over, 2-pipe with electrical coil or 4-pipe configurations with and without 3-speed fan override
- 24Vac and 240Vac power modules

Ordering Codes	NTC K10 Sensor	Setpoint Range	Outputs				List Price	
			PAT	0-10V	DAT	On/Off		
Stand-alone Controllers								
TC-8903-1131-WK	■	12-28°C	1	-	-	-	£151	
TC-8901-2131-WK			-	2	-	-	£136	
TC-8904-2131-WK			-	-	2	-	£97	
TC-8906-2131-WK			-	-	-	2	£144	
TC-8903-1132-WK			-	-	1	-	-	£141
TC-8901-2132-WK			-	-	-	2	-	£89
TC-8904-2132-WK			-	-	-	2	-	£109
TC-8906-2132-WK			-	-	-	-	2	£130
TC-8903-1151-WK	■	0-40°C	1	-	-	-	£153	
TC-8903-1152-WK	-		1	-	-	-	£126	
Stand-alone Controllers with 0-10V input								
TC-8903-1183-WK	-	0-100%	1	-	-	-	£151	
TC-8901-2183-WK	-		-	2	-	-	£151	
Local Controllers used with ES-8930 Remote Setpoint Module								
TC-8933-1112-W	-	-	1	-	-	-	£143	
TC-8931-2112-W			-	2	-	-	£85	
TC-8936-2112-W			-	-	-	2	£89	
ES-8930-3031-WK			■	12-28°C	-	-	-	£116
Local Controllers used with ES-8940 Central Setpoint Module								
TC-8943-1141-WK	■	+/-	1	-	-	-	£117	
TC-8941-2141-WK			-	2	-	-	£136	
TC-8944-2141-WK			-	-	2	-	£113	
TC-8946-2141-WK			-	-	-	2	£142	
ES-8940-4130-WK			-	12-28°C	-	-	-	£129

Ordering Codes	NTC K10 Sensor	Setpoint Range	Config.	Outputs	Power Mod.+	List Price	
							Local Controllers (3-speed Fan Output) and used with ES-8940 Module
TC-8902-1031-WK	■	12-28°C	2 pipe ††	1 x 0-10Vdc	A	£83	
				1 x DAT 230V	B		
				1 x DAT 24V	C		
TC-8907-1031-WK			4 pipe	1 x Relay †	D		£144
TC-8902-2031-WK				2 x 0-10Vdc	A		£136
				2 x DAT 230V	B		
TC-8907-2031-WK	2 x DAT 24V	C	£142				
	2 x Relay †	D					

(continued next column)

Ordering Codes	NTC K10 Sensor	Setpoint Range	Config.	Outputs	Power Mod.+	List Price	
Local Controllers (3-speed Fan Output) and used with ES-8940 Module (cont)							
TC-8902-1032-WK	-	12-28°C	2 pipe ††	1 x 0-10Vdc	A	£93	
				1 x DAT 230V	B		
				1 x DAT 24V	C		
TC-8907-1032-WK			4 pipe	1 x Relay †	D		£132
TC-8902-2032-WK				2 x 0-10Vdc	A		£80
				TC-8907-2032-WK	2 x DAT 230V		
TC-8942-2041-WK*	■	+/- **	4 pipe	2 x DAT 24V	C	£136	
TC-8947-2041-WK*				2 x Relay †	D	£144	

Notes:

* only in connection with ES-8940-4130-WK

** +/- on local controller TC-89, 12-28°C on ES-8940 central setpoint module

† Relay 3A, 230V/24V

†† With changeover

Size - 80 x 80 x 33mm

Protection Class - IP30

+ POWER MODULES

Ordering Codes	Description	Price
PM-8902-0500	(A) - 1 x 0-10Vdc Output	£114
PM-8905-0300	(B) - 1 x DAT 230V Output	£129
PM-8905-0500	(C) - 1 x DAT 24V Output	£106
PM-8907-0300	(D) - 1 x Relay 3A 230V/24V Output	£105

VT7200 Series

Low Voltage, Zoning Thermostats



The VT7200 PI thermostat family is specifically designed for zoning applications in commercial HVAC applications. These include local hydronic reheat valve control and pressure dependent VAV with or without local reheat.

The product features a backlit LCD display with dedicated function menu keys for simple operation. Accurate temperature control is achieved due to the product's PI proportional control algorithm, which virtually eliminates temperature offset associated with traditional, differential-based thermostats. Models are available for 3-point floating and analogue 0-10Vdc control. In addition remote room sensing is available. They all contain an SPST auxiliary switch that can be used to control lighting or auxiliary reheat.

The controllers are also compatible with the new PIR cover accessories. Thermostats equipped with a PIR cover provide advanced active occupancy logic, which will automatically switch occupancy levels from 'Occupied' to 'Stand-By' and 'Unoccupied' as required by local activity being present or not. This advanced occupancy functionality provides advantageous energy savings during occupied hours without compromising occupant comfort.

FEATURES

- Advanced occupancy functions
- Three configurable inputs
- Pre-configurable sequences of operation
- Unique configurable setup utility
- Lockable keypad
- Available for 24Vac On/Off, Floating or Analogue Control
- Auxiliary output
- Available with various 'open industry standards' communication adapters
- Ready for PIR accessory cover

Ordering Codes*	Description	List Price
VT7200C5031	2 x Tri-state Floating Outputs 1 x Auxiliary or Reheat Contact	£193
VT7200F5031	2 x Analogue 0-10Vdc Outputs 1 x Auxiliary or Reheat Contact	£225

Supply Voltage - 24Vac, 50/60 Hz; 2VA Class 2
 Sensor - Local NTC 10K thermistor
 Set-point (cooling) - 12-37.5°C
 Set-point (heating) - 4.5-32°C
 Temperature Display Range - -40-+50°C
 Proportional Band - 1.8°C (cooling & heating)
 Switch Contact - Triac output 30Vac (1A): Analogue output 0-10Vdc
 Size - 125.5 x 86 x 29mm

ACCESSORY

Ordering Code	Description	Price
COV-PIR-ZN-5000	Retrofit PIR Cover - Zoning Interface	£141

VT7300 Series

Low Voltage, Fan Coil Controllers

The VT7300 PI controller family is specifically designed for fan coil control in commercial and lodging HVAC applications. The product features a backlit LCD display with dedicated function menu buttons for simple operation. Accurate temperature control is achieved due to the product's PI proportional control algorithm, which virtually eliminates temperature offset associated with traditional, differential-based controllers.



The VT7300 features configurable 'System' and 'Fan' button functions to meet all possible applications. They all contain an SPST auxiliary switch that can be used to control lighting or auxiliary reheat. They also have 0-10Vdc control and can control up to three fan speed. Three additional inputs are also provided for monitoring and / or various advanced functions

The controllers are also compatible with the new PIR cover accessories. Thermostats equipped with a PIR cover provide advanced active occupancy logic, which will automatically switch occupancy levels from 'Occupied' to 'Stand-By' and 'Unoccupied' as required by local activity being present or not. This advanced occupancy functionality provides advantageous energy savings during occupied hours without compromising occupant comfort.

FEATURES

- Models available with internal humidity sensing
- Advanced occupancy functions
- Three configurable inputs
- Configurable sequences of operation
- Configurable fan functions button
- Unique configurable setup utility
- Multi level lockable keypad
- Auto fan speed mode
- Available for 24Vac On/Off, Floating or Analogue Control
- Auxiliary output
- Ready for PIR accessory cover

Ordering Codes*	Description	List Price
VT7300C5031	2 x Tri-state Floating Outputs 1 x Auxiliary or Reheat Contact	£258
VT7300F5031	2 x Analogue 0-10Vdc Outputs 1 x Auxiliary or Reheat Contact	£272

Supply Voltage - 24Vac, 50/60 Hz; 2VA Class 2
 Sensor - Local NTC 10K thermistor
 Humidity sensor - 10-90% RH
 Set-point (dehumidification) - 30-90% RH
 Set-point (cooling) - 12-37.5°C
 Set-point (heating) - 4.5-32°C
 Temperature Display Range - -40-+50°C
 Proportional Band - 1.8°C (cooling & heating)
 Switch Contact - Valve analogue output 0-10Vdc. Fan relay output 30Vac (1A):
 Valve triac output 30Vac (1A):
 Size - 125.5 x 86 x 29mm

ACCESSORY

Ordering Code	Description	Price
COV-PIR-FCU-C-5000	Retrofit PIR Cover - Commercial Interface	£141

System 450 Series
Modular, Microprocessor based Control System



These multi-purpose, control modules are field configurable for a wide variety of temperature, pressure or humidity control applications. They can be configured to monitor and control all three applications simultaneously. Control modules feature integrated LCD display with 1 or 2 output relays, or with analogue outputs.

Controllers can be set-up as stand-alone or connected to expansion modules to control up to ten outputs based on any of the three inputs. Configurable modules make it very easy to set-up and adjust inputs and outputs in the field using the automatic Bus system (serial I2C).

FEATURES

- Out-of-the-box and field configurable
- Simple and complex application control systems are easily built
- Multi-purpose, field configurable modules designed for global use
- Durable, compact modular design with plug-together connectors
- Backlite liquid crystal display (LCD) and four button touchpad user interface (UI)
- Surface or DIN-rail mounting (BKT-rail)

Ordering Codes	Module Function	Outputs	Supply Voltage	Sensor Input	List Price
C450CBN-3C	Relay control + display	1 x relay	24Vac	A99B, HE-67S3, P499, DPT265	£144
C450CCN-3C		2 x relays			£185
C450SBN-3C	Reset relay control + display & clock	1 x relay	-	-	£86
C450SCN-3C		2 x relays			£115
C450YNN-3C	Power module	24V rectified	120-240Vac	-	£79
C450CPN-3C	PI control module	1 x analogue	24Vac	A99B, HE-67S3, P499, DPT265	£156
C450CQN-3C		2 x analogue			£197
C450SPN-3C	PI expansion module	1 x analogue	-	-	£96
C450SQN-3C		2 x analogue			£122
C450RBN-3C	Boiler reset control + display & clock	1 x relay	24Vac	A99B	£254
C450RCN-3C		2 x relays			£307

Supply Voltage - 24(20-30)Vac, 50/60 Hz; 10VA min. SELV, Class 2
 Input Signal - 0-5Vdc, 1035 ohms
 Analogue Input Accuracy - 14-bit resolution
 Relay Output - 240V, 10A SPDT
 Analogue Output - 0-10V or 4-20mA (see data sheet for load requirements)
 Size - 127 x 61 x 61mm

SENSORS

Ordering Code	Description	Price
A99BA-200C	PTC silicon sensor, shielded cable (2m), -40-+120°C	£39
A99BB-25C	PTC silicon sensor, PVC cable (0.25m), -40-+120°C	£30
A99BB-200C	PTC silicon sensor, PVC cable (2m), -40-+120°C	£33
A99BB-300C	PTC silicon sensor, PVC cable (3m), -40-+120°C	£37
A99BB-500C	PTC silicon sensor, PVC cable (5m), -40-+120°C	£45
A99BB-600C	PTC silicon sensor, PVC cable (6m), -40-+120°C	£50
A99BC-1500C	PTC silicon sensor, silicon cable (15m), -40-+120°C	£242
HE-67S3-0N0BT	Space humidity/temp. sensor, 10-95% RH, -40-+121°C*	£389
HE-67S3-0N0OP	Duct humidity/temp. sensor, 10-95% RH, -40-+121°C*	£406

*Space & duct sensors - Integral A99B temp. sensor

CO² Sensors

CD-W00-00-1 Series
Wall Mount Transmitter

These sensors measure and transmit CO² levels, ranging from 0-2,000 parts per million (ppm).

Specific applications include: Demand Control Ventilation (DCV), Fresh Air and Indoor Air Quality (IAQ), and Rooftop Air Handling Economiser Controls System.

These sensors are designed to work in stand-alone mode or as part on any integrated Building Automation System (BAS). They are easy to install and require no maintenance or field calibration.

FEATURES

- Response time (0-63%): 1 minute
- Accuracy at 25°C: ±50 ppm + 3.0% of reading



Ordering Codes	Description	List Price
CD-W00-00-1	CO ² Transmitter - Wall Mount	£374
Accessories		
ACC-DWCLIP-0	Drywall Spring-Clip Mounting Kit	£30
Y65T31-0	Multiple Primary Transformer, 40VA, 120/208/240V Primary, 24V Class 2 Secondary	£54

Power Supply - 20-30Vac (18-30Vdc, Class 2)
 Operating Temperature - -5-+45°C
 Size - 120 x 80 x 32mm
 Humidity Range - 0-85%

CD-Wxx-00-0 Series
Wall Mount Transmitters

This range of CD-Wxx-00-0 sensors measure and transmit CO² levels, ranging from 0-2,000 parts per million (ppm).

Specific applications include: Demand Control Ventilation (DCV), Fresh Air and Indoor Air Quality (IAQ), and Rooftop Air Handling Economiser Controls System.

These sensors are designed to work in stand-alone mode or as part on any integrated Building Automation System (BAS). They are easy to install and require no maintenance or field calibration.

FEATURES

- Response time (0-63%): 1 minute
- Accuracy at 25°C: ±50 ppm + 3.0% of reading



Ordering Codes	Description	List Price
CD-WA0-00-0	CO ² Transmitter with Analogue Temperature Output	£579
CD-WR0-00-0	CO ² Transmitter with Relay	£744
CD-WRD-00-0	CO ² Transmitter with Relay and Display	£768
Replacement Part		
ACC-DWCLIP-0	Drywall Spring-clip Mounting Kit	£30
Accessories		
ACC-CD-S	Relay Setpoint Software Kit; includes software and interface cable to reset the On and Off relay setpoints for CD-WR0-00-0 or CD-WRD-00-0	£465
Y65T31-0	Multiple Primary Transformer, 40VA, 120/208/230V Primary, 24V Class 2 Secondary	£54

Power Supply - 20-30Vac (18-30Vdc), Class 2
 Signal Output - 0-10V (default), 0-20mA or 4-20mA signal
 Operating Temperature - -5-+45°C
 Humidity Range - 0 to 85%
 Size - 109 x 80 x 37mm

CD-Pxx-00-0 Series
Duct Mount Transmitters

These sensors measure and transmit CO² levels, ranging from 0-2,000 parts per million (ppm).

Specific applications include: Demand Control Ventilation (DCV), Fresh Air and Indoor Air Quality (IAQ), and Rooftop Air Handling Economiser Controls System.

The sensors produce a 0-10V (default), 0-20 mA or 4-20 mA signal.

FEATURES

- Response time (0-63%): 1 minute
- Accuracy at 25°C: ± 30 ppm + 2.0% of reading



Ordering Codes	Description	List Price
CD-P00-00-0	CO ² Transmitter - Duct Mount	£594
CD-PR0-00-0	CO ² Transmitter with Relay - Duct Mount	£717
Replacement Part		
ACC-CD-CFK1	Conduit Adaptor Kit	£46
Accessories		
ACC-CD-S	Relay Setpoint Software Kit; includes software and interface cable to reset the On and Off relay setpoints for CD-PR0-00-0	£465
Y65T31-0	Multiple Primary Transformer, 40VA, 120/208/230V Primary, 24V Class 2 Secondary	£54

Power Supply - 20-30Vac (18-30Vdc), Class 2
 Signal Output - 0-10V (default), 0-20mA or 4-20mA signal
 Operating Temperature - -5-+45°C
 Humidity Range - 0 to 85%
 Size - 80 x 80 x 64mm (head), 80-140mm (stem length), 15mm (stem Ø)

Dew Point Sensors

HX-9100 Series
Dew Point Sensors

The HX-9100 is used to prevent condensation on surfaces such as cold water pipes, cool ceilings and windows. The sensor provides override functions when condensation is forming.

FEATURES

- Hysteresis: 1%
- Output: open collector closed: 0.5Vdc max or ≤ + 0.5Vdc



Ordering Codes	Action	Output at Condensation	List Price
HX-9100-8001	ON/OFF	Open collector closed, 0.5Vdc max.	£32
HX-9100-9001	0-10Vdc	≤ +0.5Vdc	£107

Power Supply - 15Vdc ±10%
 Size - 50 x 15 x 10mm
 Protection Class - IP44

Humidity Sensors

HT-1000 Series
Room Humidity Sensors

This new sensor provides an active sensing of relative humidity and, on specific models, also active/passive sensing of temperature in HVAC applications.

It features a polymer capacitance humidity sensing element and provides a voltage output signal within either ±2% or ±4% accuracy proportional to 0-100 % relative humidity. It's fast response and reliable long-term performance makes this transmitter well suited for HVAC installations.



They are designed to work in stand-alone mode or as part on any integrated Building Automation System (BAS).

FEATURES

- Humidity accuracy 2% RH from 0-100% RH (HT-1201-UR)
- Temperature outputs 0-10Vdc, NTC K2, Pt1000
- Transmitter is resistant to many hostile environments
- Polymer humidity sensing element integral on chip

Ordering Codes	Accuracy	Temp. Output	Temp. Range*	List Price
HT-1201-UR	±2%	0-10Vdc	0-40°C	£338
HT-1300-UR	±4%	-	-	£193
HT-1301-UR		0-10Vdc	0-40°C	£236
HT-1303-UR		NTC K2	-	£205
HT-1306-UR		Pt1000	-	£217

* If sensing temperature output is present

Supply Voltage - 12-30Vdc or 24Vac, ±15% @ 50/60Hz

Size - 80 x 80 x 32mm

Protection Class - IP30

ACCESSORIES

Ordering Codes	Description	Price
TM-1100-8931	Surface Mounting Base	£16
TM-9100-8900	Special Tool to open module	£12

HT-9000 Series

Wall Mount, Humidity Sensors

These sensors measure humidity over the entire range of 0-100% RH (non condensing) and have a wide operating temperature range. Its fast response, reliable long-term performance makes this transmitter well suited for refrigeration and HVAC installations. This range also includes models with an integrated temperature sensing element.



FEATURES

- Humidity Accuracy 4% RH from 10 to 90% RH
- Temperature Outputs 0-10Vdc, NTC K2, Pt 100, Pt 1000, A99

Ordering Codes	Temp. Range	Temp. Output	Humidity Output	List Price
HT-9005-URW	0-60°C	Pt100	0-10Vdc	£214
HT-9009-URW		A99		£233

Humidity Range - 0-100% (non condensing)

Supply Voltage - 12-30Vdc or 24Vac +15%

Size - 81 x 81 x 31mm

Protection Class - IP30

Old HT-9000 Sensors	Replacement Sensors (see above)
HT-9000-URW	HT-1300-UR
HT-9001-URW	HT-1301-UR
HT-9003-URW	HT-1303-UR
HT-9006-URW	HT-1306-UR

HT-9000 Series

Duct Mount, Humidity Sensors

The HT-9000 Series measures humidity over the entire range of 0-100% RH (non condensing) and has a wide operating range. Its fast response, reliable long-term performance makes this transmitter well suited for refrigeration and HVAC installations. This range also includes models with an integrated temperature sensing element.



FEATURES

- Humidity accuracy 4% RH from 10-90% RH
- Temperature outputs 0-10Vdc, NTC K2, Pt 100, Pt 1000, A99

Ordering Codes	Temp. Range	Temp. Output	Probe Length	Humidity Output	List Price
HT-9000-UD1	-	-	153mm	0-10Vdc	£253
HT-9001-UD1	0-40°C	0-10Vdc			£278
HT-9003-UD1		NTC K2			£214
HT-9005-UD1	0-60°C	Pt100			£293
HT-9006-UD1		Pt1000			£241
HT-9009-UD1		A99	£239		
HT-9000-UD2	-	-	230mm	0-10Vdc	£230
HT-9001-UD2	0-40°C	0-10Vdc			£324
HT-9003-UD2		NTC K2			£272
HT-9005-UD2	0-60°C	Pt100			£249
HT-9006-UD2		Pt1000			£294
HT-9009-UD2		A99			£295

Supply Voltage - 12-30Vdc or 24Vac +15%

Size - 74.5 x 74.5 x 52mm (head), 25mm Ø (probe)

Protection Class - IP30

Temperature Sensors

TE-7000 Series

Room Command Modules

The TE-7000 Room Command Module is designed for use with the VMA1400 series VAV Modular Assembly. The module has an NTC temperature sensor, a dial for setpoint adjustment within the range of 12-28°C or -3 to +3K, and an occupancy button with an LED indicator. If the VAV controller is not already in occupied mode as shown by the LED indicator, the occupant may press the occupancy button to obtain comfort control for a set period of time (normally defaulted to one hour).



The module also has a built-in connector for a PC with the software to test and commission the VMA1400 series VAV Modular Assembly and the air supply system.

FEATURES

- Power supply from VMA1400
- Temperature sensor: NTC K2
- Occupancy override button
- Remote setpoint adjustment

Ordering Codes	Colour	Setpoint Dial Range	List Price
TE-7000-8002	Off-White / Gray Base	12-28°C	£112
TE-7000-8002-W	White / White Base		£111
TE-7000-8003	Off-White / Gray Base	-3 -+3 K	£109
TE-7000-8003-W	White / White Base		£111

Note: Add '-K' to code for setpoint dial with serrated edge, e.g. TE-7000-8002-K, TE-7000-8002-WK

Supply Voltage - Power from VMA1400

Size - 80 x 80 x 33mm

Protection Class - IP30

ACCESSORIES

Ordering Codes	Description	Price
TM-9100-8901	Dial-Stop screws kit (bag of 100 self-tapping screws)	£22
TM-9100-8902	Serrated knob kit (bag of 10 knobs) - off-white	£35
TM-9100-8902-W	Serrated knob kit (bag of 10 knobs) - white	£35

RS-1100 Series
Room Command Modules

These Room Command Modules are designed for use with Facility Explorer Series or System 91 controllers from Johnson Controls and provides a 0-10V signal directly proportional to the sensed temperature.



FEATURES

- Remote temperature setpoint adjustment
- Occupancy override function, (models with or without display)
- Fan speed button

Ordering Codes	Output Signal	LCD Display	Setpoint Dial Range	Override Function*	Fan Speed Selection	List Price	
RS-1140-0000	0-10V dc	-	-	-	-	£66	
RS-1160-0000			12-28°C	Pushbutton		£95	
RS-1160-0005			+/-	Pushbutton		£95	
RS-1180-0000		■	12-28°C	Integrated		£125	
RS-1180-0005		■	+/-	Integrated		£126	
RS-1190-0000		-	12-28°C	-		£87	
RS-1190-0005		-	+/-	-		£87	
RS-1180-0002		■	12-28°C	Integrated		■	£164
RS-1180-0007		■	+/-	Integrated		■	£164

Note: * Temporary occupancy override function

Supply Voltage - 5Vdc (all models) or 24Vac/dc (only models with display)

Temperature Output - 0-10Vdc

Size - 80 x 80 x 32mm (RS-1140 only), 80 x 80 x 35mm (other types)

Protection Class - IP30

ACCESSORIES

Ordering Codes	Description	Price
TM-1100-8931	Plastic surface mounting kit	£16
TM-9100-8900	Special tool for opening enclosure	£12

TM-1100 Series
Room Command Modules

The TM-1100 Series of Room Command Modules are designed for use with the TC-9102, TC-9109 and TCU series of DDC terminal unit controllers. The setpoint dial enables the room occupant to adjust the working set point of the controller within the range of 12-28°C or -3-+3°, according to the model number.



The occupancy button enables the occupant to switch the mode of operation of the controller between COMFORT and STANDBY or to request a temporary COMFORT mode during NIGHT operation.

An LED indicator shows the current operating mode. For TC-9102 and TCU Fan Coil Unit controllers, a Room Command Module with a 3-speed fan override is available. Models without a temperature sensing element are provided for application where the temperature sensor is mounted inside the Fan Coil Unit.

FEATURES

- Passive Sensor
- Remote Temperature Setpoint adjustment
- 3-speed fan override
- Occupancy override button

(continued next column)

Ordering Codes	Sensing Element	Setpoint Dial Scale	Fan Speed Override	Occupancy Override	List Price
TM-1140-0000	NTC K2	-	-	-	£47
TM-1150-0000		-		-	£62
TM-1160-0000		12-28°C		-	£66
TM-1160-0005		+/-	3-Speed	■	£66
TM-1160-0002		12-28°C		£84	
TM-1160-0007		+/-		£78	
TM-1170-0005		Without		-	£62
TM-1170-0007	Without	3-Speed	£70		
TM-1190-0000	NTC K2	12-28°C	-	-	£66
TM-1190-0005		+/-	-	-	£66

Supply Voltage - Power from TC-9102, TC-9109 and TCU Series

Unit Size - 80 x 80 x 32mm (TM-1140 only), 80 x 80 x 35mm (other types)

Protection Class - IP30

ACCESSORIES

Ordering Codes	Description	Price
TM-1100-8931	Plastic Base for surface mount	£16
TE-9100-8501	Unit Mount NTC K2 Temperature Sensor (1.5m cable)	£28
TM-9100-8900	Special Tool for opening enclosure	£12

TM-2100 Series
Room Command Modules

This Series of Room Command Modules is designed for use with the FCC and Facility Explorer Series of DDC terminal unit controllers. The setpoint dial enables the room occupant to adjust the working set point of the controller within the range of 12-28°C or -3-+3°, according to the model number.



The occupancy button enables the occupant to switch the mode of operation of the controller between COMFORT and STANDBY or to request a temporary COMFORT mode during NIGHT operation. An LED indicator shows the current operating mode. A Room Command Module with a 3-speed fan override adjuster is available.

FEATURES

- Passive sensor
- Remote temperature setpoint adjustment
- 3-speed fan override
- Occupancy override button

Ordering Codes	Sensing Element	Setpoint Dial Scale	Fan Speed Override	Occupancy Override	List Price
TM-2140-0000	NTC 10K	-	-	-	£52
TM-2150-0000		-		-	£56
TM-2160-0000		12-28°C		-	£66
TM-2160-0005		+/-	3-Speed	■	£60
TM-2160-0002		12-28°C		£71	
TM-2160-0007		+/-		£65	
TM-2190-0000		12-28°C		-	-
TM-2190-0005		+/-	-	-	£60

ACCESSORIES

Ordering Codes	Description	Price
TM-1100-8931	Plastic base for surface mount	£16
TE-9100-8501	Unit Mount NTC K2 Temperature Sensor (1.5 m cable)	£28
TM-9100-8900	Special Tool for opening enclosure	£12

Supply Voltage - Power from FCC and Facility Explorer Series

Size - 80 x 80 x 32mm (TM-2140 only), 80 x 80 x 35mm (other types)

Protection Class - IP30

TS-9100, TE-9100 Series

Plant Sensors

The TS-9100/TE-9100 Series Temperature Sensors and Transducers provide a passive or active signal that corresponds with the air or water temperature in heating, ventilating and air-conditioning applications.

They provide either a 0-10Vdc signal directly proportional to the sensed temperature, or a passive resistive NTC, Pt1000 or Pt100 signal.



FEATURES

- Wide range of enclosures and signal outputs
- For immersion applications, well can be mounted before rod sensor is mounted
- Various lengths of tubes and wells for duct and immersion applications
- IP54 enclosure

Ordering Codes	Output Signal	Sensor Type	Rod Length (mm)	Temp. Range (°C)	List Price	
TS-9101-8101	0-10V	Remote element	-	-40-+50	£73	
TS-9101-8103				0-40	£61	
TS-9101-8104				0-100	£73	
TS-9101-8212		Rod*	160	-	-20-+40	£86
TS-9101-8213					0-40	£86
TS-9101-8214				0-100	£86	
TS-9101-8222				200	-20-+40	£93
TS-9101-8223					0-40	£93
TS-9101-8224				0-100	£93	
TS-9101-8225			0-150	£93		
TS-9101-8226			300	-	20-120	£74
TS-9101-8227					50-150	£92
TS-9101-8232				-20-+40	£96	
TS-9101-8233				0-40	£77	
TS-9101-8234				0-100	£77	
TS-9101-8235		0-150		£96		
TS-9101-8252		500	-	-20-+40	£93	
TS-9101-8253				0-40	£93	
TS-9101-8254			0-100	£116		
TS-9101-8322			Rod Fast Response	200	-20-+40	£116
TS-9101-8323		0-40			£116	
TS-9101-8324		0-100			£93	
TS-9101-8333		300		0-40	£118	
TS-9101-8353		500		0-40	£143	
TS-9101-8401		Outdoor	-	-40-+50	£63	
TS-9101-8402				-20-+40	£75	
TS-9101-8602		Strap-on	-	0-100	£79	
TS-9101-8604				0-40	£76	
TS-9101-8703		Ceiling	-	0-40	£81	

Note: * Rod sensor can either be for: - Duct applications (alone) - Immersions applications (with well)

(continued next column)

Ordering Codes	Output Signal	Sensor Type	Rod Length (mm)	Temp Range (°C)	List Price			
TE-9100-8501	NTC K2	Cable Sensor		-20-+40	£28			
TS-9103-8220		Rod*	200	0-40	£115			
TS-9103-8250			500		£101			
TS-9103-8320		Rod fast response	200		£115			
TS-9103-8400		Outdoor	-		£93			
TS-9103-8600		Strap-on	-		£63			
TS-9103-8700		Ceiling	-		£77			
TE-9100-8502		NTC K10	Cable Sensor		-20-+40	£32		
TS-9104-8220			Rod*		200	0-120	£59	
TS-9104-8230					300		£56	
TS-9104-8320	Rod fast response		200		£129			
TS-9104-8600	Strap-on		-	£54				
TS-9105-8220	Pt100		Rod*	200	-20-+150		£84	
TS-9105-8230				300			£79	
TS-9105-8250				500			£119	
TS-9105-8400			Outdoor	-			-40-+50	£78
TS-9105-8600			Strap-on	-			-20-+100	£96
TS-9105-8700	Ceiling	-	0-40	£79				
TS-9106-8210	Pt1000	Rod*	160	-20-+150	£75			
TS-9106-8220			200		£72			
TS-9106-8230			300		£79			
TS-9106-8310		Rod fast response	160		£77			
TS-9106-8320			200		£75			
TS-9106-8330			300		£80			
TS-9106-8400		Outdoor	-		-40-+50	£58		
TS-9106-8600		Strap-on	-		-20-+100	£85		

Note: * Rod sensor can either be for: - Duct applications (alone)
- Immersions applications (with well)

ACCESSORY

Ordering Codes	Description	Price
TS-9100-8950	Duct Mounting Flange	£17

IMMERSION WELLS

Ordering Codes	Material	Thread	Length (mm)	External Diameter (mm)	List Price
TS-9100-8905	Copper	R 1/2"	50	9	£28
TS-9100-8901			120		£29
TS-9100-8907			150		£23
TS-9100-8902			200		£31
TS-9100-8903			260		£25
TS-9100-8921	Stainless steel	R 1/2"	120	12	£76
TS-9100-8927			150		£78
TS-9100-8922			200		£84
TS-9100-8923			260		£85
TS-9100-8915			G 1/2"		-
TS-9100-8911	120	£76			
TS-9100-8917	150	£54			
TS-9100-8912	200	£81			
TS-9100-8913	260	£55			

Terminal Unit Controller

TUC3 Series NEW
Configurable Unit Controllers

The TUC03 configurable Terminal Unit Controller is designed specifically to provide direct digital control of terminal unit applications with heating and/or cooling coils, an electric heater and a three-speed or variable speed fan.



These applications include close control units, fan coil units, unit ventilators and chilling or heating ceiling beam installations.

The device can be configured by the installer, without the need of a PC and software tool, using a set of on-board dip-switches. The controller is designed for field installation in a panel or enclosure or for mounting by original equipment manufacturers (OEMs) on DIN-rail or directly on a surface.

The space comfort set point, occupancy mode and fan speed may be adjusted from a wide range of room sensor modules with options for a digital display.

Communication options are available to enable the controller to be integrated into an N2 Open or BACnet® network of a building automation system. The BACnet interface of the controller complies with the ANSI/ASHRAE Standard 135-2004 for sharing data other devices on the network.

FEATURES

- Field Selectable application type, communication protocol and room module, via dip-switches on controller
- 230Vac power supply
- 5Vdc / 15Vdc / 24Vac power supply for field devices, directly provided by the controller
- Modular range of room sensor modules
- Network communications options - N2 Open and BACnet MS/TP
- BACnet MS/TP with peer to peer communication
- Configurable using standard tools

CONTROLLERS

Ordering Codes	Description	List Price
TUC0311-2	N2 / BACnet Terminal Unit Controller only	£187
TUC0311-2	Fan Coil Unit Control Bundle*	£300

* Special kit pack consist of:
 1 x TUC03011-2 – 230Vac N2/BACnet Terminal Unit Controller
 1 x LP-KIT03-010C – Bulb Style Temperature Sensor
 2 x VA-7482-1001 – Proportional Valve Actuator
 When purchased with two Unitary Control Valves.
 Usual discounts apply.

SENSORS

Ordering Codes	Description	List Price
Room Sensor Modules with LCD Display and Integrated IR Receiver		
LP-RSM003-000C	Room Sensor Module – wall mount	£127
LP-RSM003-001C	Room Sensor Module – horizontal flush mount	£144
LP-RSM003-003C	IR Receiver with integrated temperature sensor	£48
LP-RSM003-004C	IR Hand-held Remote Control Unit	£69
Room Sensor Modules without Display – 80mm x 80mm		
TM-2140-0000	Sensor with temperature sensor only	£52
TM-2150-0000	Sensor with occupancy button and LED	£56
TM-2160-0000	Sensor with 12-28°C setpoint dial, occupancy button and LED	£66
TM-2160-0002	Sensor with 12-28°C setpoint dial, occupancy button and LED, fan speed override	£71
TM-2160-0005	Sensor with +/- setpoint dial, occupancy button and LED	£60
TM-2160-0007	Sensor with +/- setpoint dial, occupancy button and LED, fan speed override	£65
TM-2190-0000	Sensor with 12-28°C setpoint dial	£60
TM-2190-0005	Sensor with +/- setpoint dial	£60

(continued next column)

Ordering Codes	Description	List Price
Room Sensor Modules with Backlit LCD Display – 80mm x 80mm		
RS-1180-0000	Sensor with 12-28°C setpoint dial	£125
RS-1180-0005	Sensor with +/- setpoint dial	£126
RS-1180-0002	Sensor with 12-28°C setpoint dial, fan speed override	£164
RS-1180-0007	Sensor with +/- setpoint dial, fan speed override	£164

ACCESSORIES

Ordering Codes	Description	List Price
LP-KIT003-010C	Remote temp. sensor, NTC 50k Ω, bulb, 80cm leads	£72
LP-KIT003-011C	Remote temp. sensor, NTC 50k Ω, wall mount, decorative box	£18
LP-KIT003-012C	Remote temp. sensor, NTC 50k Ω, duct mount	£40
LP-KIT003-013C	Remote temp. sensor, NTC 50k Ω, wall mount, decorative box	£20
HX-9100-8001	Condensation (dew point) sensor	£32
TE-9100-8502	Remote temp. sensor, NTC 10k Ω, bulb, 150cm leads	£27
TS-9104-8700	Remote temp. sensor, NTC 10k Ω, ceiling	£64



LP-RSM003-000C



LP-RSM003-001C



RS-Series



TM-Series



LP-RSM003-003C
& LP-RSM003-004C

Field Controls

ER Series

Electronic Refrigeration Line

Units are designed to be incorporated into refrigerated display cases and cold storage rooms.

ER Line proposes progressive offer from basic controls to advanced controls including real-time clock, energy saving and network communication to be integrated with monitoring system.



FEATURES

- Robust front panel for durability and long term usage
- Up to 5 relays in a single package
- NTC or PTC (A99) sensors
- Embedded real-time clock, no additional clock card required
- Embedded RS485 port, no additional communication card required

EVAPORATOR CONTROLLERS

Ordering Codes*	RS485	Inputs	Outputs	List Price
Panel Mount, Cool-heat Thermostat, High Power Relays 16(8)A/230Vac*				
ER52-PM230-501C	-	2 x temperatures 1 x voltage free contact	Compressor: SPST 16(8)A Auxillary: SPST 7(2)A	£86
Panel Mount, Cool Thermostat and Ventilated Unit*				
ER53-PM230-501C	-	2 x temperatures 1 x voltage free contact	Compressor: SPST 16(5)A Fan: SPST 7(2)A Auxillary: SPST 7(2)A	£99
Panel Mount, Cool-heat Thermostat, Comprehensive Controls, Real-time Clock*				
ER54-PMW-501C	MODBUS	3 x temperatures 2 x voltage free contact	Compressor: SPST 12(5)A Fan: SPST 7(2)A Defrost: SPST 7(2)A Auxillary: SPST 7(2)A	£152
ER54-PMW-001C	N2 Open			£152
DIN-rail Mounting, Cool-heat Thermostat, Comprehensive Controls*				
ER55-DR230-501C	MODBUS	3 x temperatures 2 x voltage free contacts	Compressor: SPST 7(2)A Fan: SPST 7(2)A Defrost: SPST 16(4)A Auxillary 1: SPST 7(2)A Auxillary 2: SPST 7(2)A	£163
ER55-DR230-001C	N2 Open			£163
Split Mounting, Cool Thermostat, Comprehensive Controls*				
ER55-SM230-501C	MODBUS	3 x temperatures 2 x voltage free contacts	Compressor: SPST 16(8)A Fan: SPST 8(3)A Defrost: SPST 16(4)A Auxillary 1: SPST 7(2)A Auxillary 2: SPST 7(2)A	£179
ER55-SM230-001C	N2 Open			£179

Note: * NTC Sensor included

RACK CONTROLLERS

Ordering Codes*	RS485	Inputs	Outputs	List Price
DIN-rail, Pressure or Temperature Control, 4 Compressors or Fans Sequencer, RS485, Plug Connectors				
ER65-RK230-501C	MODBUS	1 x temperature 1 x pressure 2 x voltage free contacts 3 x supplied contacts (230V)	Stages (x4): SPST 5(1)A Alarm: SPDT 7(2)A	£312
ER65-RK230-001C	N2 Open			£312

Notes:

Sensor to be ordered separately, see also P499 pressure transducer section.

Power Supply - 230Vac, +/-10%

Temperature Range - -40 to +70°C, accuracy +/-0.3°C

Display - LED 3 digits, decimal displaying

Sizes - 77 x 71 x 35mm (panel types), 98 x 71 x 81mm (DIN-rail types), 98 x 105 x 48mm (Split mounting type).

Protection Class - Panel mount (front IP55, back IP20), DIN-rail (IP20)

ACCESSORIES

Ordering Codes	Description	Applied Products	List Price
ER-NTC-0C	NTC sensor, 2m cable, universal replace.	All ER	£16
ER-NTC-1C	NTC sensor, 2m cable, T1 mark on cable	ER52, ER53, ER54, ER55	£16
ER-NTC-2C	NTC sensor, 2m cable, T2 mark on cable	ER52, ER53, ER54	£17
ER-FIX-01C	Panel mounting clips	ER54, ER55-SM	£21
ER-COM-1C	RS485 cable, 1.5m, plug connector	ER55-DR	£29
ER-ERM-2C	RS485 cable, 1.5m, RJ connector	ER55-SM	£12
ER-COM-3C	Display cable, 2m	ER55-SM	£52
ER-DIS-1C	Remote Display, Panel Mount Blue LED	ER55-SM	£ *
P499Axx-xxx	Pressure transducer, 4-20 mA (refer to P499 section on page 33)	ER65	£ *

* Prices on page 33.

ER Series **NEW**

Heating Controller

This unit is a new generation of electronic controllers dedicated to small domestic or residential heating units.

A simple to use, simple to understand and simple to install product. All-in-one design allows applying a single controller to many small heating applications



FEATURES

- Controller covers water and air heating applications
- All-in-one design allows full flexibility to apply a single controller to many small heating applications
- The controller incorporates a comprehensive energy saving function and can be connected to a supervisory system via its on board communications port
- Robust front panel for durability and long term usage
- Direct 230V supply: no external transformer required
- Selectable inputs and outputs: up to three sensors, two digital inputs and four outputs

HEATING CONTROLLER

Ordering Code	Description	List Price
ER65-DRW-501C	Modbus Heating Controller	£275

Power Supply - 230Vac, +/-10%

Inputs - 3 temperature and 2 digital

Outputs - 3 relays and 2 triacs

Temperature Range - -40 to +70°C, accuracy +/-0.3°C

Display - LED 3 digits, decimal displaying

Sizes - 77 x 71 x 35mm (panel types), 98 x 71 x 81mm (DIN-rail types), 98 x 105 x 48mm (Split mounting type).

Protection Class - Panel mount (front IP55, back IP20), DIN-rail (IP20)

ACCESSORY

Ordering Code	Description	List Price
ER-NTC-0C	NTC bulb sensor, 2m (spare part)	£16

MS Series

General Purpose and Multi Stages

This range of versatile controls is intended for single or multistage (2 or 4 stages) applications such as heating, cooling but also humidity or pressure depending on the input type. This range incorporates all control functions as required by modern applications and it exists in both panel mount and DIN rail enclosures.



FEATURES

- Up to four relays in panel mount enclosure
- Accept temperature (A99) and 0-10V sensor signal depending on models
- Accurate and interchangeable IP68 sensor
- Wide range of enclosures for sensors available
- Keyboard lock

Ordering Codes	Range (°C)	Power Supply	Enclosure	Input	Output Rating	List Price
MS Display						
DIS12T-1C	-40-+70	12Vac/dc	Panel	A99 * Sensor	-	£96
DIS230T-1C		230Vac		A99 * Sensor	-	£96
DIS12V-1C	0-100% (Rh)	12Vac		0-10V **	-	£96
DIS230V-1C		230Vac		0-10V **	-	£96
1-stage Control (Alarm Output - Open Collector 40Vdc/100 mA)						
MS1PM12RT-1C	-40-+70	12Vac/dc	Panel	A99 * Sensor	SPST	£109
MS1PM230T-1C		230Vac	DIN-rail		SPDT	£115
MS1DR230T-1C						SPST
MS1PM12RV-1C	-40-+100	12Vac	Panel	0-10V **	SPST	£109
MS1PM230V-1C		230Vac	DIN-rail		SPDT	£112
MS1DR230V-1C						SPST
2-stage Control						
MS2PM12RT-1C	-40-+70	12Vac/dc	Panel	A99 * Sensor	SPST	£159
MS2DR230T-1C		230Vac	DIN-rail		SPDT	£168
MS2DR48DT-1C		12-24Vac/dc 48Vdc				SPDT
MS2PM12RV-1C	-40-+100	12Vac	Panel	0-10V **	SPST	£161
MS2DR230V-1C		230Vac	DIN-rail		SPDT	£164
4-stage Control						
MS4PM12RT-1C	-40-+70	12Vac/dc	Panel	A99 * Sensor	SPST	£187
MS4DR230T-1C		230Vac	DIN-rail		SPDT	£215
MS4DR48T-1C		12-24Vac/dc 48Vdc				SPDT

Notes:
 * A99 sensor (included)
 ** 0-10V from humidity sensor (not included)

Output Rating - 250Vac, 8(3)A (each stage)
 Sizes - 118 x 70 x 63mm (DIN-rail types), 35 x 75 x 68mm (panel types)
 Protection Class - Panel (overall IP20, front IP54), DIN rail (IP20)

(continued next column)

PARAMETER DESCRIPTIONS

Display Codes	Parameters (Setting Range)	Default	MS1 MS x1	MS2	MS4
Temperature Control Parameters					
H1	Hysteresis - HY (1-9 K)	2	■	■	■
S2	Setpoint 2 (direct/reverse = 1-40 units, deadband = 2-40 units, indep. setpoint = low to high limit)	3	-	■	■
H2	Hysteresis - HY (1-9 K)	-40	-	■	■
S3	Setpoint 3 (1-40 units)	-40	-	-	■
H3	Hysteresis - HY (1-9 K)	-40	-	-	■
S4	Setpoint 4 (1-40 units)	-40	-	-	■
H4	Hysteresis - HY (1-9 K)	-40	-	-	■
LL	Lower setpoint limit - LL (-40°C to higher limit)	-40	■	■	■
HL	Higher setpoint limit - HL (lower limit to 125 units)	70	■	■	■
CC	Anti short cycling cooling - CC (0-9 min)	2	■	■	■
CH	Anti short cycling heating - CH (0-99 min)	60	■	■	■
rt	Soft start (0-99 min / units)	3	■	■	■
Alarm Parameters					
AH	High temperature alarm (0-50 units related to setpoint)	10	■	■	■
AL	Low temperature alarm (-50-0 units related to setpoint)	-10	■	■	■
Ad	Alarm differential (1-9 units)	1	■	■	■
At	Alarm time delay (0-99 min)	30	■	■	■
Temperature Parameters					
Lc	Non compensated band (0-20 K)	OF	-	-	■
Uc	Heating compensation (0-6 K/K)	0	-	-	■
nc	Cooling compensation (0-6 K/K)	20	-	-	■
Other Parameters					
So	Sensor offset (-20-+20 units)	0	■	■	■
Un	Temperature units (0 = Celsius degrees, 1 = Fahrenheit degrees)	0	■	■	■
PU	Display updating time delay (1-99 sec)	7	■	■	■
iF	Digital input function (0 = not used, 1 = shut off and alarm signalling, 2 = stand by mode, 3 = remote switch off)	6	-	■	■
Sb	Stand-by bias (0-20 units)	40	-	■	■
Id	Digital input time delay (0-99 sec)	5	-	■	■
IS	Interstage delay (3-99 sec)	20	-	■	■
Lr	Low range analogue input 1 (-40 to high range)	20	■	■	-
Hr	High range analogue input 1 (low range to 100)	20	■	■	-

Note:
 When there are two setpoints (MS2 or MS4 is configured for independent setpoint mode), the low alarm is linked to the lowest setpoint and the high alarm is linked to the highest setpoint.

CR Series Electrical Cabinets



Designed to facilitate installers work, this range of electrical cabinets is intended for use in cold rooms working at positive or negative temperatures and powered either with single phase or three phase power supply. Based on specifically designed controllers, it incorporates all control functions as required by modern cold room units, such as compressor control, defrost management, fan management, alarm function and solenoid valve for 'pump down'. It also includes all the safety equipment needed such as circuit breakers for the compressor and for the controller. Particular attention has been given to the accessibility so that the installation time will be reduced to a minimum. Space has been left available for customisation.

FEATURES

- Power rating from: 0.37-1.5 kW in single phase 1.5-7.5 kW in three phases
- Most wiring integrated on the controller
- Specifically designed controller to manage Pump Down
- Accurate and interchangeable
- IP68 sensor
- IP65 standard DIN polycarbonate cabinets
- Integrate circuit breaker for motor and controller
- In field extension
- Main switch

POSITIVE TEMPERATURE COLD ROOM CABINETS

Ordering Codes	Power Supply		Compressor		Eva. Fan (Amps)	List Price
	Vac (Φ)		Power AC-3 (Amps)			
12 Module Cabinets						
CR-PS037-1	230 (1)		0.37 kW (5)		1.6	£399
CR-PS075-1			0.75 kW (8)			£420
CR-PS110-1			1.1 kW (10)		3.2	£454
CR-PS150-1			1.5 kW (12)		4.8	£472
18 Module Cabinets						
CR-PT150-1	400 (3)		1.5 kW (3.5)		3.2	£592
CR-PT250-1			2.5 kW (5.7)			£597
CR-PT400-1			4.0 kW (8.5)		4.8	£605
CR-PT550-1			5.5 kW (11.5)			£618
CR-PT750-1			7.5 kW (15.5)			£631

NEGATIVE TEMPERATURE COLD ROOM CABINETS

Ordering Codes	Power Supply		Compressor		Eva. Fan (Amps)	Defrost (Amps)	List Price
	Vac	Φ	Power AC-3 (Amps)				
12 Module Cabinets							
CR-NS037-1	230 (1)		0.37 kW (5)		1.6	8	£454
CR-NS075-1			0.75 kW (8)			12	£492
CR-NS110-1			1.1 kW (10)		3.2	£513	
CR-NS150-1			1.5 kW (12)		4.8	16	£511
18 Module Cabinets with Auxiliary Output*							
CR-NT150-1	400 (3)		1.5 kW (3.5)		3.2	12	£615
CR-NT250-1			2.5 kW (5.7)			£637	
CR-NT400-1			4.0 kW (8.5)		4.8	15	£638
CR-NT550-1			5.5 kW (11.5)			£651	
CR-NT750-1			7.5 kW (15.5)			£715	
24 Module Cabinets with 3-Phase Defrost							
CR-NDT150-1	400 (3)		1.5 kW (3.5)		3.2	3 x 5	£929
CR-NDT250-1			2.5 kW (5.7)			3 x 9	£929
CR-NDT400-1			4.0 kW (8.5)		3 x 10	£945	
CR-NDT550-1			5.5 kW (11.5)		3 x 12	£976	
CR-NDT750-1			7.5 kW (15.5)		3 x 16	£989	
36 Module Cabinets with Auxiliary Output*, 3-Phase Defrost and Fan							
CR-NFDT150-1	400 (3)		1.5 kW (3.5)		3 x 2	3 x 5	£888
CR-NFDT400-1			4.0 kW (8.5)			3 x 10	£1,104
CR-NFDT750-1			7.5 kW (15.5)			3 x 16	£1,295

Note: * Condenser fan or door frame heater. Auxiliary output 3 Amps

(continued next column)

PARAMETER DESCRIPTIONS

Display Codes	Parameters (Setting Range)	Default	MR12DR	MR15DR
Temperature Control Parameters				
Hy	Hysteresis - HY (1-9 K)	2	■	■
LL	Lower setpoint limit - LL (-40°C to higher limit)	-40	■	■
HL	Higher setpoint limit - HL (lower limit to 70°C)	70	■	■
CC	Anti short cycling - CC (0-9 min)	2	■	■
Co	Deep freezing time - Co (0-99 min)	60	■	■
Alarm Parameters				
AH	High temperature alarm (0-50°C related to setpoint)	10	■	■
AL	Low temperature alarm (-50-0°C related to setpoint)	-10	■	■
Ad	Alarm differential (1-9 K)	1	■	■
At	Alarm time delay (0-99 min)	30	■	■
Defrost Parameters				
dF	Defrost function. (0 = electric heater, 1 = hot gas)	0	-	■
dE	Defrost end function. (0 = by time, 1 = by temperature)	1	-	■
dt	Defrost termination temp. (0-20°C)	7	-	■
di	Defrost interval time (0-99 hours)	12	■	■
dd	Max. defrost duration (0-99 min)	40	■	■
dC	Dripping time (0-99 min)	5	■	■
dU	First defrost after power ON (OFF 0-99 min)	OFF	■	■
dP	Display during defrost. (0 = last value before defrost, 1 = setpoint)	0	■	■
dr	Delay displayed temp. after defrost (1-99 min)	20	■	■
Digital Input Parameters				
iF	Digital input function (0 = instrument off, 1 = alarm signalling, 2 = alarm reset, 3 = alarm reset and fan cut-off)	0	■	■
id	Digital input time delay (0-99 sec)	5	■	■
Fan Control Parameters				
FF	Fan operating function (0 = parallel with compressor, 1 = continuous running)	0	-	■
Fd	Fan start-up delay after defrost end and power up (0-99 min.)	5	-	■
Fr	Fan start-up temperature after defrost end and power up (-30-+5°C/-22-+41 °F)	2	-	■
Other Parameters				
SF	Thermostat operating function when sensor failure (0 = always ON, 1 = always OFF, 2 = automatic)	2	■	■
So	Offset thermostat sensor (-20-+20 units)	0	■	■
Un	Temperature units (0 = °C, 1 = °F)	0	■	■
PU	Display updating time delay (1-99 sec)	1	■	■

18 Module Type



12 Module Type



24 Module Type



36 Module Type

Sizes:

- 220 x 275 x 140mm (12 Module types)
- 220 x 380 x 140mm (18 Module types)
- 370 x 275 x 140mm (24 Module types)
- 370 x 380 x 140mm (36 Module types)

Fan Speed Controls

P215PR Series

Direct Mount Pressure Actuated, Single-phase

These direct mount pressure actuated condenser fan speed controllers are designed for speed variation of single-phase motors.

Head pressure control of a refrigeration system, through speed variation of the fan on an air-cooled condenser, results in optimum performance throughout the year. A pressure actuated device, gives the most direct and fastest response to pressure variations in the refrigerant system.

The controller varies the supply voltage to the motor from 30% to at least 95% over the proportional band using the phase cutting principle. This provides speed variation of permanent split capacitor or shaded pole motors that do not draw more than 4A (rms) full load current. Cut-off models (fan stops at low pressure) as well as minimum speed models (fan keeps running at 30%) are available. The controllers can be used in non-corrosive refrigerant systems.



FEATURES

- Condenser pressure control by fan speed variation
- Direct mount
- Setpoint screw on top
- Built-in suppression filter
- Quick connector plug included

Ordering Codes	Range (bar)	† Style	Setpoint (bar)	P.B. (bar)	Notes	List Price
P215PR-9200	10-25	47	19	4.5	-	£109
P215PR-9202	22-42		26	5.5		£109
P215PR-9800	10-25	28	19	4.5	A	£122
P215PR-9230	22-42	47	26	5.5		£128
P215PR-9232			19	4.5		A, B

Notes: † Refer to page 46 for 'Style' references

A = Bulk Pack
B = Bulk Pack, 2 metre cable connector included

Supply Voltage - 230Vac, 50/60Hz
Rating - 4 Amp
Controller Mode - Cut-off
Size - 106 x 65mmØ (Style 47 types), head and stem 90mm (Style 28 type)
Protection Class - IP65

P215DP/SH/ST Series

Pressure Actuated, Single-phase

These controllers are designed for speed variation of single phase motors, especially for fan speed control on air cooled condensers.

Head pressure control of a refrigeration system, through speed variation of the fan on an air-cooled condenser, results in optimum performance throughout the year. Using a pressure transducer as the input device to the fan speed controller, gives the most direct and fastest response to pressure variations in the refrigerant system. The controller varies the supply voltage to the motor from 45% to at least 95% over the proportional band using the phase cutting principle. It is recommended to confirm with the electric motor manufacturer if a controller using the phase cutting principle for speed variation can be used. The controller used for dual pressure input varies the fan speed by directly sensing the pressure changes of two separate refrigerant circuits.



The setpoint of each pressure transducer can be separately adjusted. The controller selects the input with the greatest cooling demand to control the fan speed. The transducers can be used in non-corrosive refrigerant systems.

FEATURES

- Condenser pressure control by fan speed variation
- Transducers with proven reliability
- Easy accessible setpoint screw
- Adjustable minimum speed or cut-off selection
- Dual input possibility (P215DP only, by adding another P35 transducer)
- Heatpump input available (P215SH)

Ordering Codes	Range (bar)	P.B. (bar)	Setpoint (bar)	Pressure Connection †	Notes	List Price
8 Amp Rating						
P215DP-9100	14-24	4	16	90cm capillary (style 50)	A	£425
P215DP-9101	8-14	2.5	10			£333
P215DP-9600	14-24	4	16	90cm capillary (style 51)		£352
P215DP-9601	8-14	2.5	10			£352
P215DP-9800	14-24	4	16	Braze con. (st. 28)	B	£432
P215DP-9102	22-42	6	30	90cm cap. (st. 50)		£351
4 Amp Rating						
P215SH-9100	14-24	4	16	90cm capillary (style 50)	C	£216
P215SH-9101	8-14	2.5	10			£182
P215SH-9102	22-42	6	30	Braze con. (st. 28)	B	£216
P215SH-9800	14-24	4	16		C	£219
6 Amp Rating						
P215ST-9100	14-24	4	16	90cm capillary (style 50)	C	£305
P215ST-9101	8-14	2.5	10			£305
P215ST-9600	14-24	4	16	90cm cap. (st. 51)		£241
P215ST-9102	22-42	6	30	90cm cap. (st. 50)	B	£251

Notes: † See page 46 for 'Style' references

A = Single/dual input. For dual input a second separate transducer has to be ordered!
B = For use on R410A applications
C = Single input

Supply Voltage - 230Vac, 50/60Hz
Size - 205 x 213 x 107mm
Rating - 4, 6, 8 Amp
Protection Class - IP54

P215LR/BR/TR Series

Single/Dual/Triple Input Pressure Actuated

The P215LR is a single pressure input, the P215BR is a dual pressure input and the P215TR is a triple pressure input fan speed controller for air cooled condensers with respectively single, dual and triple refrigerant circuits.

The controller varies the fan speed by directly sensing the pressure changes of one, two or three separate refrigerant circuits. The setpoint of each pressure transducer can be separately adjusted. The controller selects the input with the greatest cooling demand to control the fan speed.



The controllers can be used in non corrosive refrigerant systems and vary the supply voltage to the motor from 45% to ≥95% of the supplied voltage using the phase cutting principle. It is recommended to confirm with the electric motor manufacturer if a controller using the phase cutting principle for speed variation can be used. If the pressure drops below the adjusted set-point minus the proportional band, the output to the motor is zero volt or the adjusted min. speed setting.

FEATURES

- Condenser pressure control by fan speed variation
- Model with heat pump input available
- Transducers with proven reliability
- Easy accessible set-point screw
- Adjustable minimum speed or cut-off selection (only on LR and BR models)
- Dual pressure input (BR models)
- Triple pressure input (TR models)

Ordering Codes	Range (bar)	P.B (bar)	Setpoint (bar)	Pressure Conn. (Style†)	Notes	List Price
3 Amp Rating						
P215LR-9110	14-24	4	16	90cm cap. (style 50)	A, B	£170
P215LR-9111	8-14	2.5	10			£182
P215LR-9130	Bulk pack version of type P215LR-9110 (15 pcs)			Direct mount (47)		£170
P215LR-9210	14-24	4	16		£182	
P215LR-9610	8-14	2.5	10	Direct mount (style 51)		£149
P215LR-9611	8-14	2.5	10		C	£150
P215LR-9114	22-42	6	30		D	£161
P215LR-9140	14-24	4	16	90cm cap. (style 50)	E	£244
P215BR-9110	8-14	2.5	10		A, F	£268
P215BR-9111	8-14	2.5	10			£283
P215BR-9210	14-24	4	16	Direct mount (47)		£279
P215TR-9110	14-24	4	16	90cm cap. (50)	G	£313

† See page 46 for 'Style' references

Notes:

- A = Minimum speed adjustable E = 400V version
 B = Single pressure input F = Dual pressure input
 C = For R410A applications G = Triple pressure input
 D = 230V heat pump input

REPLACEMENT PARTS (for Fan Speed Control 230V Versions)

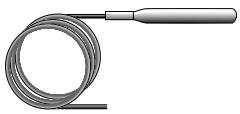
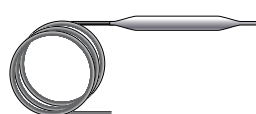
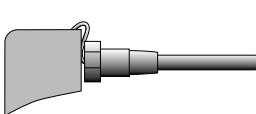
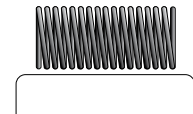
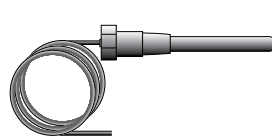
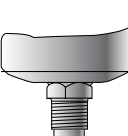
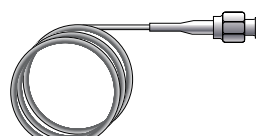
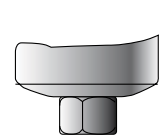

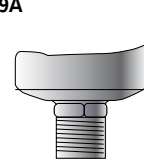

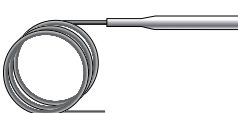
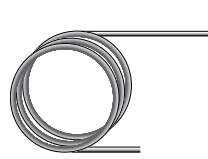
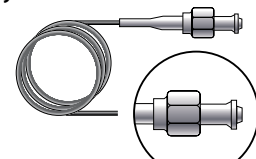
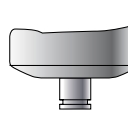
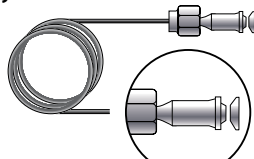
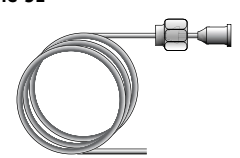
Controller Code	Range (bar)	Element Style †	Replacement Item	
			Pressure Transducer	Electronic Module
P215LR-9110	14-24	50	P35AC-9500	P38AA-9111
P215LR-9111	8-14	50	P35AC-9501	P38AA-9111
P215LR-9210	14-24	47	P35AC-9502	P38AA-9111
P215LR-9211	8-14	47	P35AC-9503	P38AA-9111
P215LR-9610	14-24	51	P35AC-9507	P38AA-9111
P215LR-9611	8-14	51	P35AC-9508	P38AA-9111
P215BR-9110	14-24	50	P35AC-9500	P38AA-9211
P215BR-9111	8-14	50	P35AC-9501	P38AA-9211
P215BR-9210	14-24	47	P35AC-9202	P38AA-9211
P215BR-9211	8-14	47	P35AC-9203	P38AA-9211

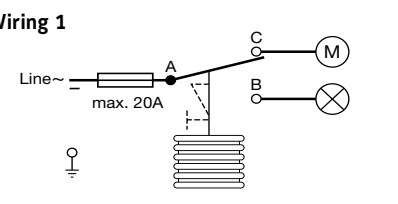
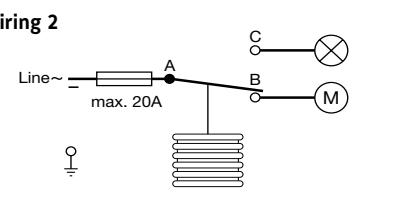
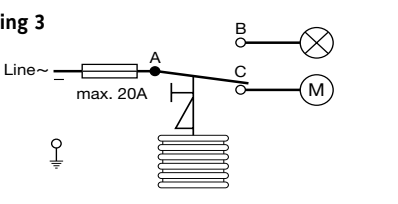
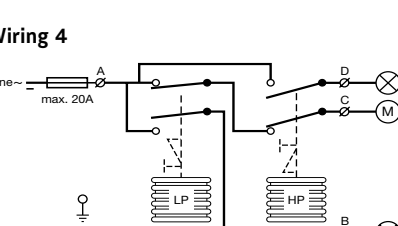
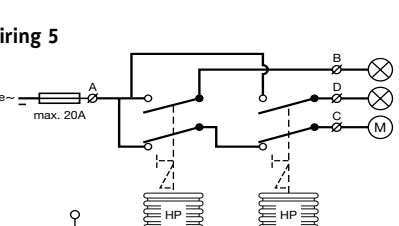
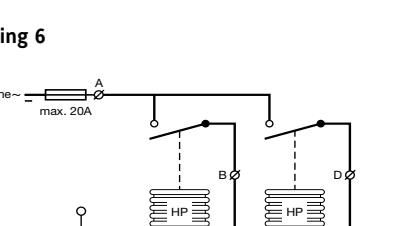
Notes:

† See page 46 for 'Style' references

- P35 Mechanical Transducers – see page 32
 P38 Electronic Boards – please refer to the Sales Support Team
 Supply Voltage – 230V, 50/60Hz
 Rating – 3 Amp
 Size – 118 x 70 x 53mm

Style Reference & Wiring Diagrams

Style 1a 	Style 1b 	Style 2 	Style 3 
Style 4H 	Style 5 	Style 13 	Style 15 
Style 28 	Style 29A 	Style 30 	Style 34 
Style 35 	Style 45A 	Style 47 	Style 50 
Style 51 			

Wiring 1  <p>A - C opens on pressure decrease</p>	Wiring 2  <p>A - B opens on pressure increase</p>	Wiring 3  <p>A - C opens on pressure increase</p>
Wiring 4  <p>LP: A - C opens on pressure decrease A - B closes simultaneously</p> <p>HP: A - C opens on pressure increase A - D closes simultaneously</p>	Wiring 5  <p>Left side HP: A - C opens on pressure increase A - B closes simultaneously</p> <p>Right side HP: A - C opens on pressure increase A - D closes simultaneously</p>	Wiring 6 

Building Management System

The Metasys® system family of Field Equipment Controllers comprise a group of versatile BACnet®, Master-Slave/Token-Passing (MS/TP) network compliant field controllers and communicating zone and network sensors.

These products require engineering by specialist engineers, and are only available to Johnson Controls' Solution Integrators. All enquiries should be passed to your Account Manager.

MS-AD/RAP Series Application and Data Servers (ADS/ADX)

The ADS server is an optional component of the system manages the collection and presentation of large amounts of trend data, event messages, operator transactions, and system configuration data. The ADX is a larger scale system that runs on a server operating system to provide extended historical archiving and reporting capabilities.



Ordering Codes	Description	List Price
MS-ADS05U-0	Application & Data Server (5 users)	POA
MS-ADX10SQL-0	Application & Data Server (10 users) c/w SQL2008	POA
MS-ADX10U-0	Application & Data Server (10 users)	POA
MS-ADXSWO-0	Application & Data Server (25 users)	POA
MS-ADXSWSOQL-0	Application & Data Server (25 users) c/w SQL2008	POA
MS-ADSLE5U-0	ADS-Lite-E (supports upto 5 engines in NAE35, NAE45, NCE, and/or NIE29/39/49)	POA
MS-RAP	Ready Access Portal (for NxE stand-alone sites)	POA

MS-FEC/IOM/FAC/VMA/TUC Series Field Equipment Controllers

These controllers comprise a group of versatile BACnet®, master-slave/token-passing (MS/TP) network compliant field controllers designed to monitor, control and integrate a wide variety of heating, ventilating and air-conditioning (HVAC). This family also includes the field equipment controller (FEC), input/output module (IOM) and the variable air volume modular assembly (VMA) 16 controller.



Ordering Codes	Description	List Price
MS-FEC1611-0	10-point BACnet Controller, 2UI, 1DI, 3DO, 4CO	£779
MS-FEC1621-0	10-point BACnet Controller, as above but with display	£1,075
MS-FEC2611-0	17-point BACnet Controller, 6UI, 2DI, 2AO, 3DO, 4CO	£1,072
MS-FEC2621-0	17-point BACnet Controller, as above but with display	£1,478
MS-IOM1711-0	4-point I/O Module, 4BI	£249
MS-IOM2711-0	6-point I/O Module, 2UI, 2UO, 2RO	£349
MS-IOM3711-0	12-point I/O Module, 4UI, 4UO, 4RO	£520
MS-IOM4711-0	17-point I/O Module 6UI, 2BI, 2AO, 3BO, 4CO	£573
MS-VMA1610-1	Integrated VAV Controller/Actuator/Pressure Sensor (cooling only), FC Bus and SA Bus	£469
MS-VMA1620-1	Integrated VAV Controller/Actuator/Pressure Sensor (with reheat and fan control), FC Bus and SA Bus	£513
TUC0301-2	N2/BACnet Terminal Unit Controller, no cover	£180
TUC0311-2	N2/BACnet Terminal Unit Controller	£187

MS-NCE Series Network Control Engines

Network control engine (NCE) series controllers combine the network supervisor capabilities and internet protocol (IP) network connectivity of a network automation engine (NAE) with the input/output (I/O) point connectivity and direct digital control capabilities of a field equipment controller (FEC). NCEs provide cost-effective solution designed for integrating central plants and large built-up networks.



Ordering Codes	Description	M	DI	List Price
MS-NCE2510-0	NCE* + N2 trunk (upto 32 devices)	-	-	£1,835
MS-NCE2511-0	NCE* + N2 trunk " "	■	-	£2,028
MS-NCE2516-0	NCE* + N2 trunk " "	-	■	£2,169
MS-NCE2517-0	NCE* + N2 trunk " "	■	■	£2,233
MS-NCE2520-0	NCE* + LonWorks trunk (upto 32 devices)	-	-	£1,964
MS-NCE2521-0	NCE* + LonWorks trunk " "	■	-	£1,975
MS-NCE2526-0	NCE* + LonWorks trunk " "	-	■	£2,169
MS-NCE2527-0	NCE* + LonWorks trunk " "	■	■	£2,233
MS-NCE2560-0	NCE* + BACnet MS/TP trunk (upto 32 devices)	-	-	£1,964
MS-NCE2561-0	NCE* + BACnet MS/TP trunk " "	■	-	£1,975
MS-NCE2566-0	NCE* + BACnet MS/TP trunk " "	-	■	£2,169
MS-NCE2567-0	NCE* + BACnet MS/TP trunk " "	■	■	£2,233
MS-NCE2500-0	NCE* (no FC Bus)	-	-	£1,136
MS-NCE2506-0	NCE* (no FC Bus) + integral display	-	■	£1,306

*Standard configuration - 33-points, 10UI, 8DI, 4AO, 7DO, 4CO
Key: M - Modem, DI - LCD display

MS-NAE Series Network Automation Engines

These network automation engines (NAE) enable internet protocol (IP) connectivity and web-based access to Metasys building management systems. NAE units leverage standard building management communications technologies, including BACnet® protocol, LONWORKS® network, and N2 Bus protocol to monitor and supervise a wide variety of heating, ventilating and air conditioning (HVAC); lighting; security; and fire safety equipment.



Ordering Codes	Description	M	List Price
MS-NAE3510-2	NAE + N2 or BACnet MS/TP (upto 50 devices)	-	£4,432
MS-NAE3511-2	NAE + N2 or BACnet MS/TP " "	■	£4,692
MS-NAE3520-2	NAE + LonWorks (upto 64 devices)	-	£4,520
MS-NAE3521-2	NAE + LonWorks " "	■	£4,786
MS-NAE4510-2	NAE + N2 or BACnet MS/TP (upto 100 devices)	-	£8,603
MS-NAE4511-2	NAE + N2 or BACnet MS/TP " "	■	£8,994
MS-NAE4520-2	NAE + LonWorks (upto 127 devices)	-	£8,775
MS-NAE4521-2	NAE + LonWorks " "	■	£9,174
MS-NAE5510-2E	NAE + 2 trunks BACnet MS/TP (upto 100 devices)	-	£11,606
MS-NAE5511-2E	NAE + 2 trunks BACnet MS/TP " "	■	£12,073
MS-NAE5520-2E	NAE + 2 trunks LonWorks (upto 127 devices)	-	£12,928
MS-NAE5521-2E	NAE + 2 trunks LonWorks " "	■	£12,535

Key: M - Modem

NS Series
Network Sensors

This series of NS sensors is designed to function directly with FEC, OM and VMA16 controllers. Several sensors can monitor room temperature. Zone humidity, carbon dioxide (CO²), local temperature setpoint adjustments, and other variables are transmitted to a field controller on the SA-Bus.



Ordering Codes	Description	DI	TA	OO	ST	CO	AS	List Price
Temp. & Humidity Sensors, Surface Mount								
NS-AHA7001-0	Sensor (RH 3% acc.)	■	Set	■	-	MJ	-	£469
NS-AHA7002-0	" "	■	Set	■	-	ST	-	£469
NS-AHB7001-0	" "	■	Set	■	■	MJ	-	£469
NS-AHB7002-0	" "	■	Set	■	■	ST	-	£469
NS-AHB7003-0	" "	■	Set	■	■	ST	■	£469
NS-AHN7001-0	" "	-	-	-	-	MJ	-	£350
NS-AHN7001-2	" "	-	-	-	-	ST	-	£317
NS-AHP7001-0	" "	-	W/C	■	-	MJ	-	£361
NS-APA7001-0	Sensor (RH 2% acc.)	■	Set	■	-	MJ	-	£586
NS-APA7002-0	" "	■	Set	■	-	ST	-	£586
NS-APB7001-0	" "	■	Set	■	■	MJ	-	£586
NS-APB7002-0	" "	■	Set	■	■	ST	-	£586
NS-APB7003-0	" "	■	Set	■	■	ST	■	£586

Note: Please refer to 'Key' in next column.

Ordering Codes	Description	DI	TA	OO	ST	FC	CO	AS	BF	List Price
Temp. Sensors, Surface Mount										
NS-ATA7001-0	Temp. sensor	■	Set	■	-	-	MJ	-	-	£114
NS-ATA7002-0	" "	■	Set	■	-	-	ST	-	-	£114
NS-ATA7003-0	" "	■	Set	■	-	-	ST	■	-	£114
NS-ATB7001-0	" "	■	Set	■	■	-	MJ	-	-	£121
NS-ATB7002-0	" "	■	Set	■	■	-	ST	-	-	£121
NS-ATB7003-0	" "	■	Set	■	■	-	ST	■	-	£121
NS-ATC7001-0	" "	■	Set	■	-	■	MJ	-	-	£129
NS-ATC7002-0	" "	■	Set	■	-	■	ST	-	-	£129
NS-ATD7001-0	" "	■	Set	■	■	■	MJ	-	-	£130
NS-ATD7002-0	" "	■	Set	■	■	■	ST	-	-	£130
NS-ATF7001-0	" "	■	W/C	■	■	-	MJ	-	-	£114
NS-ATF7002-0	" "	■	W/C	■	■	-	ST	-	-	£114
NS-ATN7001-0	" "	-	-	-	-	-	MJ	-	-	£92
NS-ATN7001-2	" (no JC logo)	-	-	-	-	-	MJ	-	-	£92
NS-ATN7003-0	Temp. sensor	-	-	-	-	-	ST	■	-	£92
NS-ATN7003-2	" (no JC logo)	-	-	-	-	-	ST	■	-	£85
NS-ATP7001-0	Temp. sensor	-	W/C	■	-	-	MJ	-	-	£101
NS-ATP7001-2	" "	-	W/C	■	-	-	MJ	-	-	£101
NS-ATP7002-0	" "	-	W/C	■	-	-	ST	-	-	£101
NS-ATP7003-0	" "	-	W/C	■	-	-	ST	■	-	£101
NS-ATP7003-2	" "	-	W/C	■	-	-	ST	■	-	£92
NS-ATV7001-0	Balancing Tool	■	Set	■	■	-*	MJ	-	■	£138
NS-ATV7002-0	" "	■	Set	■	■	-*	ST	-	■	£138

* VAV balancing models - the fan control button is replaced by a lightbulb button used in the VAV balancing process.

Supply Voltage - 15Vdc nominal (from SA Bus)
Temp. Measurement - 0-40°C
Humidity Range - 0-100% RH (0-90% RH calibrated)
Size - 80 x 80 x 32mm (35mm)

Key:

- DI - LCD display
- TA - Temperature adjustment: SET (setpoint adjustment), W/C (warmer/cooler dial)
- OO - Occupancy override
- ST - F/C scale toggle
- FC - Fan control button
- CO - Connection: ST (screw terminals), MJ (modular jack)
- AS - Address switches (DIP switch set)
- BF - Balancing feature (VAV)

Ordering Codes	Description	List Price
CO² Sensor and Duct Temperature Sensors		
NS-BCN7004-0	CO ² sensor, 0-2000 ppm, no display (surface mount)	£883
NS-DTN7043-0	Duct mount, temp. sensor, 102mm, with 3m flying lead	£128
NS-DTN7083-0	Duct mount, temp. sensor, 203mm, " "	£128

Supply Voltage - 15Vdc nominal (from SA Bus)
Sizes - CO² sensor: 120 x 80 x 32mm, duct sensor: 76 x 76 x 51mm

ACCESSORY

Ordering Code	Description	Price
NS-WALLPLATE-0	Adapts NS sensor to standard 80 x 120mm wallbox	£13

WRZ-TT/MS-ZFR Series

Wireless Sensors

These sensors and BUS router provides wireless monitoring and control of HVAC equipment within multiple levels of a Metasys system using BACnet protocol - from supervisory engines, to controllers and room temperature sensors. Field controllers (FEC, IOM or VMA16) can be wirelessly enabled using a ZFR1811 wireless field bus router. One router is required per field controller.

Ordering Codes	Description	DI	TA	FC	FS	List Price
WRZ-TTP0000-0	Sensor (warmer/cooler +/-)	-	Set	-	-	£224
WRZ-TTR0000-0	Sensor only	-	-	-	-	£217
WRZ-TTS0000-0	Sensor (13-29°C/55-85°F)	-	Set	-	-	£224
WRZ-TTB0000-0	Sensor (13-29°C/55-85°F)	■	Set	■	-	£224
WRZ-TTD0000-0	Sensor (13-29°C/55-85°F)	■	Set	■	■	£224
MS-ZFR1811-0	Wireless Field Bus Router	-	-	-	-	£187
MS-ZFR1810-0	Wireless Field Bus Co-ordinator	-	-	-	-	£551

Key:

- DI - LCD display
- TA - SET (setpoint adjustment)
- FC - F/C button
- FS - Fan speed control

MS Series

Spares and Accessories

Ordering Codes	Description	List Price
MS-BACEOL-0	Terminal Module	£91
MS-BAT1010-0	Battery 12V for NAE/NIE	£122
MS-BAT1020-0	Battery Pack	£62
MS-BTCVT-1	Bluetooth MSTP Interface	£768
MS-BTCVTCBL-700	Cable Replacement BTCVT	£18
MS-DIS1710-0	Remote Display for NCE/FEC	£329
MS-EREPOR-0	Energy Essentials Software for ADX only	£1,354
MS-EXPORT-0	Metasys Export Utility	£1,900
MS-FUSE01-0	10 Fuses (1 packet)	£44
MS-LDT1102-0	Local Display Terminal Kit	£912
TL-JCIBPP-DVD0	Tools DVD for the branches	POA
TL-JCIBPP-DVD6	Tools DVD for the branches	POA

General Ordering Information

Opening an Account

Johnson Controls' products are available from a nationwide network of wholesalers and distributors.

Should you wish to establish a trading account or require a list of your nearest stockists please contact the Customer Support Team. You can also email your request to products.uk@jci.com.

Placing an Order

Please help us to help you! So that we can process your purchase orders quickly can you please ensure your purchase orders show the correct part number and pricing. This will help us eradicate any unwanted shipments, returns, delays and credits. If you're unsure of any detail, please call the Customer Service Team in Slough for assistance.

Please send your order by fax to 0870 889 5664 or by post to our Slough office: Johnson Controls Limited, Products Dept., 72 Buckingham Avenue, Slough, Berkshire SL1 4PN

Minimum Order Value

Orders of less than £100 in value will be subject to a carriage charge (packing and postage). Order values of over £100 include free delivery within the United Kingdom.

Cancellation of Order

In the event of an order being cancelled then the customer is liable for any costs incurred by Johnson Controls Limited. No cancellation fee will be charged if the office is notified by writing within 24 hours of placing the order. After that time a 15% re-stocking charge will apply. Non standard items or customised products will be subject to different terms.

Product Warranty

3 years on all products.

The warranty becomes invalid if the product has been tampered with in any way or has been installed incorrectly or has been selected for an unsuitable application.

Warranty Return

All warranty returns should be authorised prior to return by our Customer Service Team (CST) in Slough. Full details are shown in the General Conditions of Sale.

In short the process is:

1. Fill-out a return material authorisation (RMA) form on the next page and fax/post to our Slough office.
2. Contact CST for an authorisation number and arrangement of the return of the goods.
3. The goods are returned to Slough for checking ahead of returning to their factory of origin for full inspection.
4. Credits are issued once these checks are completed.

ISO 9001 Accreditation

Johnson Controls Limited operates a Quality Management System which complies with the requirements of ISO 9001:2008 for the following scope:

Property, facilities and services management. Project management of construction and building services.

Consultancy services related to property portfolios.

Complete building service and maintenance management, covering, M&E service, HVAC service, chiller service, building automation and control systems, fire and security service. This would also encompass, turn-key plant and system retrofit/upgrade; energy solutions; environmental and legislative compliance. Procurement, project management, installation and commissioning of building automation (including fire and security), heating ventilation, air-conditioning control systems and air-conditioning systems.

The supply, systems design and installation of computerised access control, alarm monitoring, intruder, CTV, fire, perimeter protection, time and attendance and control systems, and the provision of Customer Training.



FS 23823
ISO 9001:2008

WEEE Compliance

Johnson Controls Limited complies with the Waste Electrical and Electronic Equipment Regulations 2006, through the Budget Pack WEEE Compliance Scheme Accreditation No. WEE/UP3838PL/SCH, for 2007.

Producer Registration No. WEE/GC0069TY

Return Material Authorisation Request

Your Company	
Your Name	
Your Reference (if any)	
Your Email Address	
Fax No.	
JCI Order Number	
Your Order Number	

Reason For Return

1. Fault

Type of fault <input type="checkbox"/> Electrical <input type="checkbox"/> Leak <input type="checkbox"/> Mechanical <input type="checkbox"/> Physical	Details of fault (please be specific)
--	--

2. Incorrectly Specified By Johnson Controls

Who specified (person)	
Detail of specification	
Why product does not match specification	

3. Wrong Part Supplied

Part Number Ordered	
Part Number Supplied	

4. Duplicated Order

Details of duplication

5. Part Number(s) being returned

Additional Comments

Johnson Controls Use Only

RMA Number	
Issued By	
Date	

Please complete this form and fax to 0870 889 5664. The RMA Approval Number will then be faxed back to you.

Returns Address Johnson Controls, Products Dept. (Returns). 71/72 Buckingham Ave, Slough Industrial Estate, Slough, Berkshire SL1 4PN

General Conditions of Sale

1. Definitions

In these conditions

'Seller'	means Johnson Controls Limited.
'Buyer'	means any purchaser of Goods (hereinafter defined) from the Seller.
'Goods'	means the items which are the subject of sales between the Buyer and the Seller.
'Order'	means any contract for the sale of Goods by the Seller to the Buyer to which these Conditions apply.
'Instalment Delivery'	means the delivery of part only of the Goods, which are to be purchased pursuant to the order.
'Purchase Price'	means the price (exclusive of VAT and other taxes if any) payable by the Buyer to the Seller in respect of the Order. The masculine gender shall include the feminine and neuter genders and singular number shall include the plural and vice-versa.

2. Application

- (A) All quotations, offers and tenders are made and all Orders are subject to the following conditions. Subject only to Condition 2(B) all other terms, Conditions or warranties whatsoever excluded from any other Contract between Seller and Buyer or any other variation thereof unless expressly accepted in writing by a director or other authorised representative of the Seller.
- (B) In the event of a conflict between these Conditions and the Seller's express terms of any quotation or acknowledgement of Order then such express terms shall prevail.
- (C) If any statement or representation has been made to the Buyer by the Seller, or its officers, employees or agents upon which the Buyer relies (other than in document(s) enclosed with the Seller's quotation or acknowledgement of Order), then the Buyer must set out that statement or representation in a document to be attached to or endorsed on the Order and in any such case the Seller may confirm, reject or clarify the point and submit a new quotation, if appropriate. Under no circumstances shall the Seller be responsible for, or be held liable in respect of, any statement or representation relied upon by the Buyer (other than a fraudulent or representation) which is not attached to or endorsed on the Order and subsequently confirmed in writing by the Seller.
- (D) Unless otherwise agreed in writing all trade terms shall be interpreted in accordance with INCOTERMS current at the time the Order is accepted.

3. Quotations

- (A) A quotation by the Seller does not constitute an offer and the Seller reserves the right to withdraw or revise the same at any time prior to the Seller's acceptance of the Buyer's Order.
- (B) Quotations, offers and tenders issued by the Seller are for the whole of the Goods referred to in them and the Seller reserves the right to refuse acceptance of any Order which relates to only part of the Goods forming the subject of a quotation, offer or tender.
- (C) Quotations shall be available for acceptance for a maximum period of 14 days from date of issue and may be withdrawn by the Seller at any time prior to the Buyer's acceptance by written or oral notice.

4. Prices

- (A) Save as otherwise agreed the Purchase Price shall be that contained in the Seller's net list prices current at the time of despatch. The Seller shall have the right at any time prior to despatch to withdraw any discount from its normal prices and/or to revise prices to take into account increases in costs including (without limitation) costs of any goods materials carriage packaging labour or overheads the increase or imposition of any tax duty or other levy and any variation in exchange rates.
- (B) The minimum Purchase Price for any order shall be £100 (one hundred pounds) and the Seller shall be entitled to charge the Buyer £100 (one hundred pounds) exclusive of VAT and any other ancillary charges in relation to any order submitted by the Buyer for Goods to a value of less than £100 (one hundred pounds) without giving credit for the difference between £100 (one hundred pounds) and the value of the Goods ordered.
- (C) Where the Seller delivers the Goods the Buyer shall be liable to the Seller for carriage costs and demurrage costs incurred by the Seller in the event of vehicles being unduly delayed at the designated point of delivery.
- (D) Unless otherwise specified VAT and any other tax or duties payable by the Buyer shall be added to the Purchase Price.

5. Payment

- (A) Unless otherwise agreed by the Seller in writing and subject to satisfactory trade references, payment shall be due and payable (30) days after the date of invoice. The Seller shall be entitled to submit its invoice with its delivery advice note or any time afterwards save that where delivery has been postponed at the request of or by the default of the Buyer then the Seller may submit its invoice at any time after the Goods are ready for delivery or would have been ready in ordinary course but for the request or default on the part of the Buyer.
- (B) Failure to pay on the due date shall entitle the Seller to withhold further despatches in respect of the Order as well as in respect of any other contract for the purchase of Goods between the Seller and the Buyer and to serve notice on the Buyer requiring immediate payment for all Goods supplied by the Seller under this and all other Contracts with the Buyer whether or not payment is otherwise due or invoiced.
- (C) Any extension of credit allowed to the Buyer may be changed or withdrawn at any time.
- (D) Save as otherwise agreed in writing by the Seller interest shall be payable on overdue accounts at the annual rate of two per cent above the Base Rate from time to time of National Westminster Bank Limited such interest to accrue daily and to run from the due date for payment of the Purchase Price until receipt by the Seller of the full amount thereof as well before as after any judgement or order.
- (E) No disputes arising under the Contract nor delays beyond the reasonable control of the Seller shall interfere with prompt payment in full by the Buyer.

6. Delivery

- (A) The Seller shall advise the Buyer of the scheduled date of despatch.
- (B) Delivery dated mentioned in any quotation acknowledgement of order or elsewhere as approximate only and not of any contractual effect and the Seller shall not be under any liability to the Buyer in respect of any failure to deliver on any particular date or dates unless hereof such requirement has been brought to the attention of the Seller by the Buyer and the Seller has agreed in writing thereto. Time for delivery is given as accurately as possible but is not guaranteed. The Buyer shall have no right to damages or to cancel the Contract for failure for any cause to meet any delivery stated. The date of delivery shall in every case be dependent upon prompt receipt of all necessary information, final instructions or approvals from the Buyer. Any delays or alterations by the Buyer in design, specifications or quantities required may result in delay in delivery.
- (C) By agreement in writing between the Seller and the Buyer the Order may be satisfied by Instalment Deliveries PROVIDED ALWAYS that each instalment Delivery shall be deemed to be a separate contract subject mutates mutans to these Conditions of Sale and the Seller may accordingly submit an invoice to the Buyer in respect of each Instalment Delivery for a proportional part of the Purchase Price. Failure by the Buyer to take delivery of or to make payment in respect of any one or more instalments of Goods delivered under the Contract shall entitle the Seller to treat the Contract as repudiated by the Buyer either in whole or in part.
- (D) Delivery shall be at the Buyer's premises unless otherwise agreed in writing by the Seller.
- (E) If the Buyer refuses or fails to take delivery of Goods tendered in accordance with the Order the Seller shall be entitled to immediate payment in full for Goods so tendered. The Seller shall be entitled to store at the risk of the Buyer any Goods of which the Buyer refuses or fails to take delivery and the Buyer shall in addition to the Purchase Price pay all costs of such storage and any additional costs incurred as a result of such refusal or failure. The Seller shall be entitled upon the expiration of 3 months from the date of invoice of dispose of the Goods in such manner as the Seller may determine. The Seller will endeavour to comply with reasonable requests by the Buyer for postponement of delivery but shall be under no obligation to do so. Where delivery is postponed, otherwise than due to the default by the Seller, the Buyer shall pay all costs and expenses, including a reasonable charge for storage and transportation so occasioned, and payment for the Goods shall be made in accordance with these Conditions.

7. Risk

- (A) Risk shall pass to the Buyer so that the Buyer is responsible for all loss, damage or deterioration of the Goods: -
 - (i) If the Seller delivers the Goods by its own transport, or in accordance with

General Conditions of Sale (cont)

a specific contractual obligation arranges transport for the Goods, at the time when the Goods arrive at the designated place of delivery; or

- (II) In all other circumstances, at the time when the Goods leave the premises of the Seller.
- (B) Where delivery of the Goods to the Buyer is to be effected at the Seller's premises risk therein shall pass to the Buyer upon transfer of the Goods to the Buyer's carrier or 30 days from the Seller notifying the Buyer that the Goods are available for collection whichever first occurs.
- (C) The Seller and the Buyer shall each effect and maintain insurance cover against the risk accepted by them under this condition.

8. Title

- (A) Title to the Goods shall only pass to the Buyer upon the happening of any one of the following events:-
 - (I) The Buyer has paid to the Seller all sums (including) any default interest due from it to the Seller under this Contract and under all other contracts between the Seller and the Buyer including (for the avoidance or doubt) any sums due under contracts made after this Contract whether or not the same are immediately payable and under all contracts between the Seller and any associate or subsidiary company of the Buyer or any company under the ultimate control of the same parent company as has ultimate control of the Buyer; or
 - (II) When the Seller serves on the Buyer notice in writing specifying that title in the Goods has passed.
 - (B) The Seller reserves the right to re-possess any Goods in respect of which payment is overdue and thereafter to re-sell the same and for this purpose the Buyer hereby grants an irrevocable right and licence to the Seller's servants and agents to enter upon all of any of its premises with or without vehicles during normal business hours. This right shall continue to subsist notwithstanding the termination or cancellation of the order for any reason and is without prejudice to any accrued rights of the Seller thereunder or otherwise.
 - (C) Until title to the Goods has passed to the Buyer pursuant to these Conditions it shall possess the Goods as fiduciary agent and bailee of the Seller. If the Seller so requires, the Buyer shall store the Goods separately from other goods and shall ensure that they are clearly identifiable as belongings to the Seller.

9. Cancellation

- (A) Subject to paragraph (C) of this Condition an Order may be varied or cancelled by the Buyer at any time prior to delivery (or in the event of Instalment Deliveries at any time prior to the delivery of any particular instalment in respect of that Instalment Delivery but not in respect of Instalment Deliveries already completed) by notice in writing to the Seller upon condition that the Buyer pays to the Seller compensation pursuant to paragraph (B) of this Condition PROVIDED ALWAYS that no variation or cancellation shall be effective until receipt of the said compensation by the Seller.
- (B) The compensation payable under paragraph (A) of this Condition shall be such sum not exceeding 15% of the Purchase Price as is stipulated by the Seller for loss and expense occasioned by the variation or cancellation including but not limited to loss of profit, administrative and restocking charges, the capital cost of maintaining stocks, storage and internal transportation charges. The Seller shall notify the Buyer of the amount of compensation within a reasonable time of receiving the notice of variation or cancellation from the Buyer.
- (C) Nothing in this condition shall affect the rights of the Seller where a purported variation or cancellation amounts to a wrong repudiation of the Order. Goods returned to the Seller without the Seller's written consent will under no circumstances be accepted for credit.
- (D) All variations required by the Buyer and accepted by the Seller shall be agreed in writing and the price, if not agreed prior to the manufacture or delivery of the Goods shall be based on appropriate contracts prices (if any) plus escalation in respect of inflation and increased costs of materials and labour.

10. Third Party Rights

- (A) The Buyer shall indemnify the Seller and hold him indemnified against any and all liabilities claims and costs incurred by or made against the Seller as a direct or indirect result of the carrying out of any work required to be done on or to the Goods in accordance with the requirements or specifications of the Buyer involving any infringement or alleged infringement of any third party.
- (C) The Seller shall have no liability to the Buyer in the event of the Goods

infringement or being alleged to infringe the rights of any third party. In the event that the Goods are or may be the subject of patent copyright registered design trade mark or other rights of any third party the Seller shall be obliged to transfer to the Buyer only such title as the Seller may have.

11. Specifications

- (A) The Buyer assumes responsibility that the Goods are suitable for his purpose.
- (B) Unless expressly agreed in writing by the Seller all drawings, designs, specifications and particulars of weights and dimensions submitted by the Seller are approximate only and the Seller shall have no liability in respect of any deviation therefrom. Any performance figures given by the Seller are based upon the Seller's experience and are such as the Seller would expect to obtain on test. The Seller accepts no liability for failure to obtain any performance figures quoted by him unless expressly and specifically guaranteed by the Seller in writing. In the event of a failure to achieve such performance figures the Seller may at its option replace or repair the Goods concerned. The Seller reserves the right to alter or change dimensions or composition of the Goods supplied to conform to applicable standards or laws or otherwise within reasonable limits having regard to the nature of the Goods.
- (C) The Seller accepts no responsibility for any error omissions or other defects in any drawings, designs, or specifications not prepared by the Seller and the Buyer against any and all liabilities and expenses incurred by the Seller arising therefrom shall indemnify the Seller.
- (D) All drawings designs or specifications supplied by the Seller under or in connection with any quotation or contract of sale shall remain the property of the Seller and the Buyer shall not copy them without the consent of the Seller and shall comply with the Seller's reasonable requirements as to their use, return and otherwise.
- (E) The information contained in advertising, sales and technical literature issued by the Seller may be relied upon to be accurate in the exact circumstances in which it is expressed, otherwise any illustrations, performance details, examples of installations and methods of assembly and all other technical data in such literature are based on experience and upon trials under test Conditions and are provided for general guidance only. No such information or data shall form part of the Contract unless the Buyer shall have complied with condition 2 (C) relating to statements and representations. All drawings, documents, confidential records, computer software and other information supplied by the Seller are supplied on the express understanding that copyright is reserved to the Seller and that the Buyer will not, without the written consent of the Seller, either give away, loan, exhibit or sell any such drawings, documents, records, software or other information or extracts therefrom or copies thereof or use them in any way except in connection with the Goods in respect of which they are issued.
- (F) All claims for alleged infringement in respect of patents, trade marks, registered design, design right or copyright received by the Buyer must be notified immediately to the Seller and the Seller must thereafter be kept fully informed of the conduct of such claims.
- (G) The Buyer shall be solely responsible for ensuring that all drawings, information, advice and recommendations given to the Seller, either directly or indirectly by the Buyer or by the Buyer's officers, employees, agents, consultants, or advisers, are accurate, correct and suitable. Examination or consideration by the Seller of such drawings, information, advice or recommendations shall in no way limit the Buyer's responsibility hereunder unless the Seller under the hand of a director or other authorised representative specifically agrees in writing to accept responsibility.
- (H) The Buyer shall indemnify the Seller from and against all actions, claims, costs, and proceedings which arise due to the manufacture of Goods or performance of services to the drawings or specifications of the Buyer where such drawings or specifications are at fault or where it is alleged that they involve an infringement of patent, copyright, registered, design, design right or design copyright or other exclusive right.
 - (I) The Seller can give no guarantee of the suitability of materials or design Goods made specially to the Buyer's requirements and differing from Seller's standard specifications even if the purpose be known to the Seller.
 - (J) The Seller cannot accept responsibility for Buyer's samples, drawings, tools and the like while in the Seller's possession and the Seller will not accept any claim for loss, breakage's or damages to the same whatever the cause. It is agreed between the Seller and the Buyer that the Buyer shall

be responsible for insurance cover in its own name and its cost for the risks specified in this Condition 12.

- (K) Where materials are supplied by the Buyer to the Seller such materials shall remain at the risk of the Buyer at all times and the Seller shall not be liable for the loss of, or damage to, any material during fabrication by the Seller or by any sub-contractor employed by the Seller or whilst on premises of the Seller or any such sub-contractor or in transit to or from the premises to the Seller or of any sub-contractor provided that the Seller may, at its own discretion, make a contribution towards the replacement costs of the material.
- (L) Where materials are supplied by, or on behalf of, the Buyer to the Seller the Buyer shall be responsible to ensure that the material is of satisfactory quality and is fit for its purpose and shall indemnify the Seller against any loss, damage, injury or expense whatsoever arising directly from any fault in incorrect specification of the said material.

12. Tests

- (A) The Goods are carefully inspected and when practicable submitted to the Seller's standard tests before despatch. The Seller shall make an extra charge for any special tests requested by the Buyer. If the Buyer or his appointed representative desires to be present at such tests and is given reasonable notice of the date and time of the tests by the Seller but is not present at the notified date and time the tests shall proceed and shall be deemed to have been carried out in the manner described by the Buyer or his appointed representative.

13. Liability

- (A) The Seller hereby undertakes that for a period of twelve months from and including the date of delivery he shall at no cost to the Buyer and at the option of the Seller repair or replace any Goods found not to be of merchantable quality due to defective workmanship or materials PROVIDED ALWAYS that the Goods concerned are promptly returned carriage paid to the Seller's premises.
- (B) The Seller shall not be liable to the Buyer.
- (B1) The Buyer shall have no claim for shortages or defects in the Goods supplied apparent in visual inspection unless:-
 - (i) The Buyer inspects the Goods within (three) working days of their arrival at its premises or other agreed destinations; and
 - (ii) a written complaint specifying the shortage or defect is made to the Seller and to the carrier within (seven) working days of delivery in the event of shortage, defect, or non-delivery of any separate part of a consignment, or within (fourteen) working days of the notified date if despatch in the event of non-delivery of a whole consignment or, in either event, within such shorter period as the carrier's Conditions (if applicable) require; and
 - (iii) the Seller is given an opportunity to inspect the Goods and investigate any complaint before any use of or alteration to or interference with the Goods.
- (B2) The Buyer shall have no claim in respect of defects in the Goods supplied and services performed which are not apparent on visual inspection at the time of delivery or completion of performances unless.
 - (i) a written complaint is sent to the Seller as soon as reasonably practicable after the defect is discovered and no use is made of the Goods thereafter and no alteration made thereto or interference made therewith before the Seller is given an opportunity to inspect the Goods (and service performed) in accordance with this Condition, and
 - (ii) the complaint is sent within (12) months of the date of delivery of the Goods or completion of the performance of the services or, in the case of an item not manufactured by the Seller, within the guarantee period specified by the manufacturer of such items.
- (C) In the case of Goods not manufactured by the Seller the Buyer shall be entitled only to such warranties or guarantees as are available to the Seller in respect thereof.
- (D) The Seller may at its option make good any shortage or non delivery and/or as appropriate replace or repair any Goods found to be damaged or defective PROVIDED ALWAYS that the damaged or defective Goods are promptly returned carriage paid to the Seller's premises.
- (E) The Seller's aggregate liability to the Buyer whether for negligence breach of contract misrepresentation or otherwise shall in no circumstances exceed the cost of the defective, damaged or undelivered Goods determined by net price invoiced to the Buyer In respect of any occurrence of series of occurrence.

- (F) The Seller's prices are determined on the basis of the limits of liability set out in this Condition. The Buyer may by written notice to the Seller request to agree a higher limit of liability set out in this Condition. The Buyer may by written notice to the Seller request the Seller to agree a higher limit of liability provided insurance cover can be obtained therefor. The Seller shall effect insurance up to such limit and the Buyer shall pay upon demand the amount of any and all premiums. The Buyer shall disclose such information, as the insurers shall require. In no case shall the Buyer be entitled to recover from the Seller more than the amount received from the insurers.
- (G) Subject to the foregoing all conditions warranties and representatives expressed or implied by statute common law or otherwise in relation to the Goods are hereby and excluded and the Seller shall be under no liability to the Buyer for any loss damage or injury direct resulting from defective material faulty workmanship or otherwise however arising and whether or not caused by the negligence of the Seller its employees or agents SAW the Seller shall accept liability for death or personal injury caused by them negligence of the Seller.
- (H) If a complaint is not made to the Seller as provided in this Condition 13 then the Goods shall be deemed to be in all respect in accordance with the Contract and the Buyer shall be bound to pay for the same accordingly.
- (I) Defects in quality or dimension in any instalment delivery shall not be a ground for cancellation of the remainder of the Contract.
- (J) The Buyer shall not be entitled to any claim in respect of any repairs or alterations undertaken by the Buyer without prior specific written consent of the Seller nor in respect of any defect arising by reason of fair wear and tear or damage due to accident, neglect or misuse nor in respect of any Goods to which alterations have been made without such consent or to which replacement parts not supplied by the Seller have been fitted.
- (K) The Seller shall not be liable for (and the Buyer shall indemnify the Seller against claims arising therefrom) loss or damage suffered by reason of use of the Goods after the Buyer becomes aware of a defect or after circumstances which should reasonably have indicated to the Buyer the existence of a defect.
- (L) The Seller may within 15 days of receiving a written complaint (or 28 days where the Goods are suitable outside the United Kingdom) inspect the Goods and the Buyer, if so required by the Seller, shall take all steps necessary to enable the Seller to do so.
- (M) Save as otherwise provided by the other Conditions of these Selections 13 to 15 if the Sale of Goods Act 1979 and, where applicable, Sections 3 to 5 of the Supply of Goods and Services Act 1982 are to be implied into the Contract.
- (N) In the event of the condition of the Goods or the performance of the services being such as might or would (subject to these Conditions) entitle the Buyer to claim damages, to repudiate the Contract and/or reject the Goods or services the Buyer shall not then do so but shall first ask the Seller to repair or supply satisfactory substitute Goods (or rectify the services) and the Seller shall thereupon be entitled at its option to repair or take back the defective Goods and to supply satisfactory substitute Goods or perform works of rectification free of cost and within a reasonable time or to repay the price of the Goods and/or services in respect of which the complaint is made.
- (O) If the Seller does so repair the Goods or supply satisfactory Goods or effect repayment or rectification pursuant to Condition (N) above the Buyer shall be bound to accept such repaired or substituted Goods, repayment or rectification and the Seller shall be under no liability in respect of any loss or damage whatsoever arising from the initial delivery of the defective Goods or from the initial performance of the services or from the delay before the defective Goods are repaired or the substitute Goods are delivered or the repayment or rectification is effected.
- (P) In the case of Goods not manufactured by the Seller:-
 - (I) the Seller gives no assurance or guarantee whatsoever that the sale or use of the Goods will not infringe the patent, copyright or other industrial property rights of any other person, firm or company, and
 - (II) the guarantee will be limited to the guarantee (if any) which the Seller receives from the manufacturer or supplier of such Goods.
- (Q) The Seller shall not be liable:-
 - (I) in respect of claims arising by reason of death or personal injury unless the Seller is shown to have failed to exercise reasonable care in the performance of the Contract and/or the Goods are deemed to be defective within the meaning of Part 1 of the Consumer Protection Act 1987, or

General Conditions of Sale (cont)

- (III) in respect of claims arising through damage to property unless the Goods are deemed to be defective within meaning of Part 1 of the Consumer Protection Act 1987.
- (R) Further, under no circumstances whatsoever shall the Seller be liable for consequential loss (including removal of rectification of work required in connection with the installation of repaired or substitute Goods) loss of profits, damage to property or wasted expenditure.
- (S) Without prejudice to Condition (R) where Goods are supplied for the purpose of a business the Seller's liability, whether in respect of one claim or the aggregate of various claims (other than claims for death or personal injury or pursuant to Part 1 of the Consumer Protection Act 1987), shall not exceed [£100,000] and the Buyer agreed to insure adequately to cover claims in excess of such amount.

14. Licences and Consents

- (A) If any licence or consent of any government or other authority shall be required for acquisition carriage or use of the Goods by the Buyer the Buyer shall obtain the same at its own expense and if necessary produce evidence of the same to the Seller on demand. Failure to do so shall not entitle the Buyer to withhold or delay payment of the Purchase Price. Any additional expense or charges incurred by the Sellers resulting from such failure shall be for the Buyer's account.

15. Force Majeure

- (A) The Seller shall not be liable to the Buyer for any loss or damage which may be suffered by the Buyer as a direct or indirect result of the supply of Goods by the Seller being prevented hindered delayed or rendered uneconomic by reason of circumstances or events beyond the Seller's reasonable control including but not limited to Acts of God war riot strike lock-out trade dispute or labour disturbance accident break-down of plant or machinery fire flood storm difficulty or increased expense in obtaining workmen materials or transport or other circumstances affecting the supply of the Goods or of raw materials therefor by the Seller's normal source of supply or the manufacture of the Goods by the Seller's normal means or the delivery of the Goods by the Seller's normal route or means of delivery. The Seller may at its option suspend performance or cancel its obligations under the Contract without liability for any damage or consequential loss resulting therefrom such suspension or cancellation being without prejudice to the Seller's right to recover all sums owing to it in respect of consignments delivered, and/or services performed, and costs incurred prior to the date of suspension or cancellation.

16. Insolvency Default

- (A) If the Buyer ceases to trade or enters into a deed of arrangement or commits an act of bankruptcy or compounds with his creditors or if a receiving order is made against him or if (being a company) an order is made or a resolution is passed for the winding up of the Buyer (otherwise than for the purposes of amalgamation or reconstruction) or if a receiver is appointed of any of the Buyer's assets or undertaking or if circumstances arise which entitle the court or a creditor to appoint a receiver or a manager or which entitles the Court to make a winding up order or if the Buyer takes or suffers any similar or analogous action in consequence of debt or commits any breach of this or any other contract between the Seller and the Buyer the Seller may without prejudice to any of its other rights stop any Goods in transit and/or suspend further deliveries and/or determine the rights of the Buyer under condition 8 hereof and/or by notice in writing to the Buyer determine the contract.

17. Waiver

- (A) Failure by the Seller to exercise or enforce any rights hereunder shall not be deemed to be a waiver of any such right nor operate so as to bar the exercise or enforcement thereof at any time or times thereafter.

18. Notices

- (A) Any notice hereunder shall be deemed to have been duly given if sent by prepaid first class post or telex to the party concerned at his last known address. Notices sent by first class post shall be deemed to have been given seven days after despatch and notices sent by telex shall be deemed to have been given on the date of despatch.

19. Clause Headings

- (A) Clause headings are inserted in these Conditions for ease of reference only and do not form part of the contract for Sale for the purpose of interpretation.

20. Governing Law

- (A) The contract shall be governed by and construed in accordance with the laws of England and the parties hereby submit to the jurisdiction of the English Courts.

21. Consumer Protection Act 1987 ("the Act")

- (A) In circumstances where the Seller supplies parts or products to the Buyer for incorporation with, or use ancillary to, any composite or other products to be produced, manufactured, processed or supplied by the Buyer then:-
 - (i) the Buyer shall forthwith on demand produce for inspection by the Seller copies of all written instructions, information and warnings to be supplied by the Buyer in relation to the said composite or other products, provided nevertheless that such inspection or right to inspect shall not itself constitute acceptance or approval on the part of the Seller of such instructions, information or warnings, and
 - (ii) the Buyer shall indemnify, reimburse and compensate the Seller for all losses and damages (including costs, expenses and charges for legal actions in which the Seller may be involved) that the Seller may incur, or has to bear, in the event that any claim or claims are made against the Seller pursuant to the Act or otherwise relating to the said composite or other products of the Buyer in circumstances in which the part or product supplied by the Seller was either (i) not the defective part of the said composite product, or (ii) was only rendered the defective part or became a defective product by reason of actions or omissions of the Buyer (including without limitation the supply of defective free issue materials), or (iii) was only rendered the defective part or become a defective product by reason of instructions or warnings given by the Buyer or other supplier of said composite or other products or (iv) supplied in accordance with a specification and/or drawing furnished by, or on behalf of, the Buyer.
 - (iii) for the purposes of this Condition only the word 'defective' shall be interpreted in accordance with the definition of 'defect' contained in Part 1 of the Act.
- (B) The Buyer hereby acknowledges that it is under a duty to pass on to its customers (where appropriate) all instructions, information and warnings supplied to it by the Seller with the Goods.

22. Assignment

- (A) The Contract is between the Seller and the Buyer as principles and under no circumstances shall the Buyer assign the benefit or burden of it without the prior written consent of the Seller. The Seller shall be entitled to assign or sub-contract the whole or part of its obligations under the Contract.

23. Severability

- (A) In the event of any provision of these Conditions being or becoming void in whole or in part the other provisions of these Conditions shall remainfully valid and enforceable and void provisions shall, where appropriate, be replaced in accordance with the meaning and purpose of these Conditions.

24. Attendance on Site

- (A) Should the Seller attend on the Buyer's premises to perform any services in relation to the Contract then the Buyer shall indemnify the Seller in respect of all claims made, or proceedings taken, against the Seller (and associated legal costs) by any third party including but not limited to the Seller's employee's, the Buyer's employee's or the employee's of any contractor employed by the Buyer or the personal representatives or dependants of such employee's or other third parties in respect of death, personal injury or damage to property (including damage as a result of fire or explosion) caused by or arising out of the work in any manner whatsoever.

25. Packing

- (A) Unless otherwise agreed in writing, cases and other packing materials, when charged for, will be credited if returned to the Seller's works within [14 days] of the date of invoice, carriage paid and in good Condition.
- (B) Any packaging supplied by the Seller, unless otherwise expressly agreed in writing, is intended to provide adequate protection in normal Conditions of transit of usual duration.

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A36AHB-9109	£430	26	EP-1110-7001	£737	33	HT-9005-UD1	£293	37	M9108-GDC-1N1	£233	20	M9208-100	£24	22
A99BA-200C	£39	35	EP-1110-7002	£776	33	HT-9005-UD2	£249	37	M9108-GGA-1N	£160	20	M9208-150	£24	22
A99BB-200C	£33	35	EP-1110-7003	£749	33	HT-9005-URW	£214	37	M9108-GGA-1N1	£217	20	M9208-600	£24	22
A99BB-25C	£30	35	EP-1110-7004	£776	33	HT-9006-UD1	£241	37	M9108-GGA-1N4	£273	23	M9208-600	£24	22
A99BB-300C	£37	35	EP-2000-7001	£898	33	HT-9006-UD2	£294	37	M9108-GGA-5	£173	16	M9208-601	£24	22
A99BB-500C	£45	35	EP-2000-7004	£885	33	HT-9009-UD1	£239	37	M9108-GGC-1N	£195	20	M9208-602	£24	22
A99BB-600C	£50	35	EP-2000-7021	£960	33	HT-9009-UD2	£239	37	M9108-GGC-1N4	£308	23	M9208-603	£24	22
A99BC-1500C	£242	35	EP-2000-7024	£954	33	HX-9100-8001	£32	36/40	M9108-GGC-5	£225	16	M9208-604	£24	22
ACC-CD-CFK1	£46	36	EP-8000-1	£158	33	HX-9100-9001	£107	36	M9116-AAA-1	£189	23	M9208-605	£24	22
ACC-CD-S	£465	36	EP-8000-101	£20	33				M9116-AAC-1	£227	23	M9208-605	£24	22
ACC-DWCLIP-0	£30	36	EP-8000-2	£148	33				M9116-ADA-1N	£133	20	M9208-606	£24	22
			EP-8000-3	£158	33				M9116-ADA-1N4	£205	23	M9208-607	£24	22
B			EP-8000-4	£148	33	J			M9116-ADD-1N	£180	20	M9208-608	£24	22
BKT024N002R	£5	32	EQ-0100-7001	£35	27	JC 5361	£40	33	M9116-ADD-1N4	£255	23	M9208-609	£24	22
BKT034N602R	£6	32	EQ-6056-7000	£77	27	K			M9116-ADE-1N	£212	20	M9208-610	£9	21/22
			ER-COM-1C	£21	41	KIT012N600	£14	25/26	M9116-ADE-1N4	£255	23	M9208-611	£11	21/22
			ER-COM-2C	£29	41	KIT023N600	£4	32	M9116-ADE-1N4	£255	23	M9208-612	£38	22
			ER-COM-3C	£12	41	KIT031N600	£95	32	M9116-ADF-1N	£216	20	M9208-613	£8	21/22
			ER-DIS-1C	£52	41	KIT034N600	£93	32	M9116-ADF-1N4	£255	23	M9208-614	£9	21
			ER-FIX-1C	£17	41	KIT21A602	£11	24	M9116-AGA-1N	£139	20	M9208-615	£9	21
			ER-FIX-2C	£16	41				M9116-AGA-1N4	£191	23	M9208-616	£9	21
			ER-NTC-1C	£16	41	L			M9116-AGC-1N	£160	20	M9208-617	£8	21/22
			ER-NTC-2C	£16	41	LP-KIT003-010C	£72	40	M9116-AGC-1N4	£208	23	M9208-618	£8	21/22
			ER52-PM230-501C	£86	41	LP-KIT003-011C	£18	40	M9116-AGD-1N	£207	20	M9208-619	£9	21
			ER53-PM230-501C	£99	41	LP-KIT003-012C	£40	40	M9116-AGD-1N4	£240	23	M9208-620		

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M9220-BGC-1	£309	22	MS4DR48T-1C	£215	42	P215BR-9110	£268	45	P45NBB-9381B	£234	28	P77BCB-9800	£81	30
M9220-GGA-1	£332	22	MS4PM12RT-1C	£187	42	P215BR-9111	£283	45	P45NBB-9640C	£212	28	P77BEA-9350	£57	30
M9220-GGC-1	£368	22				P215BR-9210	£279	45	P45NBB-9660C	£213	28	P77BEA-9450	£74	30
M9220-HGA-1	£341	22	N			P215DP-9100	£425	44	P45NBB-9660Q	£280	28	P77BEA-9750	£109	30
M9220-HGA-3	£341	22	NS-AHA7001-0	£469	48	P215DP-9101	£333	44	P45NBB-9680C	£212	28	P77BEB-9350	£77	30
M9220-HGC-1	£368	22	NS-AHA7002-0	£469	48	P215DP-9102	£351	44	P45NCA-9056	£260	28	P77BEB-9355	£98	30
M9304-ADA-1N	£123	20	NS-AHB7001-0	£469	48	P215DP-9600	£352	44	P45NCA-9104	£254	28	P77BEB-9750	£162	30
M9304-ADC-1N	£146	20	NS-AHB7002-0	£469	48	P215DP-9601	£352	44	P48AAA-9110	£150	29	P77BEB-9850	£76	30
M9304-AGA-1N	£120	20	NS-AHB7003-0	£469	48	P215DP-9800	£432	44	P48AAA-9120	£103	29	P77BEB-9855	£102	30
M9304-AGC-1N	£143	20	NS-AHN7001-0	£350	48	P215LR-9110	£170	45	P48AAA-9130	£103	29	P77BES-9350	£80	30
M9304-AKA-1N	£99	20	NS-AHN7001-2	£317	48	P215LR-9111	£182	45	P48AAA-9140	£103	29	P77BES-9750	£97	30
M9304-GGA-1N	£176	20	NS-AHP7001-0	£361	48	P215LR-9114	£150	45	P48AAA-9150	£128	29	P77BES-9850	£102	30
MS-ADS05U-0	POA	47	NS-APA7001-0	£586	48	P215LR-9120	£244	45	P48BEA-9140	£141	29	P78ALA-9351	£102	31
MS-ADSLE5U-0	POA	47	NS-APA7002-0	£586	48	P215LR-9130	£170	45	P499-ABS-401C	£73	33	P78ALA-9451	£100	31
MS-ADX10SQL-0	POA	47	NS-APB7001-0	£586	48	P215LR-9140	£161	45	P499-ABS-404C	£73	33	P78LCA-9300	£79	30
MS-ADX10U-0	POA	47	NS-APB7002-0	£586	48	P215LR-9210	£182	45	P499-ACS-401C	£52	33	P78LCA-9400	£79	30
MS-ADXSWO-0	POA	47	NS-APB7003-0	£586	48	P215LR-9610	£149	45	P499-VCS-401C	£56	33	P78LCA-9500	£99	30
MS-ADXSWSOQL-0	POA	47	NS-ATA7001-0	£114	48	P215LR-9611	£149	45	P499ACS-404C	£42	33	P78LCA-9700	£172	30
MS-BACEOL-0	£91	48	NS-ATA7002-0	£114	48	P215PR-9200	£109	44	P499VBS-401C	£61	33	P78LCW-9300	£191	30
MS-BAT1010-0	£122	48	NS-ATA7003-0	£114	48	P215PR-9202	£109	44	P499VBS-404C	£61	33	P78LCW-9302	£138	30
MS-BAT1020-0	£62	48	NS-ATB7001-0	£121	48	P215PR-9230	£128	44	P499VCS-404C	£46	33	P78LCW-9800	£98	30
MS-BTCVT-1	£768	48	NS-ATB7002-0	£121	48	P215PR-9232	£128	44	P735AAA-9200	£69	29	P78LCW-9801	£148	30
BTCVTCBL-700	£18	48	NS-ATB7003-0	£121	48	P215PR-9250	£130	44	P735AAA-9201	£68	29	P78MCA-9300	£83	30
MS-DIS1710-0	£329	48	NS-ATC7001-0	£129	48	P215PR-9800	£122	44	P735AAA-9300	£52	29	P78MCA-9400	£83	30
MS-EREPOR-0	£1,354	48	NS-ATC7002-0	£129	48	P215SH-9100	£216	44	P735AAA-9301	£55	29	P78MCA-9700	£177	30
MS-EXPORT-0	£1,900	48	NS-ATD7001-0	£130	48	P215SH-9101	£182	44	P735AAA-9350	£50	29	P78MCB-9300	£100	30
MS-FEC1611-0	£779	47	NS-ATD7002-0	£130	48	P215SH-9102	£216	44	NS-ATA7003-0	£54	29	P78MCB-9800	£106	30
MS-FEC1621-0	£1,075	47	NS-ATF7001-0	£114	48	P215SH-9800	£219	44	P735AAA-9400	£53	29	P78MCS-9300	£94	31
MS-FEC2611-0	£1,072	47	NS-ATF7002-0	£114	48	P215ST-9100	£305	44	P735AAW-9300	£54	29	P78PGA-9300	£93	30
MS-FEC2621-0	£1,478	47	NS-ATN7001-0	£92	48	P215ST-9101	£305	44	P735AAW-9350	£48	29	P78PGA-9400	£109	30
MS-FUSE01-0	£44	48	NS-ATN7001-2	£92	48	P215ST-9102	£251	44	P735AAW-9850	£70	29	P78PGA-9700	£206	30
MS-IOM1711-0	£249	47	NS-ATN7003-0	£92	48	P215ST-9600	£241	44	P735BCA-9300	£52	29	P78PGB-9300	£117	30
MS-IOM2711-0	£349	47	NS-ATN7003-2	£85	48	P215TR-9110	£313	45	P735BCB-9300	£54	29	P78PGB-9800	£106	30
MS-IOM3711-0	£520	47	NS-ATP7001-0	£101	48	P232A-B-AAC	£37	27	P735BEA-9350	£51	29	P78PLM-9350	£128	31
MS-IOM4711-0	£573	47	NS-ATP7001-2	£101	48	P233A-10-AAC	£36	27	P735BEB-9350	£51	29	P78PLM-9850	£152	31
MS-LDT1102-0	£912	48	NS-ATP7002-0	£101	48	P233A-10-AHC	£55	27	P735BEB-9850	£70	29	PA-20xy-Z2K2	POA	10
MS-NAE3510-2	£4,432	47	NS-ATP7003-0	£101	48	P233A-10-AKC	£44	27	P736ALA-9351	£79	29	PA-20xy-Z3K2	POA	10
MS-NAE3511-2	£4,692	47	NS-ATP7003-2	£92	48	P233A-10-PAC	£40	27	P736LCA-9300	£77	29	PA-20xy-Z6K2	POA	10
MS-NAE3520-2	£4,520	47	NS-ATV7001-0	£138	48	P233A-10-PHC	£44	27	P736LCA-9400	£87	29	PA-20xy-Z7K2	POA	10
MS-NAE3521-2	£4,786	47	NS-ATV7002-0	£138	48	P233A-10-PKC	£55	27	P736LCW-9300	£87	29	PA-21xy-Z2K7	POA	10
MS-NAE4510-2	£8,603	47	NS-ATV7003-0	£161	48	P233A-4-AAC	£45	27	P736LCW-9800	£93	29	PA-21xy-Z3K7	POA	10
MS-NAE4511-2	£8,994	47	NS-BCN7004-0	£883	48	P233A-4-AHC	£46	27	P736MCA-9300	£79	29	PA-21xy-Z6K7	POA	10
MS-NAE4520-2	£8,775	47	NS-BTB7002-0	£109	48	P233A-4-AKC	£44	27	P736MCB-9300	£93	29	PA-21xy-Z7K7	POA	10
MS-NAE4521-2	£9,174	47	NS-DTN7043-0	£128	48	P233A-4-PAC	£45	27	P736MCS-9300	£87	29	PLT112-1R	£7	24
MS-NAE5510-2E	£11,606	47	NS-DTN7083-0	£128	48	P233A-4-PHC	£43	27	P736PGA-9300	£83	29	PLT112-2R	£6	24
MS-NAE5511-2E	£12,073	47	NS-WALLPLATE-0	£13	48	P233A-4-PKC	£55	27	P736PGB-9300	£92	29	PLT69-11R	£2	24
MS-NAE5520-2E	£12,928	47				P233A-50-AAC	£36	27	P736PLM-9370	£95	29	PM-8902-0500	£114	34
MS-NAE5521-2E	£12,535	47	P			P233F-P3-AAC	£44	27	P74DA-9300	£194	28	PM-8905-0300	£129	34
MS-NCE2500-0	£1,136	47	P100AP-300D	£20	31	P28DA-9341	£295	28	P74DA-9600	£201	28	PM-8905-0500	£106	34
MS-NCE2506-0	£1,306	47	P100AP-301D	£13	31	P28DA-9660	£307	28	P74EA-9300	£185	28	PM-8907-0300	£105	34
MS-NCE2510-0	£1,835	47	P100AP-302D	£13	31	P28DJ-9360	£480	28	P74EA-9600	£229	28	PT-5217-7011	£405	27
MS-NCE2511-0	£2,028	47	P100AP-306D	£13	31	P28DJ-9861	£470	28	P74EA-9700	£290	28	PT-5217-7101	£405	27
MS-NCE2516-0	£2,169	47	P100AP-308D	£12	31	P28DN-9750	£361	28	P74FA-9701	£318	28			
MS-NCE2517-0	£2,233	47	P100AP-309D	£13	31	P28DP-9300	£228	28	P74FA-9700	£289	28	R		
MS-NCE2520-0	£1,964	47	P100AP-310D	£12	31	P28DP-9340	£262	28	P74FA-9701	£410	28	R-3710-8205	£17	33
MS-NCE2521-0	£1,975	47	P100CP-102D	£17	31	P28DP-9360	£262	28	P77AAA-9300	£58	30	RA-3000-7126	£863	11
MS-NCE2526-0	£2,169	47	P100CP-103D	£20	31	P28DP-9380	£236	28	P77AAA-9301	£59	30	RA-3000-7127	£750	11
MS-NCE2527-0	£2,233	47	P100CP-104D	£14	31	P28DP-9381	£315	28	P77AAA-9302	£59	30	RA-3000-7226	£825	11
MS-NCE2560-0	£1,964	47	P100CP-106D	£14	31	P28DP-9640	£244	28	P77AAA-9350	£58	30	RA-3000-7227	£750	11
MS-NCE2561-0	£1,975	47	P100CP-107D	£14	31	P28DP-9660	£244	28	P77AAA-9351	£57	30	RA-3000-7325	£860	11
MS-NCE2566-0	£2,169	47	P100CP-108D	£14	31	P28DP-9680	£253	28	P77AAA-9400	£68	30	RA-3000-7326	£860	11
MS-NCE2567-0	£2,233	47	P100CP-110D	£10	31	P28DP-9840	£292	28	P77AAA-9450	£68	30	RA-3000-7327	£860	11
MS-RAP	POA	47	P100CP-111D	£20	31	P28DP-9860	£334	28	P77AAA-9451	£58	30	RA-3003-7126	£1,095	11
MS-VMA1610-1	£469	47	P100DA-66D	£17	31	P35AC-9100	£142	32	P77AAA-9700	£99	30	RA-3003-7127	£1,128	11
MS-VMA1620-1	£513	47	P100DA-67D	£20	31	P35AC-9106	£138	32	P77AAA-9750	£99	30	RA-3003-7226	£1,095	11
MS-ZFR1810-0	£551	48	P100DA-68D	£22	31	P35AC-9200	£176	32	P77AAA-9800	£69	30	RA-3003-7227	£1,128	11
MS-ZFR1811-0	£187	48	P100DA-69D	£22	31	P35AC-9201	£176	32	P77AAA-9850	£69	30	RA-3003-7326	£1,057	11
MS1DR230T-1C	£128	42	P100DA-70D	£19	31	P35AC-9202	£174	32	P77AAW-9300	£72	30	RA-3003-7327	£1,138	11
MS1DR230V-1C	£129	42	P100DA-71D	£22	31	P35AC-9203	£176	32	P77AAW-9350	£65	30	RA-3041-7126	£1,353	11
MS1PM12RT-1C	£109	42	P100DA-72D	£20	31	P35AC-9500	£151	32	P77AAW-9355	£75	30	RA-3041-7226	£1,353	11
MS1PM12RV-1C	£109	42	P100DA-73D	£20	31	P35AC-9501	£183	32	P77AAW-9700	£119	30	RA-3041-7325	£1,374	11
MS1PM230T-1C	£115	42	P100DA-74D	£18	31	P35AC-9505	£155	32	P77AAW-9750	£170				

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RA-3103-7227	£1,138	11	TL-JCIBPP-DVDD6	POA	48	TS-9105-8220	£84	39	V5210MC	£50	4	VA7810-GGC-12	£423	12
RA-3103-7325	£1,215	11	TM-1100-8931	£16	37/38	TS-9105-8230	£79	39	V5210ZC	£28	4	VA7820-GGA-11	£388	12
RA-3103-7326	£1,164	11	TM-1140-0000	£47	38	TS-9105-8250	£119	39	V5290BC	£28	4	VA7820-GGA-12	£397	12
RA-3103-7327	£1,253	11	TM-1150-0000	£62	38	TS-9105-8400	£78	39	V5290CC	£28	4	VA7820-GGC-11	£568	12
RA-3141-7226	£1,289	11	TM-1160-0000	£66	38	TS-9105-8600	£96	39	V5290DC	£28	4	VA7820-GGC-12	£464	12
RA-3141-7325	£1,448	11	TM-1160-0002	£84	38	TS-9105-8700	£79	39	V5290EC	£28	4	VA7830-GGA-11	£397	12
RA-3141-7326	£1,383	11	TM-1160-0005	£66	38	TS-9106-8210	£75	39	V5510BC	£41	4	VA7830-GGA-12	£395	12
RLY13A603R	£143	28	TM-1160-0007	£78	38	TS-9106-8220	£72	39	V5510CC	£41	4	VA7830-GGC-11	£568	12
RLY13A627R	£189	28	TM-1170-0005	£62	38	TS-9106-8230	£79	39	V5510DC	£41	4	VA7830-GGC-12	£464	12
RLY13A635R	£186	28	TM-1170-0007	£70	38	TS-9106-8310	£77	39	V5510EC	£41	4	VA9104-GGA-1S	£159	15
RS-1140-0000	£66	38	TM-1190-0000	£66	38	TS-9106-8320	£75	39	V5510JC	£47	4	VA9104-IGA-1S	£124	15
RS-1160-0000	£95	38	TM-1190-0005	£66	38	TS-9106-8330	£80	39	V5510KC	£47	4	VA9203-AGA-1Z	£209	16
RS-1160-0005	£95	38	TM-2140-0000	£52	38/40	TS-9106-8400	£58	39	V5510MC	£57	4	VA9203-GGA-1Z	£251	16
RS-1180-0000	£125	38	TM-2150-0000	£56	38/40	TS-9106-8600	£85	39	V5590BC	£41	4	VA9203-BGA-1	£147	16
RS-1180-0000	£125	38	TM-2160-0000	£66	38/40	TUC0301-2	£180	47	V5590CC	£41	4	VA9203-BGB-1	£197	16
RS-1180-0002	£164	38	TM-2160-0002	£71	38/40	TUC0311-2	£187	47	V5590DC	£41	4	VA9203-BUA-1	£162	16
RS-1180-0002	£164	38	TM-2160-0005	£60	38/40				V5590EC	£47	4	VA9203-BUB-1	£205	16
RS-1180-0005	£126	38	TM-2160-0007	£65	38/40	V			V5810BC	£37	4	VA9203-GGA-1Z	£236	16
RS-1180-0005	£126	38	TM-2190-0000	£60	38/40	V46AA-9300	£124	18	V5810CC	£37	4	VA9203-GGB-1Z	£271	16
RS-1180-0007	£164	38	TM-2190-0005	£60	38/40	V46AA-9301	£99	18	V5810DC	£37	4	VA9208-AGA-1	£271	16
RS-1180-0007	£164	38	TM-9100-8900	£12	37/38	V46AA-9510	£126	18	V5810EC	£37	4	VA9208-AGC-1	£310	16
RS-1190-0000	£87	38	TM-9100-8901	£22	37	V46AA-9600	£105	18	V5810JC	£41	4	VA9208-BDA-1	£231	16
RS-1190-0005	£87	38	TM-9100-8902	£35	37	V46AA-9602	£137	18	V5810KC	£41	4	VA9208-BDC-1	£271	16
			TM-9100-8902-W	£35	37	V46AA-9606	£140	18	V5810MC	£51	4	VA9208-BGA-1	£211	16
S			TS-9100-8901	£29	39	V46AA-9608	£133	18	VA-7150-1001	£180	11	VA9208-BGC-1	£251	16
SEC002N600	£9	32	TS-9100-8902	£31	39	V46AA-9609	£133	18	VA-7150-1003	£180	11	VA9208-GGA-1	£291	16
SEC002N602	£10	32	TS-9100-8903	£25	39	V46AA-9950	£126	18	VA-7150-8201	£186	11	VA9208-GGC-1	£330	16
SEC002N606	£15	32	TS-9100-8905	£28	39	V46AA-9951	£106	18	VA-7150-8203	£186	11	VG1205AD	£65	15
SEC002N607	£13	32	TS-9100-8907	£23	39	V46AB-9300	£131	18	VA-7152-1001	£279	11	VG1205AE	£65	15
SEC002N616	£9	32	TS-9100-8911	£76	39	V46AB-9510	£131	18	VA-7152-8201	£292	11	VG1205AF	£65	15
SEC002N617	£11	32	TS-9100-8912	£81	39	V46AB-9600	£111	18	VA-7200-1001	£308	12	VG1205AG	£65	15
SEC002N621	£9	32	TS-9100-8913	£55	39	V46AB-9605	£123	18	VA-7200-8201	£262	12	VG1205AL	£65	15
SEC002N622	£15	32	TS-9100-8915	£55	39	V46AB-9950	£118	18	VA-7202-1001	£453	12	VG1205AN	£65	15
SEC002N624	£20	32	TS-9100-8917	£54	39	V46AB-9951	£147	18	VA-7202-8201	£411	12	VG1205BL	£69	15
SEC002N626	£13	32	TS-9100-8921	£76	39	V46AC-9300	£168	18	VA-7480-0001	£92	6	VG1205BN	£69	15
SEC002N627	£16	32	TS-9100-8922	£84	39	V46AC-9510	£129	18	VA-7480-0003	£97	6	VG1205CN	£71	15
SEC002N628	£17	32	TS-9100-8923	£85	39	V46AC-9600	£172	18	VA-7480-0011	£92	6	VG1205CP	£71	15
SEC002N631	£9	32	TS-9100-8927	£78	39	V46AC-9605	£149	18	VA-7480-0013	£97	6	VG1205DP	£130	15
			TS-9100-8950	£17	39	V46AC-9951	£168	18	VA-7481-0001	£92	6	VG1205DR	£130	15
T			TS-9101-8101	£73	39	V46AD-9300	£312	18	VA-7481-0003	£97	6	VG1205ER	£170	15
T90	£12	4	TS-9101-8103	£61	39	V46AD-9510	£372	18	VA-7481-0011	£92	6	VG1205ES	£170	15
TBG16A-600R	£33	32	TS-9101-8104	£73	39	V46AD-9511	£431	18	VA-7481-0013	£97	6	VG1205FS	£230	15
TC-8901-2131-WK	£136	34	TS-9101-8212	£86	39	V46AD-9600	£379	18	VA-7482-0011	£97	6	VG1205FT	£230	15
TC-8901-2132-WK	£89	34	TS-9101-8213	£86	39	V46AE-9300	£415	18	VA-7482-0031	£86	6	VG1205GT	£458	15
TC-8901-2183-WK	£151	34	TS-9101-8214	£86	39	V46AE-9510	£425	18	VA-7482-1001	£97	6	VG1205GU	£458	15
TC-8902-1031-WK	£83	34	TS-9101-8222	£93	39	V46AE-9512	£397	18	VA-7482-2001	£97	6	VG1205HU	£496	15
TC-8902-1032-WK	£93	34	TS-9101-8223	£93	39	V46AE-9600	£432	18	VA-7700-1001	£164	12	VG1205HW	£496	15
TC-8902-2031-WK	£136	34	TS-9101-8224	£93	39	V46AR-9300	£501	18	VA-7700-1003	£144	12	VG1205JV	£573	15
TC-8902-2032-WK	£80	34	TS-9101-8225	£93	39	V46AR-9600	£520	18	VA-7700-8201	£166	12	VG1805AD	£105	15
TC-8903-1131-WK	£151	34	TS-9101-8226	£74	39	V46AS-9300	£922	18	VA-7700-8203	£166	12	VG1805AE	£105	15
TC-8903-1132-WK	£141	34	TS-9101-8227	£92	39	V46AS-9301	£940	18	VA-7706-1001	£332	12	VG1805AF	£105	15
TC-8903-1151-WK	£153	34	TS-9101-8232	£96	39	V46AT-9300	£1,302	18	VA-7706-8201	£277	12	VG1805AG	£105	15
TC-8903-1152-WK	£126	34	TS-9101-8233	£77	39	V46AT-9301	£1,302	18	VA-7740-1001	£206	12	VG1805AL	£105	15
TC-8903-1183-WK	£151	34	TS-9101-8234	£77	39	V47AA-9161	£265	18	VA-7740-1003	£206	12	VG1805AN	£102	15
TC-8904-2131-WK	£97	34	TS-9101-8235	£96	39	V47AB-9160	£325	18	VA-7740-8201	£209	12	VG1805BL	£109	15
TC-8904-2132-WK	£109	34	TS-9101-8252	£93	39	V47AC-9160	£363	18	VA-7740-8203	£209	12	VG1805BN	£105	15
TC-8906-2131-WK	£144	34	TS-9101-8253	£93	39	V47AD-9161	£481	18	VA-7746-1001	£374	12	VG1805CN	£140	15
TC-8906-2132-WK	£130	34	TS-9101-8254	£116	39	V47AD-9160	£383	18	VA-7746-8201	£305	12	VG1805CP	£134	15
TC-8907-1031-WK	£144	34	TS-9101-8322	£116	39	V47AE-9160	£587	18	VA1000-EP	£108	10/11	VG1805DP	£221	15
TC-8907-1032-WK	£132	34	TS-9101-8323	£116	39	V47AE-9161	£706	18	VA1000-M230N	£43	11	VG1805DR	£211	15
TC-8907-2031-WK	£142	34	TS-9101-8324	£93	39	V47AR-9160	£734	18	VA1000-P2	£101	11	VG1805ER	£322	15
TC-8907-2032-WK	£127	34	TS-9101-8333	£118	39	V47AR-9161	£734	18	VA1000-S2	£85	11	VG1805ES	£308	15
TC-8931-2112-W	£85	34	TS-9101-8353	£143	39	V48AB-9510	£282	19	VA1000-SRU	£60	11	VG1805FS	£447	15
TC-8933-1112-W	£143	34	TS-9101-8401	£63	39	V48AB-9600	£282	19	VA1125-GGA-1	£587	11	VG1805FT	£427	15
TC-8936-2112-W	£89	34	TS-9101-8402	£75	39	V48AC-9510	£319	19	VA1220-GGA-1	£744	11	VG1805GT	£821	15
TC-8941-2141-WK	£136	34	TS-9101-8602	£79	39	V48AC-9600	£323	19	VA1420-GGA-1	£743	11	VG1805GU	£821	15
TC-8942-2041-WK	£136	34	TS-9101-8604	£76	39	V48AD-9510	£835	19	VA7810-ADA-11	£272	12	VG1805HU	£840	15
TC-8943-1141-WK	£117	34	TS-9101-8703	£81	39	V48AD-9600	£654	19	VA7810-ADA-12	£288	12	VG1805HW	£840	15
TC-8944-2141-WK	£113	34	TS-9103-8220	£115	39	V48AD-9602	£654	19	VA7810-ADC-11	£356	12	VG1805JV	£878	15
TC-8946-2141-WK	£142	34	TS-9103-8250	£101	39	V48AE-9510	£873	19	VA7810-ADC-12	£356	12	VG6210EC	£23	5
TC-8947-2041-WK	£144	34	TS-9103-8320	£115	39	V48AE-9600	£685	19	VA7810-AGA-11	£271	12	VG6210JC	£31	5
TE-7000-8002	£112	37	TS-9103-8400	£93	39	V48AF-9300	£926	19	VA7810-AGA-12	£271	12	VG6210LC	£51	5
TE-7000-8002-W	£111	37	TS-9103-8600	£63	39	V48BC-9600	£825	19	VA7810-AGC-11	£338	12	VG6510EC	£37	5
TE-7000-8003	£109	37	TS-9103-8700	£77	39	V5210BC	£28	4	VA7810-AGC-12	£338	12	VG6510JC	£44	5
TE-7000-8003-W	£111	37	TS-9104-8220	£59	39	V5210CC	£28	4	VA7810-AGH-11	£338	12	VG6510LC	£83	5
TE-9100-8501	£28	38/39	TS-9104-8230	£56	39	V5210DC	£28	4	VA7810-AGH-12	£338	12	VG6810EC	£26	5
TE-9100-8502	£32	39	TS-9104-8320	£129	39	V5210EC	£28	4	VA7810-GGA-11	£366	12	VG6810JC	£36	5
TE-9100-8502	£27	40	TS-9104-8600	£54	39	V5210JC	£28	4	VA7810-GGA-12	£373	12	VG6810LC	£57	5
TL-JCIBPP-DVDD0	POA	48	TS-9104-8700	£64	40	V5210KC	£31	4	VA7810-GGC-11	£423	12	VG7201AS	£125	8

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VG7201BT	£125	8	VG7804AT	£260	9	VG94E1S1K	£328	10
VG7201CS	£125	8	VG7804BT	£260	9	VG94E1S1L	£349	10
VG7201CT	£125	8	VG7804CT	£260	9	VG94F1S1K	£370	10
VG7201DS	£125	8	VG7804DT	£260	9	VG94F1S1L	£386	10
VG7201DT	£125	8	VG7804ET	£260	9	VG94G1S1K	£481	10
VG7201ES	£125	8	VG7804FT	£260	9	VG94G1S1L	£507	10
VG7201ET	£125	8	VG7804GT	£260	9	VG94H1S1K	£660	10
VG7201FS	£125	8	VG7804LT	£323	9	VG94H1S1L	£692	10
VG7201FT	£125	8	VG7804NT	£349	9	VG94J1S1K	£978	10
VG7201GS	£125	8	VG7804PT	£470	9	VG94J1S1L	£1,030	10
VG7201GT	£125	8	VG7804RT	£621	9	VG98A1S1K	£232	10
VG7201LT	£130	8	VG7804ST	£732	9	VG98A1S1L	£243	10
VG7201NT	£186	8	VG82A1S1N	£427	9	VG98A2S1K	£232	10
VG7201PT	£229	8	VG82A2S1N	£427	9	VG98A2S1L	£243	10
VG7201RT	£353	8	VG82A3S1N	£427	9	VG98A3S1K	£232	10
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VG7203DT	£207	8	VG82A8S1N	£427	9	VG98A5S1L	£243	10
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VG7203FT	£207	8	VG82B1S1N	£433	9	VG98B1S1L	£264	10
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VG7401DS	£150	8	VG88A3S1N	£587	9	VG98H1S1L	£692	10
VG7401DT	£150	8	VG88A4S1N	£587	9	VG98J1S1K	£978	10
VG7401ES	£150	8	VG88A5S1N	£587	9	VG98J1S1L	£1,030	10
VG7401ET	£150	8	VG88A6S1N	£587	9	VP100AAA	£162	4
VG7401FS	£150	8	VG88B1S1N	£590	9	VP100AAE	£162	4
VG7401FT	£150	8	VG88C1S1N	£598	9	VP100AAG	£172	4
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VG7802CT	£165	8	VG94A1S1L	£243	10	Y		
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VG7802DT	£165	8	VG94A2S1L	£243	10			
VG7802ES	£165	8	VG94A3S1K	£232	10			
VG7802ET	£165	8	VG94A3S1L	£243	10			
VG7802FS	£165	8	VG94A4S1K	£232	10			
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VG7802GS	£165	8	VG94A5S1K	£232	10			
VG7802GT	£165	8	VG94A5S1L	£243	10			
VG7802LS	£167	8	VG94B1S1K	£254	10			
VG7802LT	£167	8	VG94B1S1L	£264	10			
VG7802NT	£246	8	VG94C1S1K	£264	10			
VG7802PT	£309	8	VG94C1S1L	£275	10			

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