

CONTROLS, AIR-CONDITIONING, REFRIGERATION & BMS PRODUCTS

The UK Products Catalogue 2015



Take the pressure off ...



talk to **Johnson Controls**

for a complete range of PIC Valves



Axial valves
DN15-20



Axial valves
DN25-32



Rotary action valves
DN40-50



Flanged valves
DN50-150

VP1000 Series

A full selection of thermal, floating & proportional actuators are available.

Pressure Independent Control Valves replace traditional control valves and water pressure balancing sets. They automatically limit the water flow rate, irrespective of pressure and allows the flow to be modulated to match the load.

Please see page 4 for the full range.



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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 & Actuators

VP1000 Series
DN15-32, PN25

These VP1000 pressure independent control valves are 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.



Axial valve DN15-20

NEW



Axial valve DN25-32



Rotary action valve DN40-50

NEW



Flanged valve DN50-150

Following actuators are available:

VP1000 Valves

- VA-707x ON/OFF Thermal Actuators (VP1000)
- VA-709x Thermal 0-10Vdc Proportional Actuators
- VA-748x Floating and Proportional Actuators

VP1000 Ball Valves

- M9108 Rotary Actuators (non-spring)
- VA9208 Rotary Actuators (spring return)

VAP Flanged Valves

- VAPx000 Linear Actuators (non-spring)

FEATURES

- Kvs calculation is 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 Type	Body Size	Flow Rate	Pressure Port	List Price	
Lift & Lay Valve Type – DN15-32 Flow Rate						
VP100AAA	BSP	15mm	150 l/h - 0.042 l/s	■	£179	
VP101AAA				-	£171	
VP100AAE			600 l/h - 0.167 l/s	■	£179	
VP101AAE				-	£171	
VP100AAG			780 l/h - 0.217 l/s	■	£190	
VP101AAG				-	£183	
VP100BAJ		20mm	1000 l/h - 0.278 l/s	■	£202	
VP101BAJ				-	£208	
VP100BAN			1500 l/h - 0.417 l/s	■	£167	
VP101BAN				-	£162	
VP100CAU			25mm	2200 l/h - 0.611 l/s	■	£230
VP100CAW				2700 l/h - 0.750 l/s	■	£248
VP100DAW	32mm	3000 l/h - 0.833 l/s	■	£275		
VP100DAY			■	£282		
Ball Valve Type – DN40-DN55 High Flow Rate						
VP101DBB	Union Female	40mm	6001 l/h - 1.7 l/s	-	£1,035	
VP101EBB				-	£1,035	
VP101EBD			11001 l/h - 3.1 l/s	-	£1,386	
VP101EBC		-		£1,221		
VP101FBD		50mm	12000 l/h - 3.3 l/s	-	£1,188	
VP101FBF				-	£2,140	
VP101GBF	Union Male	55mm	18000 l/h - 5 l/s	-	£2,140	

(continued next column)

Ordering Codes	Connection Type	Body Size	Flow Rate	Pressure Port	List Price
Flange Valve Type – DN50-DN150 High Flow Rate					
VPA050-C	Flange ISO 7005-2	DN50	13 m ³ /h - 3.64 l/s	-	£1,512
VPA065-C		DN65	21 m ³ /h - 5.8 l/s	-	£1,613
VPA080-C		DN80	28 m ³ /h - 7.8 l/s	-	£1,848
VPA100-C		DN100	50 m ³ /h - 13.9 l/s	-	£2,183
VPA125C		DN125	90 m ³ /h - 25 l/s	-	£3,097
VPA150-C		DN150	145 m ³ /h - 40.3 l/s	-	£3,293

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)	£14

Actuators for VPA Valves

VAPx000 Series

1000N and 3000N, Linear Actuator, Proportional Control

These actuators have been specifically designed to drive the VPA pressure independent control valves.

The VAP3000 model provides a display to show functional information and manual override lever.

FEATURES

- Maximum flow rate adjustable from potentiometer
- C32 bit CPU assures high accuracy flow rate
- VAP3000 display shows the percentage of control signal, feedback signal and failure systems
- Force protection system to avoid actuator overload
- Actuators can automatically detect and memorise the valve stroke
- Two different output/input signals: 0(2)-10Vdc, 0(4)-20mA
- Manual override on VAP3000



NEW

Ordering Codes	Torque	Control Signal	Supply Voltage	List Price
VAP1000-24-C	1000N	Proportional	24Vac	£504
VAP3000-24-C	3000N			£840

Supply Voltage – 24V 50/60Hz
Nominal Stroke – DN50-65 20mm
DN80-150 40mm
Protection Class – IP54

VALVE SELECTION GUIDE

Valve Model	DN (mm)	Inch	Flow Rate		Actuator	P Range kPA
			m ³ /h	l/s		
VPA050-C	50	2"	13	3.64	VAP1000-24-C	35-400
VPA065-C	65	2 1/2"	21	5.8		
VPA080-C	80	3"	28	7.8	VAP3000-24-C	
VPA100-C	100	4"	50	13.9		
VPA125-C	125	5"	90	25		
VPA150-C	150	6"	145	40.3		

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-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 Type	Body Size	Kvs (Control)	Kvs (By-pass)	Close-off (kPa)	List Price	
2-way PDTC (Normally Open) Configuration							
V5210ZC	BSP	1/2"	0.16	-	400	£31	
V5210BC			0.4			£31	
V5210CC			0.63			£31	
V5210DC			1			£31	
V5210EC			1.6			£31	
V5210JC		3/4"	2.5	-	110	£31	
V5210KC			3.5			£34	
V5210MC			4.5			£55	
V5290BC		Compression **	1/2"	0.4	-	400	£31
V5290CC				0.63			£31
V5290DC	1			£31			
V5290EC	1.6			£31			
V5810BC	BSP			1/2"			0.4
V5810CC		0.63	0.4		£41		
V5810DC		1	0.63		£41		
V5810EC		1.6	1	£41			
V5810JC		3/4"	2.5	1.6	150	£45	
V5810KC			4	2.5		£45	
V5810MC		1"	5	3.5	110	£56	
3-way Mixing/Diverting with Built-in Bypass Configuration							
V5510BC	BSP	1/2"	0.4	0.3	180	£45	
V5510CC			0.63	0.4		£45	
V5510DC			1	0.63		£45	
V5510EC			1.6	1		£45	
V5510JC			3/4"	2.5		1.6	150
V5510KC		4		2.5	£52		
V5510MC		5		3.5	110	£63	
V5590BC		Compression **	1/2"	0.4	0.3	180	£45
V5590CC				0.63	0.4		£45
V5590DC				1	0.63		£45
V5590EC	1.6			1	£52		

Fluid Temperatures - 2-120°C

Connections - BSP male, female and compression fittings

Note: ** Compression fittings required

Fittings - For V5000 and VG6000 Series

Ordering Codes	Description	Price
P903ST.1	15x1/2" Short Thread Adapters (includes nuts/olives)	£5.56
P903ST.3	22x3/4" Short Thread Adapters " "	£7.96
P903ST.4	22x1" Short Thread (new part) " "	£9.32

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*	Connection Size	Kvs (Control)	Kvs (By-pass)	Close-off (kPa)	List Price
2-way PDTC (Normally Open) Configuration - Male Thread					
VG6210EC	1/2"	1.7	-	250	£25
VG6210JC	3/4"	2.6		150	£34
VG6210LC	1"	4.5		70	£56
3-way Mixing and Diverting Configuration					
VG6810EC	1/2"	1.7 (M), 1.7 (D)	1.2 (M), 1.3 (D)	250	£29
VG6810JC	3/4"	2.5 (M), 2.6 (D)	1.6 (M), 1.8 (D)	150	£40
VG6810LC	1"	4.5 (M), 4.5 (D)	3.1 (M), 4.5 (D)	70	£63
3-way Mixing and Diverting Configuration with built-in bypass					
VG6510EC	1/2"	1.7 (M), 1.7 (D)	1.2 (M), 1.3 (D)	250	£41
VG6510JC	3/4"	2.5 (M), 2.6 (D)	1.6 (M), 1.8 (D)	150	£49
VG6510LC	1"	4.5 (M), 4.5 (D)	3.1 (M), 4.5 (D)	70	£92

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		

Ordering Codes	Description	Price
P163.05	15mm Nuts	£1.52
P165.05	15mm Olives	£0.33
P197.15	1/2" Fibre Washers (quantity 10)	£1.00
P197.25	3/4" Fibre Washers " "	£1.00

Linear Actuators - for Terminal Unit Valves

VA-748x Series

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 †	£101
VA-7481-0011			8 sec/mm			£101
VA-7480-0013	230Vac		13 sec/mm			£107
VA-7481-0013			8 sec/mm			£107
VA-7482-0011	24Vac/dc	Proport.	8 sec/mm			£107
VA-7480-0001	24Vac	Floating	13 sec/mm	-	M30 x 1.5 ††	£101
VA-7481-0001			8 sec/mm			£101
VA-7480-0003	230Vac		13 sec/mm			£107
VA-7481-0003			8 sec/mm			£107
VA-7482-1001	24Vac/dc	Proport.	8 sec/mm	■		£107
VA-7482-2001						£107

Size - 80 x 49 x 79.5mm
 Cable length - 1.5m (standard)
 Max. Fluid Temp. - 90°C
 Protection Class - IP43

† For VG4000 & VG5000 valves
 †† For V5000, VG6000 & VP1000 (DN15 to DN32)
 Extended cable lengths are available for large quantity orders.

VA-707x Series

125N, ON/OFF or DAT Control

The VA-707x series terminal unit valve actuators provide ON/OFF and DAT control in HVAC applications.

These actuators are designed for field mounting onto V5000, VG4000, VG5000 and VG6000 terminal unit valves. Thanks to an innovative fixing system, the VA-707x is suitable for almost all the terminal unit valves in the market.

FEATURES

- Direct or reverse action
- Threaded mounting nut (M28 x 1.5 for VG5000 or M30 x 1.5 for V5000 and VG6000)
- Compact design
- Actuator stroke indicator highly visible



Ordering Codes	Supply Voltage	Mounting	Action Control *	Force	List Price
VA-7070-21	24Vac/dc	M28 x 1.5	Extends (DA)	125N	£46
VA-7070-23	230Vac				£46
VA-7071-21	24Vac/dc		Retracts (RA)		£46
VA-7071-23	230Vac				£46
VA-7077-21	24Vac/dc	M30 x 1.5	Extends (DA)	125N	£46
VA-7077-23	230Vac				£46
VA-7078-21	24Vac/dc		Retracts (RA)		£46
VA-7078-23	230Vac				£46

Stroke - 4.5mm
 Cable - 2m length
 Sizes - 44Ø x 66mm max. NC types, 44Ø x 64mm max. NO types
 Protection class - IP54 (in any mounting position)

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				VA-7482-1001
VXL				
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-7480-0003	VA-7482-1001
	DN25-32	VA-7481-0001	VA-7481-0003	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					VA-7482-2001
TBV-CMP						
KTCM512	DN15-20					

VALVE & ACTUATOR TABLES - Key to colours

- Valves & actuators with M28 x 1.5 fittings
- Valves & actuators with M30 x 1.5 fittings

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	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-3001
93L 1"				
93H 1"				
93L 1 1/4"				
93H 1 1/4"	DN32	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-3001
93L 1 1/4"				

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				
VXP47	DN10-20	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
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	VA-7480-0001 VA-7481-0001	VA-7480-0003 VA-7481-0003	VA-7482-1001
Tri-M Plus	DN15			

Schneider 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	£138		
VG7201AT			-		£138		
VG7201BS		0.4	■		£138		
VG7201BT			-		£138		
VG7201CS		0.63	■		£138		
VG7201CT			-		£138		
VG7201DS		1.0	■		£138		
VG7201DT			-		£138		
VG7201ES		1.6	■		£138		
VG7201ET			-		£138		
VG7201FS		2.5	■		£138		
VG7201FT			-		£138		
VG7201GS		4.0	■		£138		
VG7201GT			-		£138		
VG7201LT		DN20	6.3		-	13mm	£143
VG7201NT		DN25	10		-	13mm	£205
VG7201PT	DN32	16	-	19mm	£252		
VG7201RT	DN40	25	-	19mm	£389		
VG7201ST	DN50	40	-	19mm	£445		
2-way PDTO (Normally Closed) - Female Thread							
VG7401AT	DN15	0.25	-	8mm	£165		
VG7401BS			■		£165		
VG7401BT		0.4	-		£165		
VG7401CS			■		£165		
VG7401CT		0.63	-		£165		
VG7401DS			■		£165		
VG7401DT		1.0	-		£165		
VG7401ES			■		£165		
VG7401ET		1.6	-		£165		
VG7401FS			■		£165		
VG7401FT		2.5	-		£165		
VG7401GS			■		£165		
VG7401GT		4.0	-		£165		
VG7401LS			■		£165		
VG7401LT		DN20	6.3		-	13mm	£168
VG7401NT		DN25	10		-	13mm	£259
VG7401PT	DN32	16	-	19mm	£281		
VG7401RT	DN40	25	-	19mm	£384		
VG7401ST	DN50	40	-	19mm	£486		

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	£228		
VG7203BT		0.4			£228		
VG7203CT		0.63			£228		
VG7203DT		1.0			£228		
VG7203ET		1.6			£228		
VG7203FT		2.5			£228		
VG7203GT		4.0			£228		
VG7203LT		DN20			6.3	-	13mm
VG7203NT	DN25	10	£329				
VG7203PT	DN32	16	£412				
VG7203RT	DN40	25	19mm	£553			
VG7203ST	DN50	40		£739			
2-way PDTO (Normally Closed) - Female Thread							
VG7403AT	DN15	0.25	-	8mm	£214		
VG7403BT		0.4			£214		
VG7403CT		0.63			£214		
VG7403DT		1.0			£214		
VG7403ET		1.6			£214		
VG7403FT		2.5			£214		
VG7403GT		4.0			£228		
VG7403LT		DN20			6.3	-	13mm
VG7403NT	DN25	10	£338				
VG7403PT	DN32	16	£391				
VG7403RT	DN40	25	19mm	£615			
VG7403ST	DN50	40		£730			

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 next page 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	£182		
VG7802AT			-		£182		
VG7802BS		0.4	■		£182		
VG7802BT			-		£182		
VG7802CS		0.63	■		£182		
VG7802CT			-		£182		
VG7802DS		1.0	■		£182		
VG7802DT			-		£182		
VG7802ES		1.6	■		£182		
VG7802ET			-		£182		
VG7802FS		2.5	■		£182		
VG7802FT			-		£182		
VG7802GS		4.0	■		£182		
VG7802GT			-		£182		
VG7802LS		DN20	6.3		■	13mm	£184
VG7802LT					-		£184
VG7802NT	DN25	10	-	19mm	£271		
VG7802PT	DN32	16			£341		
VG7802RT	DN40	25	-	19mm	£461		
VG7802ST	DN50	40			£619		

(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	£287
VG7804BT		0.4			£287
VG7804CT		0.63			£287
VG7804DT		1.0			£287
VG7804ET		1.6			£287
VG7804FT		2.5			£287
VG7804GT		4.0			£287
VG7804LT	DN20	6.3	-	13mm	£356
VG7804NT	DN25	10			£385
VG7804PT	DN25	16			£518
VG7804RT	DN32	25			£685
VG7804ST	DN40	40			£807

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.

VG7000 Series Actuator Selection Table

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

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

- Nodular 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	£471
VG82A8S1N		0.16	£471
VG82A7S1N		0.25	£471
VG82A6S1N		0.4	£471
VG82A5S1N		0.63	£471
VG82A4S1N		1.0	£471
VG82A3S1N		1.6	£471
VG82A2S1N		2.5	£471
VG82A1S1N		4.0	£471
VG82B1S1N		DN20	6.3
VG82C1S1N	DN25	10	£496
VG82D1S1N	DN32	16	£498
VG82E1S1N	DN40	25	£547
VG82F1S1N	DN50	40	£681
VG82G1S1N	DN65	63	£810
VG82H1S1N	DN80	100	£1,020
VG82J1S1N	DN100	160	£1,203
VG82K1S1N	DN125	250	£1,959
VG82L1S1N	DN150	350	£2,614
3-way Mixing Configuration			
VG88A6S1N	DN15	0.4	£647
VG88A5S1N		0.63	£647
VG88A4S1N		1.0	£647
VG88A3S1N		1.6	£647
VG88A2S1N		2.5	£647
VG88A1S1N		4.0	£647

(continued next column)

Ordering Codes*	Body Size	Kvs (Control)	List Price
3-way Mixing Configuration (cont)			
VG88B1S1N	DN20	6.3	£650
VG88C1S1N	DN25	10	£659
VG88D1S1N	DN32	16	£688
VG88E1S1N	DN40	25	£790
VG88F1S1N	DN50	40	£905
VG88G1S1N	DN65	63	£1,082
VG88H1S1N	DN80	100	£1,384
VG88J1S1N	DN100	160	£1,860
VG88K1S1N	DN125	250	£3,016
VG88L1S1N	DN150	350	£3,594
3-way Diverting Configuration			
VG89A6S1N	DN15	0.4	£601
VG89A5S1N		0.63	£601
VG89A4S1N		1.0	£601
VG89A3S1N		1.6	£601
VG89A2S1N		2.5	£601
VG89A1S1N		4.0	£601
VG89B1S1N	DN20	6.3	£603
VG89C1S1N	DN25	10	£744
VG89D1S1N	DN32	16	£662
VG89E1S1N	DN40	25	£876
VG89F1S1N	DN50	40	£981
VG89G1S1N	DN65	63	£1,144
VG89H1S1N	DN80	100	£1,456
VG89J1S1N	DN100	160	£1,987
VG89K1S1N	DN125	250	£3,167
VG89L1S1N	DN150	350	£3,771

ACCESSORY

Ordering Code	Description	Price
VA1000-EP	Extension mounting kit for VP1000 series actuators when fluid temperature >140°C	£119

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.

VG8000N series Actuator Selection Table

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		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.

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	£256
VG94A4S1K		1.0	£256
VG94A3S1K		1.6	£256
VG94A2S1K		2.5	£256
VG94A1S1K		4.0	£256
VG94B1S1K	DN20	6.3	£280
VG94C1S1K	DN25	10	£290
VG94D1S1K	DN32	16	£338
VG94E1S1K	DN40	25	£530
VG94F1S1K	DN50	40	£728
VG94G1S1K	DN65	63	£1,078
VG94H1S1K	DN80	100	£728
VG94J1S1K	DN100	160	£1,078
PN6 - 3-way (Normally Closed) Configuration			
VG98A5S1K	DN15	0.63	£256
VG98A4S1K		1.0	£256
VG98A3S1K		1.6	£256
VG98A2S1K		2.5	£256
VG98A1S1K		4.0	£256
VG98B1S1K	DN20	6.3	£280
VG98C1S1K	DN25	10	£291
VG98D1S1K	DN32	16	£338
VG98E1S1K	DN40	25	£362

Ordering Codes*	Body Size	Kvs (Control)	List Price
PN6 - 3-way (Normally Closed) Configuration (cont)			
VG98F1S1K	DN50	40	£338
VG98G1S1K	DN65	63	£530
VG98H1S1K	DN80	100	£728
VG98J1S1K	DN100	160	£1,078
PN10 - 2-way PDT0 (Normally Closed) Configuration			
VG94A5S1L	DN15	0.63	£268
VG94A4S1L		1.0	£268
VG94A3S1L		1.6	£268
VG94A2S1L		2.5	£268
VG94A1S1L		4.0	£268
VG94B1S1L	DN20	6.3	£291
VG94C1S1L	DN25	10	£303
VG94D1S1L	DN32	16	£355
VG94E1S1L	DN40	25	£385
PN10 - 2-way PDT0 (Normally Closed) Configuration			
VG94F1S1L	DN50	40	£426
VG94G1S1L	DN65	63	£559
VG94H1S1L	DN80	100	£763
VG94J1S1L	DN100	160	£1,136
PN10 - 3-way (Normally Closed) Configuration			
VG98A5S1L	DN15	0.63	£268
VG98A4S1L		1.0	£268
VG98A3S1L		1.6	£268
VG98A2S1L		2.5	£268
VG98A1S1L		4.0	£268
VG98B1S1L	DN20	6.3	£291
VG98C1S1L	DN25	10	£303
VG98D1S1L	DN32	16	£355
VG98E1S1L	DN40	25	£385
VG98F1S1L	DN50	40	£426
VG98G1S1L	DN65	63	£559
VG98H1S1L	DN80	100	£763
VG98J1S1L	DN100	160	£1,136

Note:

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

ACCESSORY

Ordering Code	Description	Price
VA1000-EP	Extension mounting kit for VP1000 series actuators when fluid temperature >140°C	£119

VG9000 Series Actuator Selection Table

PN6, 2-WAY PDT0 - (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)						
	0.63 / 1.0	-	-	-	600	600		
1.6 / 2.5 / 4.0								
6.3								
10	-				-	-	590	600
16								
25	-				-	-	190	480
40								
40	-	-	-	100	290			
63								
63	-	-	-	-	150			
100								
100	510	300	400	-	-			
160	320	180	240	-	-			

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VG9000 Series Actuator Selection Table (cont)

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				-	-	-	600	
DN25	10								
DN32	16								
DN40	25								
DN50	40								
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 PDTO (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				980				
DN20	6.3				640				
DN25	10				400	900			
DN32	16				210	510			
DN40	25				110	310			
DN50	40				470	620	-	160	
DN65	63				510	300		400	-
DN80	100				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				880				
DN20	6.3				430				
DN25	10				240	790			
DN32	16				110	420			
DN40	25				40	240			
DN50	40				470	620	-	120	
DN65	63				510	300		400	-
DN80	100				320	180		240	-

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

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			-	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	-	-	-	£951
RA-3003-7126			-	■	-	£1,207
RA-3041-7126			-	-	■	£1,492
RA-3100-7126			-	-	-	£1,007
RA-3000-7127	230V	1600N	-	-	-	£827
RA-3003-7127			-	■	-	£1,244
RA-3100-7127			-	-	-	£1,007
RA-3103-7127			-	■	-	£1,343
RA-3000-7226	24V	1800N	-	-	-	£910
RA-3003-7226			-	■	-	£1,207

(continued next column)

Ordering Codes	Supply Voltage	Force	Hand Crank	Variations*		List Price
				Y	Z	
RA-3041-7226	24V	1800N	-	-	■	£1,492
RA-3100-7226			-	-	-	£934
RA-3103-7226			-	■	-	£1,165
RA-3141-7226			-	-	■	£1,421
RA-3000-7227	230V	1800N	-	-	-	£827
RA-3003-7227			-	■	-	£1,244
RA-3103-7227			-	■	-	£1,255
RA-3000-7325			-	-	-	£948
RA-3041-7325	24V (60Hz)	3000N	-	■	■	£1,515
RA-3103-7325			-	-	-	£1,340
RA-3141-7325			-	■	■	£1,596
RA-3000-7326	24V (50Hz)	3000N	-	-	-	£948
RA-3003-7326			-	■	-	£1,165
RA-3041-7326			-	-	■	£1,407
RA-3100-7326			-	-	-	£1,055
RA-3103-7326	230V (50Hz)	3000N	-	■	-	£1,283
RA-3141-7326			-	-	■	£1,525
RA-3000-7327			-	-	-	£948
RA-3003-7327	230V (50Hz)	3000N	-	■	-	£1,255
RA-3100-7327			-	-	-	£1,137
RA-3103-7327	-	-	■	■	-	£1,381

* 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 (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	£647
VA1220-GGA-1		2000N	Retracts	£820
VA1420-GGA-1		2000N	Extends	£819

* On power failure

ACCESSORIES (for in-situ installation)

Ordering Codes	Description	Price
VA1000-M230N	230Vac Module	£47
VA1000-P2	2 KΩ feedback potentiometer	£111
VA1000-S2	2 x SPDT auxiliary switches	£94
VA1000-SRU	Split range unit module for proportional actuators only	£66
VA1000-EP	Extension kit for applications with temp. 140-200°C	£119

Nominal Stroke - 49mm

Size - 230 x 136/149 x 263mm

Protection Class - IP66

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

The VA-715 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	£198
VA-7150-1003	230Vac				£198
VA-7150-8201	24Vac		Slotted		£205
VA-7150-8203	230Vac				£205
VA-7152-1001	24Vac	Proportional 0-10V	Threaded		£308
VA-7152-8201			Slotted		£322

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	£340
VA-7202-1001		Proportional		£499

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

(continued next column)

Ordering Codes	Supply Voltage	Action Control	Override		List Price
			Manual	Electrical	
For VG7000 Series Valves					
VA-7700-1001	24Vac	Floating	-	-	£181
VA-7740-1001			■	-	£227
VA-7700-1003	230Vac		-	-	£159
VA-7740-1003			■	-	£227
VA-7706-1001	24Vac	Proportional	-	■	£366
VA-7746-1001			■	■	£412

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	-	-	-	£500		
VA7810-ADC-11				■		£558		
VA7810-AGA-11	-			£382				
VA7810-AGC-11	■			£413				
VA7810-AGH-11	24Vac	ON/OFF, Floating or Proport.*	-	-	■	£413		
VA7810-GGA-11				-	-	£455		
VA7810-GGC-11				■	-	£517		
For VGS8000 / VG8000 / VG9000 Series Valves								
VA7810-ADA-12	230Vac			ON/OFF or Floating	-	-	-	£509
VA7810-ADC-12						■		£565
VA7810-AGA-12	-	£390						
VA7810-AGC-12	■	£413						
VA7810-AGH-12	24Vac	ON/OFF, Floating or Proport.*	-	-	■	£413		
VA7810-GGA-12				-	-	£455		
VA7810-GGC-12				■	-	£517		
For VG7000 Series Valves								
VA7820-GGA-11	24Vac			ON/OFF, Floating or Proport.*	Retracts	-	-	£484
VA7820-GGC-11						■		£625
VA7830-GGA-11		Extends	-		£484			
VA7830-GGC-11			■		£631			

(continued next page)

Ordering Codes	Supply Voltage	Action Control	Spring Return**	2 x Aux. Switches	2 KΩ pot.	List Price
For VGS8000 / VG8000 / VG9000 Series Valves						
VA7820-GGA-12	24Vac	ON/OFF, Floating or Proport.*	Retracts	-	-	£484
VA7820-GGC-12				■		£625
VA7830-GGA-12			Extends	-		£484
VA7830-GGC-12				■		£625

* 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

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	£72
VG1205AE		1.6	£72
VG1205AF		2.5	£72
VG1205AG		4.0	£72
VG1205AL		6.3	£72
VG1205AN		10	£72
VG1205BL		DN20	6.3
VG1205BN	10		£76
VG1205CN	DN25	10	£78
VG1205CP		16	£78
VG1205DP	DN32	16	£143
VG1205DR		25	£143
VG1205ER	DN40	25	£187
VG1205ES		40	£187
VG1205FS	DN50	40	£254
VG1205FT		63	£254
3-way Valves - Female Thread			
VG1805AD	DN15	1.0	£116
VG1805AE		1.6	£116
VG1805AF		2.5	£116
VG1805AG		4.0	£116
VG1805AL		6.3	£116
VG1805AN		10	£112
VG1805BL		DN20	6.3
VG1805BN	10		£116

(continued next column)

Ordering Codes	Body Size	Kvs (Control Port)	List Price
VG1805CN	DN25	10	£154
VG1805CP		16	£148
VG1805DP	DN32	16	£244
VG1805DR		25	£233
VG1805ER	DN40	25	£355
VG1805ES		40	£340
VG1805FS	DN50	40	£493
VG1805FT		63	£471

(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 16 for 'Actuator Selection Tables'.

ACCESSORIES

Ordering Codes	Description	Price
M9000-520-5	Ball valve linkage for M9206-xxx-5S	£33
M9000-525-5	Linkage kit for mounting to M9108 series actuators	£33

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	£505
VG12E5GU		100	£505
VG12E5HU		180	£547
VG12E5HW	DN80	180	£547
VG12E5JV	DN100	150	£632
3-way Valves - Flanged			
VG18E5GT	DN65	40	£905
VG18E5GU		63	£905
VG18E5HU	DN80	63	£926
VG18E5HW		75	£926
VG18E5JV	DN100	75	£968

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

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		-		2 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			-		2 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		-		2 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

Butterfly Valves and Actuators

VFB Series

DN25-500, PN6, PN10 and PN16 Pipe Flanges

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

A variety of electric and pneumatic actuators are available.

Following rotary actuators are available:
VA-9070 (see next column) and M9000 series

FEATURES

- Low seating/unseating torques
- Bubble-tight shut-off
- Fluid temperature -29-+121°C
- Water with 50% max. glycol



Ordering Codes	Close-off Pressure	Body Size	List Price
VFB025H	1000 kPa (High)	DN25	£134
VFB032H		DN32	£137
VFB040H		DN40	£141
VFB050H	1200 kPa (High)	DN50	£144
VFB065H		DN65	£154
VFB080H		DN80	£181
VFB100H		DN100	£218
VFB125H		DN125	£238
VFB150H		DN150	£275
VFB200H		DN200	£369
VFB250H	1000 kPa (High)	DN250	£856
VFB300H		DN300	£1,326
VFB350H		DN350	£2,015
VFB400H		DN400	£2,754
VFB450H		DN450	£3,695
VFB500H	300 kPa (Low)	DN500	£5,038
VFB100L		DN100	£218
VFB125L		DN125	£238
VFB150L		DN150	£275
VFB200L		DN200	£369
VFB250L		DN250	£856
VFB300L		DN300	£1,326
VFB350L		DN350	£2,015
VFB400L		DN400	£2,754
VFB450L		DN450	£3,695
VFB500L	DN500	£5,038	

Fluid Temperature Limits - Water: -29-+121°C

Actuators for VFB Valves

VA-9070 Series

57 to 2034 Nm, Rotary Actuator, ON/OFF, Floating or Proportional Control

The VA-9070 range of actuators are specifically developed for use with VFB butterfly valves.

These bi-directional actuators are direct mounted onto the valve without any linkage.

With a power supply of 24Vac or 230Vac, actuators can be controlled in 2-point, 3-point (floating) or proportional configuration.



FEATURES

- Two isolated auxiliary switches and an electrical heater are standard
- IP65 protection class
- Hand operation is standard
- Exact positioning ensures precise flow control
- Extensive range of power sizes

Ordering Codes	Force	Control Signals	Supply Voltage	List Price
VA-9072-13	57 Nm	Proportional	24Vac	£2,519
VA-9072-23			230Vac	£2,351
VA-9072-14		ON/OFF or Floating	24Vac	£1,679
VA-9072-24	226 Nm	Proportional	230Vac	£1,511
VA-9075-13			24Vac	£4,031
VA-9075-23		ON/OFF or Floating	230Vac	£3,023
VA-9075-14			24Vac	£2,855
VA-9075-24	230Vac	£1,948		
VA-9077-13	565 Nm	Proportional	24Vac	£5,374
VA-9077-14		ON/OFF or Floating		£4,366
VA-9078-23	735 Nm	Proportional	230Vac	£3,695
VA-9078-24		ON/OFF or Floating		£3,359
VA-907A-23	1470 Nm	Proportional	230Vac	£7,726
VA-907A-24		ON/OFF or Floating		£6,382
VA-907B-24	2034 Nm	Proportional	230Vac	£7,726
VA-907B-23		ON/OFF or Floating		£9,405

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

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

Connection - Direct mounting

Protection Class - IP65

ACCESSORIES

Order Codes	Description	Price
M9100-100A	Linkage for M9116 and DN25 to DN40 valves	£67
M9100-100B	Linkage for M9116 & M9124 and DN50 to DN80 valves	£67
M9100-100C	Linkage for M9124 and DN100 low close-off pressure valve	£67
M9200-100A	Linkage for M9220 and Valves from DN25 to DN40	£67
M9200-100B	Linkage for M9220 and Valves from DN50 to DN80	£67
M9200-100C	Linkage for M920 and DN100 low close off pressure valve	£67
VF-998-100	Ten Position manual handle for DN25 to DN40 valves	£43
VF-998-101	" " for DN50 to DN80 valves	£43
VF-998-102	" " for DN100 valve	£43
VF-998-103	" " for DN125 to DN150 valves	£43
VF-998-104	" " for DN200 valve	£77
VF-998-105	" " for DN250 to DN300 valves	£77
VF-998-303	Gear-operated manual hand wheel for DN 50-150 valves	£201
VF-998-304	" " for DN200 valve	£268
VF-998-305	" " for DN 250-300 valves	£278
VF-998-307	" " for DN 350-400 valves	£671
VF-998-308	" " for DN 450-500 valves	£1,006

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	£137
VA9104-GGA-1S	BMD1.2	Proportional			£175

* 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	-	£173
M9108-AGC-5	BAS1.S			■	£205
M9108-ADA-5	BAS2		230Vac	-	£163
M9108-ADC-5	BAS2.S	■		£205	
M9108-GGA-5	BMS1.1	Proportional	24Vac/dc	-	£191
M9108-GGC-5	BMS1.1S			■	£248

(continued next column)

ACCESSORY

Ordering Code	Description	Price
M9000-525-5	Linkage kit for mounting VG1000 series ball valves	£33

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

Running Time - 30 sec.

Auxiliary Switches - SPDT

Size - 180 x 100 x 67.5mm

Protection Class - IP54

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	-	£247
VA9203-GGB-1Z			■	£286
VA9203-AGA-1Z	ON/OFF or Floating		-	£217
VA9203-AGB-1Z			■	£265
VA9203-BGA-1	ON/OFF	24Vac/dc	-	£149
VA9203-BGB-1			■	£205
VA9203-BUA-1		100-240Vac	-	£166
VA9203-BUB-1			■	£213

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

(continued next page)

Ordering Codes	Control Signals	Supply Voltage	2 x Aux. Switches	List Price
8 Nm Actuators				
VA9208-GGA-1	Proportional	24Vac/dc	-	£321
VA9208-GGC-1			■	£364
VA9208-AGA-1	ON/OFF or Floating	24Vac/dc	-	£299
VA9208-AGC-1			■	£342
VA9208-BGA-1	ON/OFF	24Vac/dc	-	£233
VA9208-BGC-1			■	£277
VA9208-BDA-1		100-240Vac	-	£255
VA9208-BDC-1			■	£299

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	£999
M9000-560	Ball Valve Linkage Kit for applying M9203 and M9208 series actuators to VG1000 servives valves	£18
M9000-561	Thermal Barrier extends M/VA9104, M/VA9203, and M/VA9208 series actuators	£23
M9000-341	Weathershield Kit for VG1000 ball valves of M/VA9104, M/VA9203, and M/VA9208 actuators	£324
M9000-607	Position indicator for VG1000 valve applications (5 off)	£14

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

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



(continued next column)

Ordering Codes		Control Signals	Supply Voltage	Connection	List Price
Johnson Contr.	Joventa				
2 Nm Actuators					
M9102-AGA-1S	DAB1.4	Floating	24Vac	Cable	£79
M9102-AGA-5S	DAB1.4C			Terminal	£69
M9102-IGA-1S	DAB1	ON/OFF or Floating*	24Vac	Cable	£86
M9102-IGA-5S	DAB1C			Terminal	£92
4 Nm Actuators					
M9104-AGA-1S	DAD1.4	Floating	24Vac	Cable	£78
M9104-AGA-5S	DAD1.4C			Terminal	£74
M9104-IGA-1S	DAD1	ON/OFF or Floating*	24Vac	Cable	£86
M9104-IGA-5S	DAD1C			Terminal	£92
M9104-GGA-1S	DMD1.2	Proportional	24Vac	Cable	£148
M9104-GGA-5S	DMD1.2C			Terminal	£152

Supply Voltage - 24Vac, 50/60Hz
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)

* With timeout

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	-	£132
M9304-AGC-1N	DAN1.SN		■	£158	
M9304-ADA-1N	DAN2N	ON/OFF or Floating	230Vac	-	£136
M9304-ADC-1N	DAN2.SN		■	£161	
M9304-AKA-1N	DAN5N	48Vdc	-	£109	
M9304-GGA-1N	DMN1.2N	Proportional	24Vac/dc	-	£194

* 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
Damper Size - 0.8 m²
Size - 85 x 65 x 166mm
Protection Class - IP42

ACCESSORY

Ordering Codes	Description	Price
M9000-Z01DN	Adapter Kit for 8, 10, 11 and 12mm square shaft	£66

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	-	-	£132	
M9108-AGC-1N	DAS1.S			■	£202		
M9108-AGE-1N	DAS1.P1			1 kΩ	£211		
M9108-AGD-1N	DAS1.P2			140 Ω	£214		
M9108-AGF-1N	DAS1.P4			2 KΩ	£174		
M9108-ADA-1N	DAS2			-	£161		
M9108-ADC-1N	DAS2.S		■	£202			
M9108-ADE-1N	DAS2.P1		230Vac	1 KΩ	£174		
M9108-ADD-1N	DAS2.P2			140 Ω	£174		
M9108-ADF-1N	DAS2.P4			2 KΩ	£174		
M9108-GGA-1N	DMS1.1			Proport.	24V ac/dc	-	£176
M9108-GGC-1N	DMS1.1S					■	£215
M9108-GDA-1N	DMS2.2	Proport. 0(2)-10Vdc		230Vac	-	£239	
M9108-GDC-1N	DMS2.2S		■		£257		
M9108-GDA-1N1	DMS2.5	Proport. 0(4)-20mA	230Vac	-	£239		
M9108-GDC-1N1	DMS2.5S			■	£257		
16 Nm Actuators							
M9116-AGA-1N	DA1	ON/OFF or Floating	24V ac/dc	-	-	£153	
M9116-AGC-1N	DA1.S			■	£176		
M9116-AGE-1N	DA1.P1			1 kΩ	£225		
M9116-AGD-1N	DA1.P2			140 Ω	£228		
M9116-AGF-1N	DA1.P4			2 KΩ	£228		
M9116-ADA-1N	DA2			-	£168		
M9116-ADC-1N	DA2.S		■	£208			
M9116-ADE-1N	DA2.P1		230V	1 kΩ	£234		
M9116-ADD-1N	DA2.P2			140 Ω	£203		
M9116-ADF-1N	DA2.P4			2 KΩ	£238		
M9116-GGA-1N	DM1.1			Proport.	24V ac/dc	-	£223
M9116-GGC-1N	DM1.1S					■	£254
M9116-GDA-1N	DM2.2	Proport. 0(2)-10Vdc		230Vac	-	£244	
M9116-GDC-1N	DM2.2S		■		£280		
M9116-GDA-1N1	DM2.5	Proport. 0(4)-20mA	230Vac	-	£244		
M9116-GDC-1N1	DM2.5S			■	£280		

(continued next column)

Ordering Codes		Control Signals	Supply Voltage	Feedback Potentio.	2 x Aux. Switches	List Price	
Johnson Contr.	Joventa*						
24 Nm Actuators							
M9124-AGA-1N	DAL1	ON/OFF or Floating	24V ac/dc	-	-	£293	
M9124-AGC-1N	DAL1.S			■	£331		
M9124-AGE-1N	DAL1.P1			1 kΩ	£354		
M9124-AGD-1N	DAL1.P2			140 Ω	£354		
M9124-AGF-1N	DAL1.P4			2 KΩ	£354		
M9124-ADA-1N	DAL2			-	£303		
M9124-ADC-1N	DAL2.S		■	£344			
M9124-ADE-1N	DAL2.P1		230Vac	1 KΩ	£364		
M9124-ADD-1N	DAL2.P2			140 Ω	£364		
M9124-ADF-1N	DAL2.P4			2 KΩ	£364		
M9124-GGA-1N	DML1.1			Proport.	24V ac/dc	-	£310
M9124-GGC-1N	DML1.1S					■	£346
M9124-GDA-1N	DML2.2	Proport. 0(2)-10Vdc		230Vac	-	£318	
M9124-GDC-1N	DML2.2S		■		£351		
M9124-GDA-1N1	DML2.5	Proport. 0(4)-20mA	230Vac	-	£318		
M9124-GDC-1N1	DML2.5S			■	£351		
32 Nm Actuators							
M9132-AGA-1N	DAG1	ON/OFF or Floating	24V ac/dc	-	-	£258	
M9132-AGC-1N	DAG1.S			■	£271		
M9132-AGE-1N	DAG1.P1			1 kΩ	£354		
M9132-AGD-1N	DAG1.P2			140 Ω	£354		
M9132-AGF-1N	DAG1.P4			2 KΩ	£354		
M9132-ADA-1N	DAG2			-	£354		
M9132-ADC-1N	DAG2.S		■	£277			
M9132-ADE-1N	DAG2.P1		230Vac	1 KΩ	£364		
M9132-ADD-1N	DAG2.P2			140 Ω	£364		
M9132-ADF-1N	DAG2.P4			2 KΩ	£364		
M9132-GGA-1N	DMG1.1			Proport. **	24V ac/dc	-	£355
M9132-GGC-1N	DMG1.1S					■	£378

* 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

(continued next page)

Ordering Codes	Control Signals	Supply Voltage	1 x Aux. Switch	Running Time	List Price
3 Nm Actuators					
M9203-GGA-1Z	Proportional	24Vac/dc	-	90 sec	£247
M9203-GGB-1Z			■		£286
M9203-GGA-1			-	150 sec	£239
M9203-GGB-1			■		£277
M9203-AGA-1Z	ON/OFF or Floating	24Vac/dc	-	90 sec	£217
M9203-AGB-1Z			■		£265
M9203-AGA-1			-	150 sec	£209
M9203-AGB-1			■		£256
M9203-BGA-1	ON/OFF	24Vac/dc	-	60 sec	£149
M9203-BGB-1			■		£205
M9203-BUA-1			-	100-240Vac	£166
M9203-BUB-1			■		£213
M9203-BUA-1Z		-	27 sec		£175
M9203-BUB-1Z		■			£222

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	£74
M9000-153	Crank Arm	£1
M9000-170	Remote Mounting Kit, Horizontal - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£79
M9000-171	Remote Mounting Kit, Vertical - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£79
M9000-200	Commissioning Tool - provides control signal to drive 24V floating, floating, proportional and/or resistive electric actuators	£999
M9000-604	Anti-rotation Bracket Kit (with screws) - for M9220-xxx-3 series actuators	£17
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	£13
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	£15
M9220-602	Locking Clips for M9220-xxx-3 series actuators (5 per bag)	£8
M9220-603	Adjustable Stop Kit - for M9220-xxx-3 series spring return actuators	£12
M9220-610	Shaft Gripper - 10mm square shaft with locking clip	£10
M9220-612	Shaft Gripper - 12mm square shaft with locking clip	£9
M9220-614	Shaft Gripper - 14mm square shaft with locking clip	£10

* 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 (17-25s)	£300
M9208-AGC-1	DBF1.08SN		■			£345
M9208-BGA-1	DAF1.08N	ON/OFF	-	24Vac/dc	55-71s (13-26s)	£230
M9208-BGC-1	DAF1.08SN		■			£277
M9208-BDA-1	DAF2.08N		-	230Vac	55-71s (13-26s)	£254
M9208-BDC-1	DAF2.08SN		■			£300
M9208-GGA-1	DMF1.08N	Proport.**	-	24Vac/dc	150s (17-25s)	£322
M9208-GGC-1	DMF1.08SN		■			£368

* 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	£18
M9208-100	Remote Mounting Kit, including mounting bracket, M9208-150 crankarm, ball joint and mounting fastener	£26
M9208-150	Crankarm	£26
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	£26
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	£26
M9208-602	Replacement Locking Clips for M9208-xxx-1 series actuators (quantity 5)	£26
M9208-603	Adjustable Stop Kit for M9208-xxx-1 series actuators	£26
M9208-604	Replacement Manual Override Cranks for M9208 series electric actuators with long crank radius: 72mm (quantity 5)	£26
M9208-605	Replacement Manual Override Cranks for M9208 series actuators with short crank radius: 46.5mm (quantity 5)	£26

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 (20s)	£356
M9220-AGC-1	DBF1.20S			■		£408
M9220-BDA-1	DAF2.20	ON/OFF	230Vac	-	25-57s (11-15s)	£319
M9220-BDC-1	DAF2.20S			■		£376
M9220-BGA-1	DAF1.20			-		£286
M9220-BGC-1	DAF1.20S			■		£341
M9220-GGA-1	DMF1.20	Proport.	24V ac/dc	-	150s (26s)	£366
M9220-GGC-1	DMF1.20S			■		£406
M9220-HGA-1	DHF1.20	Proport. **	24V ac/dc	-		£376
M9220-HGC-1	DHF1.20S			■		£406

* 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	£74
M9000-153	Crank Arm	£1
M9000-170	Remote Mounting Kit, Horizontal - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£79
M9000-171	Remote Mounting Kit, Vertical - includes mounting bracket, M9000-153 crank arm, ball joint and mounting bolts	£79
M9000-200	Commissioning Tool - provides control signal to drive 24V floating, floating, proportional and/or resistive electric actuators	£999
M9000-604	Anti-rotation Bracket Kit (with screws) - for M9220-xxx-3 series actuators	£17
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	£13
M9220-602	Locking Clips for M9220-xxx-3 series actuators (5 per bag)	£8
M9220-603	Adjustable Stop Kit - for M9220-xxx-3 series spring return actuators	£12
M9220-605	Ball Joint for M8x1.25 threaded rod, M8x1.25 x 16.5mm thread mount	£42
M9220-610	Shaft Gripper - 10mm square shaft with locking clip	£10
M9220-612	Shaft Gripper - 12mm square shaft with locking clip	£9

* 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	£211
M9108-AGC-1N4	SA1.12S		■			£249
M9108-AGE-1N4	SA1.12P1			1 kΩ	230Vac	£265
M9108-AGD-1N4	SA1.12P2			140 Ω		£265
M9108-AGF-1N4	SA1.12P4			2 KΩ		£265
M9108-ADA-1N4	SA2.12			-		£226
M9108-ADC-1N4	SA2.12S		■		£281	
M9108-ADE-1N4	SA2.12P1			1 kΩ	24V ac/dc	£281
M9108-ADD-1N4	SA2.12P2			140 Ω		£281
M9108-ADF-1N4	SA2.12P4			2 kΩ		£281
M9108-GGA-1N4	SM1.12	Proport.	-	24V ac/dc		£301
M9108-GGC-1N4	SM1.12S		■			£340
16 Nm Actuators						
M9116-AGA-1N4	SA1.10	ON/OFF or Floating	-	-	24V ac/dc	£211
M9116-AGC-1N4	SA1.10S		■			£229
M9116-AGE-1N4	SA1.10P1			1 kΩ	230Vac	£265
M9116-AGD-1N4	SA1.10P2			140 Ω		£265
M9116-AGF-1N4	SA1.10P4			2 KΩ		£265
M9116-ADA-1N4	SA2.10			-		£226
M9116-ADC-1N4	SA2.10S		■		£281	
M9116-ADE-1N4	SA2.10P1			1 kΩ	24V ac/dc	£281
M9116-ADD-1N4	SA2.10P2			140 Ω		£281
M9116-ADF-1N4	SA2.10P4			2 KΩ		£281
M9116-GGA-1N4	SM1.10	Proport.	-	24V ac/dc		£301
M9116-GGC-1N4	SM1.10S		■			£359

*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	-	£266
M9108-GAC-1.01	SMS4.5S			■	£336

* 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

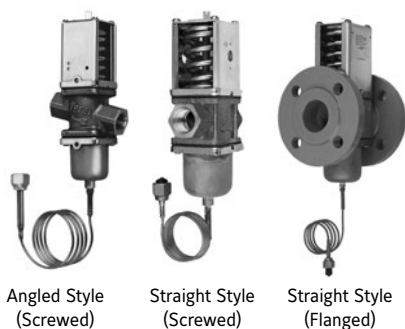
Modulating Water Valves

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

(continued next column)

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	-	£116		
V46AA-9608*					A	£147		
V46AA-9602*				B, C	£151			
V46AA-9950				B, D	£139			
V46AA-9951*				E, D	£117			
V46AB-9600		1/2"	34	75	-	£122		
V46AB-9950					D, F	£130		
V46AC-9600		3/4"	13	34	-	£190		
V46AC-9951					D	£185		
V46AA-9300		5-23	3/8"	5	-	-	£137	
V46AA-9301*	B, G, A					£109		
V46AA-9606	B, G				£154			
V46AA-9609*	B, G, A				£147			
V46AA-9510	G				£139			
V46AB-9300	1/2"		5	-	-	£144		
V46AB-9605					B, G	£136		
V46AB-9951					D, G	£162		
V46AB-9510					G	£144		
V46AC-9300					-	£185		
V46AC-9605	3/4"	13	50	75	B, G	£164		
V46AC-9510					G	£142		
Straight Style - Screwed (ISO 7-RC)								
V46AD-9300	5-18	1"	5	-	-	£344		
V46AD-9510						50	75	£410
V46AD-9600				13		75	£418	
V46AE-9300		1 1/4"	5	-	-	£458		
V46AE-9510						50	75	£469
V46AE-9600						13	75	£476
V46AD-9511	10-23	1"	50	75	G	£475		
V46AE-9512						1 1/4"	75	£438
Straight Style - Flanged (DIN 2533)								
V46AR-9300	5-18	1 1/2"	5	-	-	£552		
V46AR-9600						13	75	£573
V46AS-9300	5-11.5	2"	5	-	-	£1,017		
V46AS-9301	11-18					£1,036		
V46AT-9300	5-11.5	2 1/2"	5	-	-	£1,435		
V46AT-9301	11-18					£1,435		

† See page 49 for 'Style' references

* Bulk packs on request

ACCESSORY

Ordering Code	Description	Price
KIT031N600	Kit for changing Style 13 into Style 45A	£105

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



Angled Style (Screwed)



Straight Style (Screwed)



Straight Style (Flanged)

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)	£292
V47AB-9160	24-57	1/2"			£358
V47AC-9160		3/4"			£400
Straight Valves - Screwed (ISO 7-RC)					
V47AD-9160	24-57	1"	1.8 m armoured	Style 4 (152mm)	£530
V47AD-9161	46-82				£422
V47AE-9160	24-57	1 1/4"			£647
V47AE-9161	46-82		£778		
Straight Valves - Flanged (DIN 2533)					
V47AR-9160	24-57	1 1/2"	1.8 m armoured	Style 4 (152mm)	£809
V47AR-9161	46-82				£809

† See page 49 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



(continued next column)

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	-	£311
V48AB-9600		4-16	13			£311
V48AC-9510	3/4"	4-20	50			£352
V48AC-9600		4-16	13			£356
Straight Valves - Screwed (ISO 7-RC)						
V48AD-9510	1"	6-20	50	750	-	£921
V48AD-9600		4-16	13			£721
V48AD-9602						A
V48AE-9510	1 1/4"	6-20	50		-	
V48AE-9600		4-16	13	£755		
Maritime Type (ISO 228)						
V48BC-9600	3/4"	4-16	13	750	B	£910
Commercial Type (ISO 228)						
V48AF-9300	1 1/2"	6-14	5	-	C	£1,021

† See page 49 for 'Style' references

Notes:

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

B = Seawater resistant

C = Commercial type

Gas Valves

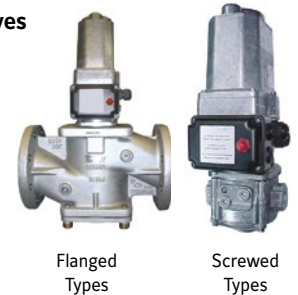
GH-5000 Series

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	£999
GH-5629-3611	2 1/2"				£1,649
GH-5629-4611	3"				£1,688
GH-5729-5610	4"	800	≤13 sec.	36mm	£2,107
GH-5729-6610	5"	650			£2,330
GH-5729-7610	6"	350			£2,954
Screwed Connections with Closed Position Indicator					
GH-5119-5610	1 1/2"	800	≤13 sec.	36mm	£1,203
GH-5219-6610	2"	650			£1,051
GH-5619-7611	2 1/2"	350			£1,472

Power Supply - 230Vac, 50/60Hz

Compression Fitting - EN 50262

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

Protection Class - IP54 (NEMA 1)

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	£189
F61SD-9150	0.04-0.07 l/s	1/2 -14 NPTF	T-body	£185
F61SD-9175		3/4 -14 NPTF		£189
IP67 Types				
F61TB-9100	0.15-46 l/s	R1" DIN2999 (ISO R7)	B	£226
F61TB-9200			C	£477
F61TD-9150	0.04-0.07 dm ³ /s	1/2 -14 NPTF	T-body	£221

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	£12

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	£137

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	£8
PLT112-2R	Air Flow Paddle - 80 x 175mm	£7

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	£268
F63BT-9102		B	£295
F63BT-9200	R1" DIN2999 (ISO R7)	C	£578

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	£52

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	-	£54
A19AAC-9009	40-120	3.5		2m (100mm)	OH	-	£47
Capillary Thermostat, Lock-out Low with Manual Reset - IP30							
A19ACC-9100	-35-+10	6	1b	2m (110mm)	OL	-	£107
A19ACC-9101	-5-+28	4		2m (135mm)		-	£77
Capillary Thermostats - IP65							
A19AQC-9101	-5-+5	2	1a	2m (80mm)	OL	A	£148
A19AQC-9102	-5-+28		1b	2m (135mm)		B	£124
A19AQC-9200	-5-+55	2.5	2	-	-	-	£144

* Auto recycle, SPDT, 8A

** Fixed

† See page 49 for 'Style' references

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.

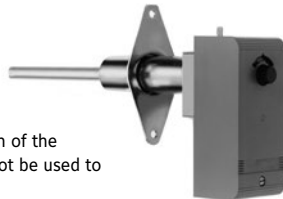
B = 8A switch, calibrated and set at 2°C, case compensation, pointer adjust, PG16 connect, 1/2" - 14NPT WELL connector.

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	£179

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	1b	1-4	2m (110mm)	OL	A	£182	
A28AA-9007	-5-+28	1.5			2m (135mm)			£165	
A28AA-9106	0-43	1.5	3	-	OH	A, B	£200		
A28AA-9118	1-60	2	1b	3m (115mm)			A, C	£175	
IP65 Thermostats									
A28QA-9101	5-50	2	4	1b	2m (110mm)	OL	-	D, E	£312
A28QA-9110	-35-+10				2m (135mm)			£203	
A28QA-9111	-5-+28	1.5	1-4	3	2m (135mm)	-	-	£215	
A28QA-9114	-35-+40	2			3.5m (110mm)			£241	
A28QA-9113	0-43	1.5	1b	-	OH	-	B	£255	
A28QA-9115	1-60	2	3m (115mm)	£204					
A28QA-9117	20-40	1.5	1-5	3	-	B	£258		
A28QJ-9100	0-95			1b			3m (100mm)	OL	F

Notes:

† See page 49 for 'Styles and Wiring Diagrams'

A = General purpose

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	£25
KIT012N600	Capillary Brackets (6 pieces)	£15
WEL003N602R	Bulb Well, max. pressure 70 bar, temp. 370 °C	£135

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	£329
A36AGA-9102			3.5m (125mm)			£300
A36AGA-9103	15-35	C1	3.5m (140mm)			£263
A36AGB-9103	-18-+20	B2	3.5m (125mm)	3A		£273
4-Stage Thermostats						
A36AHA-9105	-18-+20	B1	3.5m (125mm)	5A	A	£293
A36AHA-9107	-16-+20		5m (125mm)			£368
A36AHA-9108	15-35	C1	3.5m (140mm)			£344
A36AHB-9103	10-95	D2	3m (100mm)	3A	B	£348
A36AHB-9104	-18-+20	B2	3.5m (125mm)		A	£344
A36AHB-9105			5m (125mm)		C	£494
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.

Ordering Codes	Range (°C)	Diff. (K) Fixed	† Style	Capillary	Bulb	List Price
Automatic Recycle						
270XT-95008	-10-+12	3	9	-	3.2 x 6000mm	£185
270XT-95078					3.2 x 3000mm	£171
270XT-95068	-24-+18	4	1	2m	9.5 x 80mm	£169
Trip-free Manual Reset						
270XTAN-95008	-10-+12	-	9	-	3.2 x 6000mm	£194
270XTAN-95088					3.2 x 3000mm	£180
270XTAN-95048	-24-+18		1 (bulb)	2m	9.5 x 80mm	£178

† See page 49 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	£25
KIT012N600	Capillary Brackets (6 pieces)	£15
WEL003N602R	Bulb Well, max. pressure 70 bar, temp. 370°C	£135

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,	-	-	-	£272
DP2500-R8-AZ	0-250 Pa, 0-500 Pa,	■	-	-	£356
DP2500-R8-D	0-1000 Pa, 0-1500 Pa,	-	■	-	£329
DP2500-R8-AZ-D	0-2000 Pa, 0-2500 Pa	■	■	-	£411
DP0250-R8-AZ	0-100 Pa, 0-250 Pa	■	-	-	£356
DP0250-R8-AZ-D		■	■	-	£411
DP0100-AZ		■	-	-	£356
DP0100-AZ-D	-50-+50 Pa,	■	■	-	£411
DP0100-AZ-SP	-100-+100 Pa	■	-	■	£412
DP0100-AZ-D-SP		■	■	■	£491

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	£447
PT-5217-7101	0-1000 kPa	2000 kPa		£447

Supply Voltage - 24Vac ±15%/-10%, 50/60Hz or 13.5-33Vdc, max. 5 mA
 Mounting - Direct mounting, 1.5m cable included
 Size - 86 x 40mmØ
 Protection Class - IP65

(continued next column)

ACCESSORIES

Ordering Codes	Description	Price
EQ-6056-7000	Mounting Kit for plastic hose 4 x 6mm	£85
EQ-0100-7001	Mounting Kit for DIN-rail	£39

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	£41

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.

(continued next page)

Ordering Codes	Switch Point Range (mbar)	Switching Differential (mbar)*	Notes	List Price
P233F-P3-AAC	0.3 fixed	< 0.3	-	£49
P233A-4-AAC	0.5-4		-	£50
P233A-4-AHC			A	£51
P233A-4-PAC	50-400 Pa		-	£50
P233A-4-PHC			A, B	£47
P233A-4-PKC			B, C	£61
P233A-4-AKC	0.5-4		C	£49
P233A-10-AAC	1.4-10		-	£40
P233A-10-AHC			A	£61
P233A-10-PAC	140-1000 Pa		-	£44
P233A-10-PKC		B, C	£61	
P233A-10-AKC		C	£49	
P233A-50-AAC	6-50	< 1	C	£40
P233A-10-PHC	140-1000 Pa	< 0.5	A, B	£49

* 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	£325		
P28DA-9660		13	90		-	£338		
Voltage 230								
P28DJ-9360	0.6-4.8	5	90	non-corr.	B	£529		
P28DJ-9861		15		NH3	B, D	£518		
P28DP-9300		5	-	-	-	C	£251	
P28DP-9340						50	£289	
P28DP-9360						90	£289	
P28DP-9380						120	£260	
P28DP-9381			non-corr.	-	-	-	E, F	£347
P28DP-9640							50	£269
P28DP-9660							90	£269
P28DP-9680							120	£279
P28DP-9840		13	50	-	-	£322		
P28DP-9860		15	90			NH3	H	£368

(continued next column)

Ordering Codes	Range (bar)	† Style	Time Delay (s)	Refrigerant	Notes	List Price
Voltage 115/230						
P28DN-9750	-	15	50	NH3	E, G, H	£398

† See page 49 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 DELAYS

Ordering Codes	Timing (s)	Voltage	Switch Action	List Price
RLY13A603R	90	120/240	Manual reset, dual voltage (AC)	£158
RLY13A627R	120	24	Manual reset, 24Vac/dc	£208
RLY13A635R	90			£205

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	£276
P45NBB-9381B			120		£258
P45NBB-9640C		0.7	50	13	£234
P45NBB-9660C			90		£235
P45NBB-9660Q		1.8	90	£309	
P45NBB-9680C		0.7	120	£234	
Voltage 115/230					
P45NCA-9056	0.5-4	0.45	50	13	£287
P45NCA-9104		0.7	120		£280

Switch Action - Open low, alarm and safe light contacts

Switch Rating - 15(8)A, 230Vac

Size - 83 x 144 x 58mm

† See page 49 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	-	£214	
P74DA-9600			13			£222	
P74EA-9300		0.3 fixed	15	5	SPDT, 5A, contact Open High	A	£204
P74EA-9600				13			
P74EA-9700							A, B, C
P74EA-9701	0-1	0.1 fixed	15	SPDT, 3A, contact Open High	D	£319	
P74FA-9701	2-8	0.7 fixed				A	£452

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

† See page 49 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).



(continued next column)

Ordering Codes	Range (bar)	Differential (bar)	† Style	Notes	List Price
P48AAA-9110	0-1	0.16-0.55	29a	A	£165
P48AAA-9120	0.2-4	0.25-0.8			£114
P48AAA-9130	-0.2-+10	1-4.5			£114
P48AAA-9140	1-16	1.3-2.5			£114
P48AAA-9150	3-30	3-12		A, B	£141
P48BEA-9140*	4-16	-		C	£155

* Quantity orders only

† See page 49 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	***	£76
P735AAA-9201	-0.5-+7	0.5-3		22		£75
For Non-corrosive Refrigerants (Alerter, safety pressure limiter)						
P735AAA-9300	-0.5-+7	0.5-3	1	22	5	£57
P735AAA-9400				30	£58	
P735AAA-9301				-0.2-+10	1-4.5	15
P735AAA-9350	3-30	3-12	2	33	5	£55
P735AAA-9351	3.5-21	2.1-5.5		30		£60
P735BCA-9300	-0.5-+7	Man. res.**	1	22	5	£57
P735BEA-9350	3-30	Man. res.*	3	33		£56
For Non-corrosive Refrigerants						
P735AAW-9300	-0.5-+7	0.6 to 3	1	20	5	£60
P735AAW-9350	3-30	3.5 to 12	2	33		£53
P735AAW-9850				28	£77	
P735BCB-9300	-0.5-+7	Man. res.**	1	20	5	£60
P735BEB-9350	3-30	Man. res.*	3	33		£56
P735BEB-9850	3-30	Man. res.*	3	33	28	£77

Notes:

† See page 49 for 'Style' reference

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

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	£85
P736LCA-9400				30	£96	
P736MCA-9300				Man. Res.**	5	£87
P736PGA-9300				Man. Res.*	5	£92
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	£87
For Non-corrosive Refrigerants (LP: 22 bar, HP: 33 bar max.)						
P736LCW-9300	-0.5-+7	0.6-3	3-30	3 (fixed)	5	£96
P736LCW-9800				28	£103	
P736MCB-9300				Man. Res.**	5	£103
P736MCS-9300				Man. Res.*	5	£96
P736PGB-9300				Man. Res.*	5	£101
Manual Reset, Safety Pressure Limiter (HP/HP: 30 bar max.)						
P736PLM-9370	3-30	Man. Res.**	3-30	Man. Res.**	5	£105

† See page 49 for 'Styles and Wiring Diagrams'

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

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

(continued next column)

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	1	5	non-corr.	-	£64
P77AAA-9301	-0.2-+10	1-4.5					£65
P77AAA-9302	-0.3-+2	0.4-1.5	2	30	-	A	£65
P77AAA-9350	3-30	3-12					£64
P77AAA-9351	3.5-21	2-5.5	2	15	NH3	-	£63
P77AAA-9400	-0.5-+7	0.5-3					£75
P77AAA-9450	3-30	3-12	2	28	non-corr.	B	£75
P77AAA-9451	3.5-21	2-5.5					£64
P77AAA-9700	-0.5-+7	0.5-3	1	5	non-corr.	-	£109
P77AAA-9750	3-30	3-12					£109
P77AAA-9800	-0.5-+7	0.5-3	2	15	NH3	-	£76
P77AAA-9850	3-30	3-12					£76
Automatic Recycle (Alerter, including lockplate assembly)							
P77AAW-9300	-0.5-+7	0.5-3	1	-	non-corr.	-	£79
P77AAW-9350	3-30	3.5-12	2	5	non-corr.	-	£72
P77AAW-9355	3-42	4-12					£83
P77AAW-9700	-0.5-+7	0.5-3	1	15	NH3	-	£131
P77AAW-9750	3-30	3.5-12	2	28	non-corr.	B	£187
P77AAW-9800	-0.5-+7	0.5-3	1				£79
P77AAW-9850	3-30	3.5-12	2	15	NH3	-	£96
P77AAW-9855	3-42	4-12					£100
Manual Reset (LP)							
P77BCA-9300	-0.5-+7	-	1	5	non-corr.	-	£72
P77BCA-9400				30	corr.	A	£86
P77BCA-9700				15	NH3	-	£119
P77BCB-9300	-	-	-	5	non-corr.	-	£88
P77BCB-9800				28	corr.	B	£89
Manual Reset (HP)							
P77BEA-9350	3-30	-	3	5	non-corr.	-	£63
P77BEA-9450				30	corr.	A	£82
P77BEA-9750				15	NH3	-	£120
Limiters, including lockplate assembly							
P77BEB-9350	3-30	-	3	5	non-corr.	-	£85
P77BEB-9355	3-42			15	NH3	-	£108
P77BEB-9750	3-30			28	non-corr.	B	£179
P77BEB-9850	3-40	-	-	28	non-corr.	-	£84
P77BEB-9855				28	corr.	B	£112
Safety pressure limiter, including lockplate assembly							
P77BES-9350	3-30	-	3	5	non-corr.	-	£88
P77BES-9750				15	NH3	-	£107
P77BES-9850				28	non-corr.	B	£112

Notes:

A = Solder connection 1/4" ODF

B = Solder connection 6mm ODM

† See page 49 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.	-	£87
P78LCA-9400	-0.5-+7 LP	0.5-3 LP	4	30	-	A	£87
P78LCA-9500	3-30 HP			35		B	£109
P78LCA-9700				15	NH3	-	£190
Automatic Recycle, Technical Inspection Agency							
P78LCW-9300				5	non-corr.	-	£211
P78LCW-9302*	-0.5-+7 LP	0.5-3 LP	4	28	-	C	£152
P78LCW-9800	3-30 HP					D	£108
P78LCW-9801*						E	£163
Manual Reset (HP)							
P78MCA-9300				5	non-corr.	-	£92
P78MCA-9400	-0.5-+7 LP	0.5-3 LP	4	30	non-corr.	A	£92
P78MCA-9700	3-30 HP			15	NH3	-	£195
Manual Reset (LP)/Auto. Reset (HP)							
P78PGA-9300				5	non-corr.	-	£103
P78PGA-9400	-0.5-+7 LP	-	4	30	non-corr.	A	£120
P78PGA-9700	3-30 HP			28	NH3	-	£227
Manual Reset (LP/HP)							
P78PGB-9300	-0.5-+7 LP	-	4	5	non-corr.	-	£129
P78PGB-9800	3-30 HP			28		D	£117
Manual Reset (HP) Limiter, including lockplate assembly							
P78MCB-9300	-0.5-+7 LP	0.5-3 LP	4	5	non-corr.	-	£110
P78MCB-9800	3-30 HP			28		D	£117
Manual Reset (HP) Safety Pressure Limiter, including lockplate assembly							
P78MCS-9300	-0.5-+7 LP	0.5-3 LP	4	5	non-corr.	-	£104
Manual Reset (HP/HP) Safety Pressure Limiter, including lockplate assembly							
P78PLM-9350	3-30 LP	-	5	5	non-corr.	-	£141
P78PLM-9850	3-30 HP			28		D	£168
Dual Fan Cycling Control							
P78ALA-9351	3.5-21 LP	-	6	5	non-corr.	-	£112
P78ALA-9451	3.5-21 HP			30		A	£110

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

† See page 49 for 'Styles and Wiring Diagrams'
* Quantity orders only

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)		
Auto Reset Models						
P100AP-300D		R134A	2.5	(4)	A, D	£22
P100AP-301D					B, D	£14
P100AP-302D	Low Press.	R407C	4	(6)	A, D	£14
P100AP-306D		R404A	0.3	(2.8)	A, D	£14
P100AP-308D	Norm. Open		0.5	(1.5)	A, C	£13
P100AP-309D		-	0.7	(2.2)	A, F	£14
P100AP-310D					A, E	£13
P100CP-102D		R134A	16	(11)	A, D	£19
P100CP-103D					B, D	£22
P100CP-104D	High Press.	R407C	24	(18)	A, D	£15
P100CP-106D		R404A	28	(23)	A, D	£15
P100CP-107D	Norm. Closed				B, D	£15
P100CP-108D		R410A	38	(28)	A, D	£15
P100CP-110D		-	27.6	(20.7)	A, C	£11
P100CP-111D			26	(20)	A, D	£22

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

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



Auto Reset Models

Ordering Codes	Appl.	Refr.	P (bar)		Notes	List Price
			Open	(Close)		
Manual Reset Models						
P100DA-66D		R134A	16	(-)	A, D	£19
P100DA-67D					B, D	£22
P100DA-68D		R407C	26	(-)	A, E	£24
P100DA-69D					B, E	£24
P100DA-70D	High Pressure	R404A	28	(-)	A, E	£21
P100DA-71D					B, E	£24
P100DA-72D		R410A	38	(-)	A, D	£22
P100DA-73D					B, D	£22
P100DA-74D		R407C	26	(-)	A, F	£20

(continued next page)

Pressure Transducers

Ordering Codes	Appl.	Refr.	P (bar)		Notes	List Price
			Open (Close)	P Toler. (bar)		
P100DA-75D	High Pressure	R410A	42 (-)	0.7 (-)	A, D	£22
P100DA-76D						B, D
Heavy Duty Models - Auto Reset						
P100EE-17D	HP	R404A	20 (25)	1.0 (1.0)	A, H	£32
P100EE-18D		R134A	15 (11)			£26
P100EE-60D	Norm. Closed	R404A	28 (21)	0.7 (0.7)	A, D	£23
P100EE-61D						B, D
P100EE-68D		R134A	3 (25)	0.35 (0.35)	A, G	£25

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	£7
210-25R	Mounting bracket for P20/P35 (single)	£6
WRN12-1	Wrench P20/P21	£18
210-604R	Terminal cover P20/P21 (50 off)	£6
BKT024N002R	Mounting bracket for P233	£6
FTG015N602R	Duct mounting kit 'straight'	£25
FTG015N603R	Duct mounting kit 'bent'	£31
GMT008N600R	Duct kit for P233, self locking grommet and tubing	£12
CNR003N001R	Connector 6mm for P77/P78	£13
CNR003N002R	Connector 8mm for P77/P78	£14
CNR012N001R	Adapter R3/8 female to 1/4-18 NPT male for P48	£21
CNR013N001R	Adapter R 3/8 female to 1/4-18 NPT female for P48	£25
TBG16A-600R	Steam trap assembly P48	£36
KIT023N600	Locking kit for P48, P77/P78 - for field installation	£4
KIT031N600	Valve depressors for conversion style 13 - style 45a (100 off-1 box)	£105
KIT034N600	Seal rings for style 50/51 (250 off-1 box)	£103
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)	£10
SEC002N602	" " 90cm, style 13 - style 45a (100 off-1 box)	£11
SEC002N606	" " 200cm, style 13 - style 45a (75 off)	£17
SEC002N607	" " 200cm, 2 x style 13 (75 off)	£14
SEC002N616	" " 90cm, style 13 - cap. (150 off-1 box)	£10
SEC002N617	" " 100cm, style 13 - style 13 (100 off-1 box)	£12
SEC002N621	" " 90cm, style 34 - style 34 (100 off-1 box)	£10
SEC002N622	" " 90cm, style 50 - style 50 (100 off-1 box)	£17
SEC002N624	Capillary kit, 200cm, style 50 - style 50	£22
SEC002N626	" " 90cm, style 50 - style 51	£14
SEC002N627	" " 200cm, style 50 - style 51	£18
SEC002N628	" " 300cm, style 50 - style 51	£19
SEC002N631	" " 50cm, style 13 - style 34	£10

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		£157
P35AC-9202					£192
P35AC-9203	8-14	10	47	-	£194
P35AC-9500	14-24	16			£166
P35AC-9501	8-14	10	50		£202
P35AC-9512	22-42	30			£204
P35AC-9600	14-24	16	13	B	£157
P35AC-9601	8-14	10			£117
Replacement Pressure Transducers for P255 version (100 KΩ)					
P35AC-9200	14-24	16	47		£194
P35AC-9201	8-14	10			£194
P35AC-9106	3.5-10	16	45A	-	£152
P35AC-9604	8-14	10			£161
P35AC-9505	14-24	10	50		£171
P35AC-9506	22	16			£169
P35AC-9511	8-14	30	50	A	£197
P35AC-9200	14-24	16			£194
Replacement Pressure Transducers for P255 version (500 KΩ)					
P35AC-9200	14-24	16	50	C	£194
P35AC-9201	22-40	30			£194

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

Capillary Length - 90cm

† See page 49 for 'Style' references

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	£80
P499ABS-404C	0-30			Female		£80
P499ACS-401C	-1-+8	0-10Vdc	12-30Vdc	Female		£57
P499ACS-404C	0-30			Male		£46
P499VBS-401C	-1-+8	0-30	12-30Vdc	Male		£67
P499VBS-404C	0-30			Female		£67
P499VCS-401C	-1-+8	0-30	12-30Vdc	Female		£62
P499VCS-404C	0-30			Male		£51

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	£813
EP-1110-7002	2-10Vdc, 0-10Vdc, Ri ≥ 1 kΩ	20-100 kPa, 3-100 kPa	£856
EP-1110-7003	0-20 mAdc, Ri ≤ 450Ω	20-100 kPa	£826
EP-1110-7004	4-20Vdc, 0-20 mA(dc) Ri ≤ 450Ω	20-100 kPa, 3-100 kPa	£856

* 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	£990
EP-2000-7004			24V	£976
EP-2000-7021		2 kΩ pot.	230V	£1,058
EP-2000-7024			24V	£1,052

* 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)	£174
EP-8000-2	0.25-9.5Vdc	High Volume (relay)	3.5-133 kPa (0.5-19 psig)	£163
EP-8000-3	4-20 mAdc	Low Volume (non-relay)	21-105 kPa (3-15 psig)	£174
EP-8000-4		High Volume (relay)		£163

ACCESSORIES

Ordering Codes	Description	Price
R-3710-8205	0.18mm Restrictor (required for low volume models)	£19
EP-8000-101	Electro-Pneumatic Transducer Mounting Kit	£22
A-4000-8001	Inline Air Filter (required for all models)	£34
JC 5361	Hypodermic Needle Test Probe Assembly	£44
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	-	-	-	£166	
TC-8901-2131-WK			-	2	-	-	£150	
TC-8904-2131-WK			-	-	2	-	£107	
TC-8906-2131-WK			-	-	-	2	£159	
TC-8903-1132-WK			-	-	1	-	-	£155
TC-8901-2132-WK			-	-	-	2	-	£98
TC-8904-2132-WK			-	-	-	-	2	£120
TC-8906-2132-WK			-	-	-	-	2	£143
TC-8903-1151-WK	■	0-40°C	1	-	-	-	£169	
TC-8903-1152-WK	-		1	-	-	-	£139	
Stand-alone Controllers with 0-10V input								
TC-8903-1183-WK	-	0-100%	1	-	-	-	£166	
TC-8901-2183-WK	-		-	2	-	-	£166	
Local Controllers used with ES-8930 Remote Setpoint Module								
TC-8933-1112-W	-	-	1	-	-	-	£158	
TC-8931-2112-W			-	2	-	-	£94	
TC-8936-2112-W			-	-	-	2	£98	
ES-8930-3031-WK			■	12-28°C	-	-	-	£128
Local Controllers used with ES-8940 Central Setpoint Module								
TC-8943-1141-WK	■	+/-	1	-	-	-	£129	
TC-8941-2141-WK			-	2	-	-	£150	
TC-8944-2141-WK			-	-	2	-	£125	
TC-8946-2141-WK			-	-	-	2	£157	
ES-8940-4130-WK	-	12-28°C	-	-	-	£142		

(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						
TC-8902-1031-WK	■	12-28°C	2 pipe ††	1 x 0-10Vdc	A	£92
				1 x DAT 230V	B	
			1 x DAT 24V	C		
TC-8907-1031-WK			1 x Relay †	D	£159	
TC-8902-2031-WK	■	12-28°C	4 pipe	2 x 0-10Vdc	A	£150
				2 x DAT 230V	B	
			2 x DAT 24V	C		
TC-8907-2031-WK			2 x Relay †	D	£157	
TC-8902-1032-WK	-	12-28°C	2 pipe ††	1 x 0-10Vdc	A	£103
				1 x DAT 230V	B	
			1 x DAT 24V	C		
TC-8907-1032-WK			1 x Relay †	D	£146	
TC-8902-2032-WK	■	+/- **	4 pipe	2 x 0-10Vdc	A	£88
				2 x DAT 230V	B	
TC-8907-2032-WK			2 x DAT 24V	C	£140	
TC-8942-2041-WK*			2 x Relay †	D	£150	
TC-8947-2041-WK*	■			2 x Relay †	D	£159

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	£126
PM-8905-0300	(B) - 1 x DAT 230V Output	£142
PM-8905-0500	(C) - 1 x DAT 24V Output	£117
PM-8907-0300	(D) - 1 x Relay 3A 230V/24V Output	£116

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	£213
VT7200F5031	2 x Analogue 0-10Vdc Outputs 1 x Auxiliary or Reheat Contact	£248

* Minimum order of 10 units
Supply Voltage - 24Vac, 50/60 Hz; 2VA Class 2
Sensor - Local NTC 10K thermistor
Setpoint (cooling) - 12-37.5°C
Setpoint (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

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.



(continued next column)

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	£284
VT7300F5031	2 x Analogue 0-10Vdc Outputs 1 x Auxiliary or Reheat Contact	£300

* Minimum order of 10 units

Supply Voltage - 24Vac, 50/60 Hz; 2VA Class 2
Sensor - Local NTC 10K thermistor
Humidity sensor - 10-90% RH
Setpoint (dehumidification) - 30-90% RH
Setpoint (cooling) - 12-37.5°C
Setpoint (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	£155

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)



(continued next page)

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	£159
C450CCN-3C		2 x relays			£204
C450SBN-3C	Reset relay control + display & clock	1 x relay	-	-	£95
C450SCN-3C		2 x relays			£127
C450YNN-1C	Power module	24V rectified	120-240Vac	-	£87
C450CPN-3C	PI control module	1 x analogue	24Vac	A99B, HE-67S3, P499, DPT265	£172
C450CQN-3C		2 x analogue			£217
C450SPN-3C	PI expansion module	1 x analogue	-	-	£106
C450SQN-3C		2 x analogue			£135
C450RBN-3C	Boiler reset control + display & clock	1 x relay	24Vac	A99B	£280
C450RCN-3C		2 x relays			£338

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	£43
A99BB-25C	PTC silicon sensor, PVC cable (0.25m), -40-+120°C	£33
A99BB-200C	PTC silicon sensor, PVC cable (2m), -40-+120°C	£36
A99BB-300C	PTC silicon sensor, PVC cable (3m), -40-+120°C	£41
A99BB-500C	PTC silicon sensor, PVC cable (5m), -40-+120°C	£50
A99BB-600C	PTC silicon sensor, PVC cable (6m), -40-+120°C	£55
A99BC-1500C	PTC silicon sensor, silicon cable (15m), -40-+120°C	£267
HE-67S3-0N0BT	Space humidity/temp. sensor, 10-95% RH, -40-+121°C*	£429
HE-67S3-0N0OP	Duct humidity/temp. sensor, 10-95% RH, -40-+121°C*	£448

* Space & duct sensors - Integral A99B temp. sensor

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-WAO-00-0	CO ₂ Transmitter with Analogue Temperature Output	£638
CD-WRO-00-0	CO ₂ Transmitter with Relay	£820
CD-WRD-00-0	CO ₂ Transmitter with Relay and Display	£847
Replacement Part		
ACC-DWCLIP-0	Drywall Spring-clip Mounting Kit	£33
Accessories		
ACC-CD-S	Relay Setpoint Software Kit; includes software and interface cable to reset the On and Off relay setpoints for CD-WRO-00-0 or CD-WRD-00-0	£513
Y65T31-0	Multiple Primary Transformer, 40VA, 120/208/230V Primary, 24V Class 2 Secondary	£60

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

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	£412
Accessories		
ACC-DWCLIP-0	Drywall Spring-Clip Mounting Kit	£33
Y65T31-0	Multiple Primary Transformer, 40VA, 120/208/240V Primary, 24V Class 2 Secondary	£60

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

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	£655
CD-PRO-00-0	CO ₂ Transmitter with Relay - Duct Mount	£790
Replacement Part		
ACC-CD-CFK1	Conduit Adaptor Kit	£51
Accessories		
ACC-CD-S	Relay Setpoint Software Kit; includes software and interface cable to reset the On and Off relay setpoints for CD-PRO-00-0	£513
Y65T31-0	Multiple Primary Transformer, 40VA, 120/208/230V Primary, 24V Class 2 Secondary	£60

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 $\leq + 0.5Vdc$



Ordering Codes	Action	Output at Condensation	List Price
HX-9100-8001	ON/OFF	Open collector closed, 0.5Vdc max.	£55
HX-9100-9001	0-10Vdc	$\leq +0.5Vdc$	£118

Power Supply - 15Vdc $\pm 10\%$
 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 $\pm 2\%$ or $\pm 4\%$ 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	$\pm 2\%$	0-10Vdc	0-40°C	£373
HT-1300-UR	$\pm 4\%$	-	-	£213
HT-1301-UR		0-10Vdc	0-40°C	£260
HT-1303-UR		NTC K2	-	£226
HT-1306-UR		Pt1000	-	£239

* If sensing temperature output is present

Supply Voltage - 12-30Vdc or 24Vac, $\pm 15\%$ @ 50/60Hz
 Size - 80 x 80 x 32mm
 Protection Class - IP30

ACCESSORIES

Ordering Codes	Description	Price
TM-1100-8931	Surface Mounting Base	£18
TM-9100-8900	Special Tool to open module	£13

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	£236
HT-9009-URW		A99		£257

Humidity Range - 0-100% (non condensing)
 Supply Voltage - 12-30Vdc or 24Vac $\pm 15\%$
 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	£279
HT-9001-UD1	0-40°C	0-10Vdc			£306
HT-9003-UD1		NTC K2			£236
HT-9005-UD1	0-60°C	Pt100			£323
HT-9006-UD1		Pt1000			£266
HT-9009-UD1		A99			£263
HT-9000-UD2	-	-	230mm	0-10Vdc	£254
HT-9001-UD2	0-40°C	0-10Vdc			£357
HT-9003-UD2		NTC K2			£300
HT-9005-UD2	0-60°C	Pt100			£275
HT-9006-UD2		Pt1000			£324
HT-9009-UD2		A99			£325

Supply Voltage - 12-30Vdc or 24Vac $\pm 15\%$
 Size - 74.5 x 74.5 x 52mm (head), 25mm \varnothing (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	£123
TE-7000-8002-W	White / White Base		£122
TE-7000-8003	Off-White / Gray Base	-3 -+3 K	£120
TE-7000-8003-W	White / White Base		£122

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)	£24
TM-9100-8902	Serrated knob kit (bag of 10 knobs) - off-white	£39
TM-9100-8902-W	Serrated knob kit (bag of 10 knobs) - white	£39

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	-	-	-	-	£73
RS-1160-0000			12-28°C	Pushbutton		£105
RS-1160-0005			+/-			£105
RS-1180-0000		■	12-28°C	Integrated		£138
RS-1180-0005		+/-	£139			
RS-1190-0000		-	12-28°C	-		£96
RS-1190-0005		+/-	£96			

(continued next column)

Ordering Codes	Output Signal	LCD Display	Setpoint Dial Range	Override Function*	Fan Speed Selection	List Price
RS-1180-0002	0-10V dc	■	12-28°C	Integrated	■	£181
RS-1180-0007			+/-			£181

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	£18
TM-9100-8900	Special tool for opening enclosure	£13

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

Ordering Codes	Sensing Element	Setpoint Dial Scale	Fan Speed Override	Occupancy Override	List Price	
TM-1140-0000	NTC K2	-	-	-	£52	
TM-1150-0000		12-28°C			£68	
TM-1160-0000		+/-	3-Speed	■	£73	
TM-1160-0005		12-28°C			£73	
TM-1160-0002		+/-			£93	
TM-1160-0007		12-28°C			£86	
TM-1170-0005		Without	+/-	3-Speed	-	£68
TM-1170-0007		12-28°C	£77			
TM-1190-0000		NTC K2	12-28°C	-	-	£73
TM-1190-0005			+/-			£73

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	£18
TE-9100-8501	Unit Mount NTC K2 Temperature Sensor (1.5m cable)	£31
TM-9100-8900	Special Tool for opening enclosure	£13

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	-	-	-	£53
TM-2150-0000		-		-	£56
TM-2160-0000		12-28°C	3-Speed	■	£73
TM-2160-0005		+/-			£61
TM-2160-0002		12-28°C			£72
TM-2160-0007		+/-			£61
TM-2190-0000		12-28°C	-	-	£61
TM-2190-0005		+/-	-	-	£61

ACCESSORIES

Ordering Codes	Description	Price
TM-1100-8931	Plastic base for surface mount	£18
TE-9100-8501	Unit Mount NTC K2 Temperature Sensor (1.5 m cable)	£31
TM-9100-8900	Special Tool for opening enclosure	£13

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-6300 Series
Temperature Sensors

Designed to meet the current market requirements of quality and price, The TS-6300 series temperature sensors provide a passive signal that corresponds to the air or water temperature in heating, ventilating and air conditioning applications.



The TS-6300 temperature sensor series has been designed to work primarily with Johnson Controls Metasys and System 91 field controllers.

FEATURES

- Wide range of mounting types
- Wide range of signal outputs
- Different length of tubes and wells for duct and immersion applications
- Bayonet mounting system
- For immersion applications, well can be mounted before duct sensor is mounted
- IP54 and IP67 enclosures

(continued next column)

Ordering Codes	Sensor Type	Output Signal	Rod Length (mm)	List Price	
TS-6330D-A10	Rod* (duct)	2K2 NTC	138	£41	
TS-6330D-B10			192	£44	
TS-6330D-C10			290	£46	
TS-6330D-D10			446	£51	
TS-6340D-A10			138	£41	
TS-6340D-B10		192	£44		
TS-6340D-C10		290	£46		
TS-6340D-D10		446	£51		
TS-6350D-A10		Pt100	10K NTC	138	£41
TS-6350D-B10				192	£44
TS-6350D-C10	290			£51	
TS-6350D-D10	446			£51	
TS-6360D-A10	Pt1000			10K NTC	138
TS-6360D-B10		192	£44		
TS-6360D-C10		290	£46		
TS-6360D-D10		446	£51		
TS-6330K-F00		Remote element	2K2 NTC		2m cable
TS-6340K-F00	10K NTC		£26		
TS-6360K-F00	Pt1000		£26		
TS-6330E-000	Outdoor	2K2 NTC	-	£38	
TS-6340E-000		10K NTC		£38	
TS-6350E-000		Pt100		£38	
TS-6360E-000		Pt1000		£38	
TS-6330S-000		Strap-on		2K2 NTC	-
TS-6340S-000	10K NTC		£51		
TS-6350S-000	Pt100		£51		
TS-6360S-000	Pt1000		£51		
TS-6330C-E10	Ceiling		2K2 NTC	-	
TS-6340C-E10		10K NTC	£44		
TS-6350C-E10		Pt100	£44		
TS-6360C-E10		Pt1000	£44		

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

IMMERSION WELLS

Ordering Codes	Material	Thread	Length (mm)	List Price
TS-6300W-E200	Brass	R 1/2"	50	£18
TS-6300W-F200			120	£20
TS-6300W-G200			150	£20
TS-6300W-H200			200	£20
TS-6300W-I200			260	£21
TS-6300W-E300	Stainless steel	R 1/2"	50	£32
TS-6300W-F300			120	£33
TS-6300W-G300			150	£33
TS-6300W-H300			200	£34
TS-6300W-I300			260	£41
TS-6300W-E400		G 1/2"	50	£26
TS-6300W-F400			120	£26
TS-6300W-G400			150	£27
TS-6300W-H400			200	£29
TS-6300W-I400			260	£30

ACCESSORY

Ordering Code	Description	Price
TS-6300D-000	TS-6300 Duct flange kit	£9

Terminal Unit Controller

TUC3 Series

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	£205
TUC0311-2Bundle	Fan Coil Unit Control Bundle*	£330

* Special kit pack consist of:
 1 x TUC0311-2 – 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	£140
LP-RSM003-001C	Room Sensor Module – horizontal flush mount	£159
LP-RSM003-003C	IR Receiver with integrated temperature sensor	£53
LP-RSM003-004C	IR Hand-held Remote Control Unit	£76
Room Sensor Modules without Display – 80mm x 80mm		
TM-2140-0000	Sensor with temperature sensor only	£53
TM-2150-0000	Sensor with occupancy button and LED	£56
TM-2160-0000	Sensor with 12-28°C setpoint dial, occupancy button and LED	£73
TM-2160-0002	Sensor with 12-28°C setpoint dial, occupancy button and LED, fan speed override	£72
TM-2160-0005	Sensor with +/- setpoint dial, occupancy button and LED	£61
TM-2160-0007	Sensor with +/- setpoint dial, occupancy button and LED, fan speed override	£61
TM-2190-0000	Sensor with 12-28°C setpoint dial	£61
TM-2190-0005	Sensor with +/- setpoint dial	£61

(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	£138
RS-1180-0005	Sensor with +/- setpoint dial	£139
RS-1180-0002	Sensor with 12-28°C setpoint dial, fan speed override	£181
RS-1180-0007	Sensor with +/- setpoint dial, fan speed override	£181

ACCESSORIES

Ordering Codes	Description	List Price
LP-KIT003-010C	Remote temp. sensor, NTC 50k Ω, bulb, 80cm leads	£7
LP-KIT003-011C	Remote temp. sensor, NTC 50k Ω, wall mount, decorative box	£20
LP-KIT003-012C	Remote temp. sensor, NTC 50k Ω, duct mount	£44
LP-KIT003-013C	Remote temp. sensor, NTC 50k Ω, wall mount, decorative box	£22
HX-9100-8001	Condensation (dew point) sensor	£55
TE-9100-8502	Remote temp. sensor, NTC 10k Ω, bulb, 150cm leads	£35



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 Auxiliary: SPST 7(2)A	£95
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 Auxiliary: SPST 7(2)A	£109
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 Auxiliary: SPST 7(2)A	£168
ER54-PMW-001C	N2 Open			£168
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 Auxiliary 1: SPST 7(2)A Auxiliary 2: SPST 7(2)A	£180
ER55-DR230-001C	N2 Open			£180
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 Auxiliary 1: SPST 7(2)A Auxiliary 2: SPST 7(2)A	£197
ER55-SM230-001C	N2 Open			£197

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	£344
ER65-RK230-001C	N2 Open			£344

Notes:

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

(continued next column)

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	£18
ER-NTC-1C	NTC sensor, 2m cable, T1 mark on cable	ER52, ER53, ER54, ER55	£18
ER-NTC-2C	NTC sensor, 2m cable, T2 mark on cable		£18
ER-FIX-01C	Panel mounting clips	ER52, ER53, ER54	£19
ER-COM-1C	RS485 cable, 1.5m, plug connector	ER54, ER55-SM	£23
ER-ERM-2C	RS485 cable, 1.5m, RJ connector	ER55-DR	£32
ER-COM-3C	Display cable, 2m	ER55-SM	£13
ER-DIS-1C	Remote Display, Panel Mount Blue LED	ER55-SM	£57
P499Axx-xxx	Pressure transducer, 4-20 mA (refer to P499 section on page 34)	ER65	£ *

* Prices on page 34.

ER Series 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	£294

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)	£18

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	-	£106
DIS230T-1C		230Vac		A99 * Sensor	-	£106
DIS12V-1C	0-100% (Rh)	12Vac		0-10V **	-	£106
DIS230V-1C		230Vac		0-10V **	-	£106
1-stage Control (Alarm Output - Open Collector 40Vdc/100 mA)						
MS1PM12RT-1C	-40-+70	12Vac/dc	Panel	A99 * Sensor	SPST	£120
MS1PM230T-1C		230Vac	DIN-rail		SPDT	£127
MS1DR230T-1C			DIN-rail		SPST	£141
MS1PM12RV-1C	-40-+100	12Vac	Panel	0-10V **	SPST	£120
MS1PM230V-1C		230Vac	Panel		SPDT	£123
MS1DR230V-1C			DIN-rail		SPST	£142
			DIN-rail		SPST	£142
2-stage Control						
MS2PM12RT-1C	-40-+70	12Vac/dc	Panel	A99 * Sensor	SPST	£175
MS2DR230T-1C		230Vac	DIN-rail		SPDT	£185
MS2DR48DT-1C		12-24Vac/dc 48Vdc	DIN-rail		SPDT	£234
MS2PM12RV-1C	-40-+100	12Vac	Panel	0-10V **	SPST	£178
MS2DR230V-1C		230Vac	DIN-rail		SPST	£181
4-stage Control						
MS4PM12RT-1C	-40-+70	12Vac/dc	Panel	A99 * Sensor	SPST	£206
MS4DR230T-1C		230Vac	DIN-rail		SPDT	£237
MS4DR48T-1C		12-24Vac/dc 48Vdc	DIN-rail		SPDT	£237

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 Power AC-3 (Amps)	Eva. Fan (Amps)	List Price
	Vac	Φ			
12 Module Cabinets					
CR-PS037-1	230 (1)		0.37 kW (5)	1.6	£440
CR-PS075-1			0.75 kW (8)		£463
CR-PS110-1			1.1 kW (10)	3.2	£501
CR-PS150-1			1.5 kW (12)	4.8	£520
18 Module Cabinets					
CR-PT150-1	400 (3)		1.5 kW (3.5)	3.2	£653
CR-PT250-1			2.5 kW (5.7)		£658
CR-PT400-1			4.0 kW (8.5)	4.8	£667
CR-PT550-1			5.5 kW (11.5)		£681
CR-PT750-1			7.5 kW (15.5)		£696

NEGATIVE TEMPERATURE COLD ROOM CABINETS

Ordering Codes	Power Supply		Compressor Power AC-3 (Amps)	Eva. Fan (Amps)	Defrost (Amps)	List Price
	Vac	Φ				
12 Module Cabinets						
CR-NS037-1	230 (1)		0.37 kW (5)	1.6	8	£501
CR-NS075-1			0.75 kW (8)		12	£542
CR-NS110-1			1.1 kW (10)	3.2	£566	
CR-NS150-1			1.5 kW (12)	4.8	16	£563
18 Module Cabinets with Auxiliary Output*						
CR-NT150-1	400 (3)		1.5 kW (3.5)	3.2	12	£678
CR-NT250-1			2.5 kW (5.7)			£702
CR-NT400-1			4.0 kW (8.5)	4.8	15	£703
CR-NT550-1			5.5 kW (11.5)			£718
CR-NT750-1			7.5 kW (15.5)			£788
24 Module Cabinets with 3-Phase Defrost						
CR-NDT150-1	400 (3)		1.5 kW (3.5)	3.2	3 x 5	£1,024
CR-NDT250-1			2.5 kW (5.7)		3 x 9	£1,024
CR-NDT400-1			4.0 kW (8.5)	3 x 10	£1,042	
CR-NDT550-1			5.5 kW (11.5)	3 x 12	£1,076	
CR-NDT750-1			7.5 kW (15.5)	3 x 16	£1,090	
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	£979
CR-NFDT400-1			4.0 kW (8.5)		3 x 10	£1,217
CR-NFDT750-1			7.5 kW (15.5)		3 x 16	£1,428

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	-	£120
P215PR-9202	22-42		26	5.5		£120
P215PR-9800	10-25	28	19	4.5	A	£135
P215PR-9230						£141
P215PR-9232	22-42	47	26	5.5		£141
P215PR-9250	10-25	19	19	4.5		A, B

Notes:

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

† Refer to page 49 for 'Style' references

P315PR Series

Direct Mount Pressure Actuated, Single-phase (suitable for refrigerant R410a)

NEW

The P315PR series is designed for speed control of electronically commutated (EC) condenser fan motors. Condenser pressure control of a refrigeration system, via speed control of the fans on an air-cooled condenser, results in optimum performance throughout the year. The controller is designed for non-corrosive refrigerant systems.

A pressure actuated control provides the most direct and fastest response to pressure changes in a refrigerant system. The controller varies the supply voltage to the motor from 5% to at least 95% over the proportional band.

FEATURES

- Pressure range 8 to 25 bar and 22 to 42 bar
- Condenser pressure control by fan speed variation
- Direct mount
- Setpoint screw on top
- Built-in suppression filter
- Quick connector plug included



(continued next column)

Ordering Codes	Range (bar)	† Style	Setpoint (bar)	P.B. (bar)	List Price
P315PR-9202C	8-25 & 22-42	47	19	4	£88

† See page 49 for 'Style' references

Supply Voltage - 230Vac, 50/60Hz

Rating - 4 Amp

Control Action - Direct

Size - 106 x 65mmØ

Protection Class - IP65

P216 Series

Condenser Controller, Single-phase

NEW

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.

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 12A (rms) full load current.

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

- The new benchmark in standard FSC
- Easy to install and operate
- Output range 0.5 to 12 Amp (1 phase)
- Heat pump and reverse operation mode
- Master/slave mode
- Fixed pressure ranges for direct P215 replacement
- Setpoint and minimum speed potentiometers
- P216EEA-1K includes 0-50 bar pressure transducer



Ordering Codes	Adjustable Range (bar)	Fixed Prop. Band (bar)	Pressure Transducer	List Price
P216EEA-100C	4-42	2-5	-	£264
P216EEA-1K			■	£335

Supply Voltage - 208-240Vac, 50/60Hz

Input Signal - 0-10Vdc

Output Range - 0.5 to 12 Amp

Control Action - Direct or reverse mode

Size - 159 x 177 x 70mm

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 setpoint 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 setpoint 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	£179
P215LR-9111	8-14	2.5	10			£191
P215LR-9130	Bulk pack version of type P215LR-9110 (15 pcs)					£179
P215LR-9210	14-24	4	16	Direct mount (47)	A, B	£191
P215LR-9610				Direct mount (style 51)		£156
P215LR-9611	8-14	2.5	10			£156
P215LR-9114	22-42	6	30		C	£158
P215LR-9140					D	£169
P215LR-9120	14-24	4	16	90cm cap. (style 50)	E	£256
P215BR-9110						
P215BR-9111	8-14	2.5	10		A, F	£297
P215BR-9210	14-24	4	16	Direct mount (47)		£293
P215TR-9110				90cm cap. (50)	G	£329

† See page 49 for 'Style' references

- Notes:
- A = Minimum speed adjustable
 - B = Single pressure input
 - C = For R410A applications
 - D = 230V heat pump input
 - E = 400V version
 - F = Dual pressure input
 - G = Triple pressure 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 49 for 'Style' references
 - P35 Mechanical Transducers – see page 33
 - P38 Electronic Boards – please refer to the Sales Support Team
 - Supply Voltage – 230V, 50/60Hz
 - Rating – 3 Amp
 - Size – 118 x 70 x 53mm

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-ADS/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-ADXSWOSQL-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-0	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 field equipment controllers (FAC & FEC), input/output module (IOM) and the variable air volume modular assembly (VMA) 16 controller.



Ordering Codes	Description	List Price
MS-FAC2611-0	17-point Advanced Application Field Equipment Controller, 6UI, 2BI, 2AO, 3BO & 4CO; 24Vac; SA Bus	£633
MS-FAC2612-1	18-point Advanced Application Field Equipment Controller, 5UI, 4BI, 4CO & 5RO 24Vac; SA Bus, pluggable terminals	£671
MS-FAC2612-2	18-point Advanced Application Field Equipment Controller, 5UI, 4BI, 4CO & 5RO 120-240Vac; SA Bus, pluggable term.	£772
MS-FEC1611-0	10-point BACnet Controller, 2UI, 1DI, 3DO, 4CO	£859
MS-FEC1621-0	10-point BACnet Controller, as above but with display	£1,185
MS-FEC2611-0	17-point BACnet Controller, 6UI, 2DI, 2AO, 3DO, 4CO	£1,182
MS-FEC2621-0	17-point BACnet Controller, as above but with display	£1,629

(continued next page)

Ordering Codes	Description	List Price
MS-IOM1711-0	4-point I/O Module, with BI, FC Bus, SA Bus support	£275
MS-IOM2721-0	10-point I/O Module, 8UI, 2AO, FC Bus, SA Bus support	£242
MS-IOM3721-0	16-point I/O Module, 16BI, FC Bus, SA Bus support	£208
MS-IOM3731-0	16-point I/O Module, 8BI, 8BO, FC Bus, SA Bus support	£249
MS-IOM4711-0	17-point, I/O Module, 6UI, 2BI, 3BO, 2AO, 4CO, SA Bus sup.	£632
MS-VMA1832-0	Cooling Controller with Reheat and Fan Control	£675
MS-VMA1615-0	32-bit, Integrated VAV Contr./Actuator/Press. Sensor, 3UI & 2BO; 24 Vac; Field Controller Bus & Sensor/Actuator Bus	£468
MS-VMA1630-0	32-bit, Integrated VAV Contr./Actuator/Press. Sensor, 3UI, 3BO & 2CO; 24 Vac; FC Bus & SA Bus	£502
MS-VMA1617-0	As MS-VMA1615-0 but includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **	POA
MS-VMA1632-0	As MS-VMA1630-0 but includes 8-pin TSTAT Port for use with TE-7xx Series Non-Communicating Sensors **	POA

** This model is currently available only in Asia; please contact your local representative for more information.

FAD0351-0

Touch-Screen, Field Advanced Display with BACnet Communication

NEW



The Field Advanced Display (FAD) is a user friendly operator interface featuring BACnet® communication and a colourful, graphic display with touch-screen interface.

The solution is specifically designed to enable user interaction with a BACnet MS/TP-based Building Automation Control System through a convenient, comprehensive and intuitive user interface.

The FAD is delivered with a factory programmed application for ease of use and to reduce and simplify its set-up.

Its flexible, attractive and intuitive graphical interface allows any user type to navigate the Building Automation Control System to view useful information such as temperatures, adjust parameters like set-points, command outputs such as valves or fans, program schedules and calendars and monitor other dynamic information for example alarms and events.

FEATURES

- Factory Programmed Application
- BACnet® MS/TP Communication
- Compact design and flexible installation

Ordering Codes	Description	List Price
FAD0351-0	3.5" Field Advanced Display with neutral front plate	£617
WMB0351-0	Wall Mounting Box	POA
FMB0351-0	Flush Mounting Box	POA
IPG0351-0	IP65 Protection Gasket	POA
WPF0351-0	White Plastic Frame	POA
BPF0351-0	Black Plastic Frame	POA
Bundle Codes		
FED1611-1	Field Equipment Contr, 24Vac, 10-point with FAD Display	POA
FED2611-1	" " 24Vac, 17-point " "	POA
FCD2611-0	Field Advanced Contr, 24Vac, 17-point with FAD Display	POA
FCD2612-1	" " 24Vac, 18-point " "	POA
FCD2612-2	" " 230Vac, 18-point " "	POA

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)	-	-	£2,023
MS-NCE2511-0	NCE* + N2 trunk " "	■	-	£2,236
MS-NCE2516-0	NCE* + N2 trunk " "	-	■	£2,391
MS-NCE2517-0	NCE* + N2 trunk " "	■	■	£2,462
MS-NCE2520-0	NCE* + LonWorks trunk (upto 32 devices)	-	-	£2,165
MS-NCE2521-0	NCE* + LonWorks trunk " "	■	-	£2,177
MS-NCE2526-0	NCE* + LonWorks trunk " "	-	■	£2,391
MS-NCE2527-0	NCE* + LonWorks trunk " "	■	■	£2,462
MS-NCE2560-0	NCE* + BACnet MS/TP trunk (upto 32 devices)	-	-	£2,165
MS-NCE2561-0	NCE* + BACnet MS/TP trunk " "	■	-	£2,177
MS-NCE2566-0	NCE* + BACnet MS/TP trunk " "	-	■	£2,391
MS-NCE2567-0	NCE* + BACnet MS/TP trunk " "	■	■	£2,462
MS-NCE2500-0	NCE* (no FC Bus)	-	-	£1,252
MS-NCE2506-0	NCE* (no FC Bus) + integral display	-	■	£1,440

*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)	-	£4,886
MS-NAE3511-2	NAE + N2 or BACnet MS/TP " "	■	£5,173
MS-NAE3520-2	NAE + LonWorks (upto 64 devices)	-	£4,983
MS-NAE3521-2	NAE + LonWorks " "	■	£5,277
MS-NAE4510-2	NAE + N2 or BACnet MS/TP (upto 100 devices)	-	£9,485
MS-NAE4511-2	NAE + N2 or BACnet MS/TP " "	■	£9,916
MS-NAE4520-2	NAE + LonWorks (upto 127 devices)	-	£9,674
MS-NAE4521-2	NAE + LonWorks " "	■	£10,114
MS-NAE5510-2E	NAE + 2 trunks BACnet MS/TP (upto 100 devices)	-	£12,796
MS-NAE5511-2E	NAE + 2 trunks BACnet MS/TP " "	■	£13,310
MS-NAE5520-2E	NAE + 2 trunks LonWorks (upto 127 devices)	-	£14,253
MS-NAE5521-2E	NAE + 2 trunks LonWorks " "	■	£13,820

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	Price
Temp. & Humidity Sensors, Surface Mount								
NS-AHA7001-0	Sensor (RH 3% acc.)	■	Set	■	-	MJ	-	£517
NS-AHA7002-0	" "	■	Set	■	-	ST	-	£517
NS-AHB7001-0	" "	■	Set	■	■	MJ	-	£517
NS-AHB7002-0	" "	■	Set	■	■	ST	-	£517
NS-AHB7003-0	" "	■	Set	■	■	ST	■	£517
NS-AHN7001-0	" "	-	-	-	-	MJ	-	£386
NS-AHN7001-2	" "	-	-	-	-	ST	-	£349
NS-AHP7001-0	" "	-	W/C	■	-	MJ	-	£398
NS-APA7001-0	Sensor (RH 2% acc.)	■	Set	■	-	MJ	-	£646
NS-APA7002-0	" "	■	Set	■	-	ST	-	£646
NS-APB7001-0	" "	■	Set	■	■	MJ	-	£646
NS-APB7002-0	" "	■	Set	■	■	ST	-	£646
NS-APB7003-0	" "	■	Set	■	■	ST	■	£646

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

Ordering Codes	Description	DI	TA	OO	ST	FC	CO	AS	BF	Price
Temp. Sensors, Surface Mount										
NS-ATA7001-0	Temp. sensor	■	Set	■	-	-	MJ	-	-	£126
NS-ATA7002-0	" "	■	Set	■	-	-	ST	-	-	£126
NS-ATA7003-0	" "	■	Set	■	-	-	ST	■	-	£126
NS-ATB7001-0	" "	■	Set	■	■	-	MJ	-	-	£133
NS-ATB7002-0	" "	■	Set	■	■	-	ST	-	-	£133
NS-ATB7003-0	" "	■	Set	■	■	-	ST	■	-	£133
NS-ATC7001-0	" "	■	Set	■	-	■	MJ	-	-	£142
NS-ATC7002-0	" "	■	Set	■	-	■	ST	-	-	£142
NS-ATD7001-0	" "	■	Set	■	■	■	MJ	-	-	£143
NS-ATD7002-0	" "	■	Set	■	■	■	ST	-	-	£143
NS-ATF7001-0	" "	■	W/C	■	■	-	MJ	-	-	£126
NS-ATF7002-0	" "	■	W/C	■	■	-	ST	-	-	£126
NS-ATN7001-0	" "	-	-	-	-	-	MJ	-	-	£101
NS-ATN7001-2	" (no JC logo)	-	-	-	-	-	MJ	-	-	£101
NS-ATN7003-0	Temp. sensor	-	-	-	-	-	ST	■	-	£101
NS-ATN7003-2	" (no JC logo)	-	-	-	-	-	ST	■	-	£94
NS-ATP7001-0	Temp. sensor	-	W/C	■	■	-	MJ	-	-	£111
NS-ATP7001-2	" "	-	W/C	■	■	-	MJ	-	-	£111
NS-ATP7002-0	" "	-	W/C	■	■	-	ST	-	-	£111
NS-ATP7003-0	" "	-	W/C	■	■	-	ST	■	-	£111
NS-ATP7003-2	" "	-	W/C	■	■	-	ST	■	-	£101
NS-ATV7001-0	Balancing Tool	■	Set	■	■	-*	MJ	-	■	£152
NS-ATV7002-0	" "	■	Set	■	■	-*	ST	-	■	£152

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

Ordering Codes	Description	DI	TA	OO	OS	ST	FC	CO	Price
Network Sensors, Wall Mount or Surface Mount									
NS-MTB7001-0	Temp. sensor	■	Set	-	■	■	-	MJ	£405
NS-MTB7002-0	" "	■	Set	-	■	■	-	ST	£405
NS-MTL7001-0	" "	-	-	■	■	-	-	MJ	£404
NS-MTL7002-0	" "	-	-	■	■	-	-	ST	£405
NS-MHL7001-0	Temp./RH (3% acc.)	-	-	■	■	-	-	MJ	£550
NS-MHL7002-0	" "	-	-	■	■	-	-	ST	£550
NS-MNN7001-0	Motion Detection only	-	-	-	■	-	-	MJ	£246
NS-MNN7003-0	" " "	-	-	-	■	-	-	ST	£246

(continued next column)

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
- OS - PIR occupancy sensor
- 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)	£974
NS-DTN7043-0	Duct mount, temp. sensor, 102mm, with 3m flying lead	£141
NS-DTN7083-0	Duct mount, temp. sensor, 203mm, " "	£141

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	£14

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	-	-	£247
WRZ-TTR0000-0	Sensor only	-	-	-	-	£239
WRZ-TTS0000-0	Sensor (13-29°C/55-85°F)	-	Set	-	-	£247
WRZ-TTB0000-0	Sensor (13-29°C/55-85°F)	■	Set	■	-	£247
WRZ-TTD0000-0	Sensor (13-29°C/55-85°F)	■	Set	■	■	£247
MS-ZFR1811-0	Wireless Field Bus Router	-	-	-	-	£206
MS-ZFR1810-0	Wireless Field Bus Co-ordinator	-	-	-	-	£607

Key:

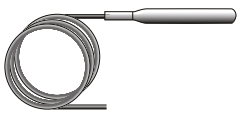
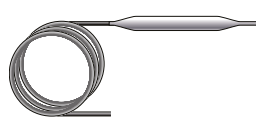
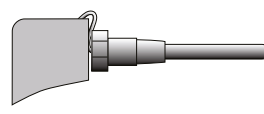
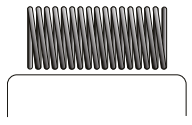
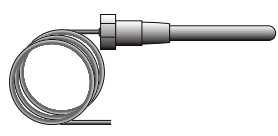
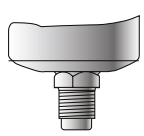

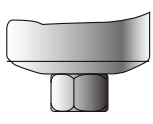
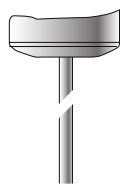
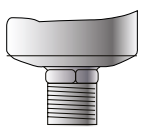
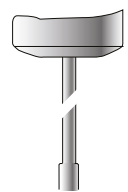
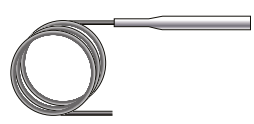
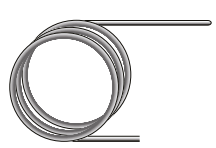
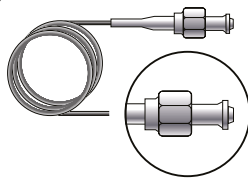
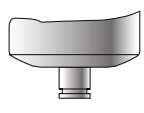
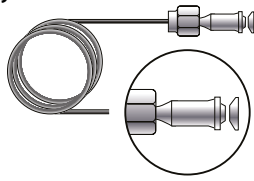
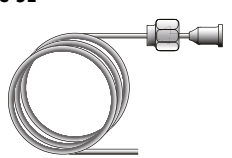
- DI - LCD display
- TA - SET (setpoint adjustment)
- FC - F/C button
- FS - Fan speed control

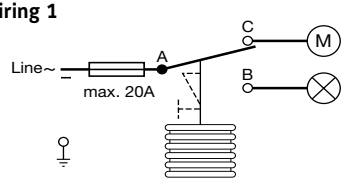
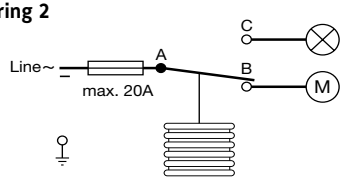
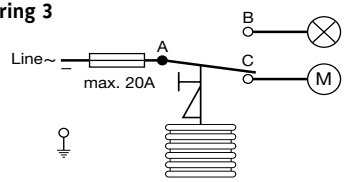
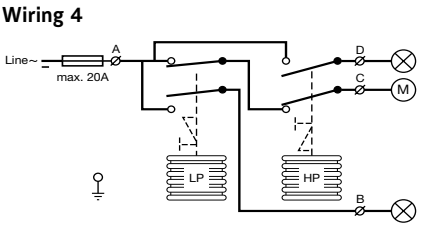
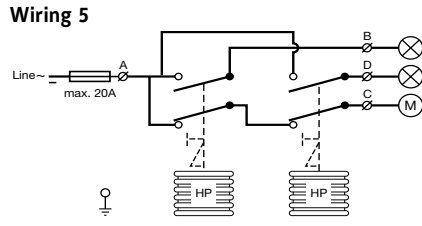
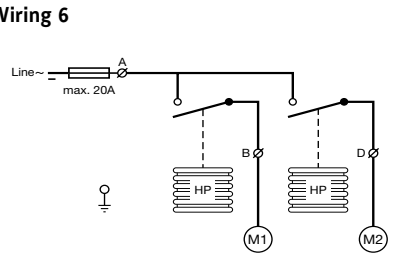
MS Series

Spares and Accessories

Ordering Codes	Description	List Price
MS-BACEOL-0	Terminal Module	£100
MS-BAT1010-0	Battery 12V for NAE/NIE	£135
MS-BAT1020-0	Battery Pack	£68
MS-BTCVT-1	Bluetooth MSTP Interface	£847
MS-BTCVTCBL-700	Cable Replacement BTCVT	£20
MS-DIS1710-0	Remote Display for NCE/FEC	£363
MS-EREPOR-0	Energy Essentials Software for ADX only	£1,493
MS-EXPORT-0	Metasys Export Utility	£2,095
MS-FUSE01-0	10 Fuses (1 packet)	£49
MS-LDT1102-0	Local Display Terminal Kit	£1,005
TL-BRTRP-0	BACnet to MS/TP Router	£808
TL-JCIBPP-DVD0	Tools DVD for the branches	POA
TL-JCIBPP-DVD6	Tools DVD for the branches	POA

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 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 Right side HP: A - C opens on pressure increase A - D closes simultaneously</p>	Wiring 6 

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 25% 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

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 25% 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.
- (B) 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

General Conditions of Sale (cont)

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 their 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

- (ii) 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 call 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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A19AAC-9009	£47	26	CR-NS037-1	£501	44	F61TB-9200	£477	25	M			M9116-AGE-1N	£225	20
A19ACC-9100	£107	26	CR-NS075-1	£542	44	F61TD-9150	£221	25	M9000-153	£1	21/22	M9116-AGE-1N4	£265	22
A19ACC-9101	£77	26	CR-NS110-1	£566	44	F62SA-9100	£137	25	M9000-158	£74	21/22	M9116-AGE-1N4	£265	22
A19AQC-9101	£148	26	CR-NS150-1	£563	44	F63BT-9101	£268	25	M9000-170	£79	21/22	M9116-AGF-1N	£228	20
A19AQC-9102	£124	26	CR-NT150-1	£678	44	F63BT-9102	£295	25	M9000-171	£79	21/22	M9116-AGF-1N4	£265	22
A19AQC-9102	£124	26	CR-NT250-1	£702	44	F63BT-9200	£578	25	M9000-200	£999	19	M9116-GDA-1N	£244	20
A19AQC-9200	£144	26	CR-NT400-1	£703	44	FAD0351-0	£617	47	M9000-341	£324	19	M9116-GDA-1N1	£244	20
A25CN-9001	£179	26	CR-NT550-1	£718	44	FCD2611-0	POA	47	M9000-520-5	£33	15	M9116-GDC-1N	£280	20
A28AA-9006	£182	26	CR-NT750-1	£788	44	FCD2612-1	POA	47	M9000-525-5	£33	15/18	M9116-GDC-1N1	£280	20
A28AA-9007	£165	26	CR-PS037-1	£440	44	FCD2612-2	POA	47	M9000-560	£18	19	M9116-GGA-1N	£223	20
A28AA-9106	£312	26	CR-PS075-1	£463	44	FED1611-1	POA	47	M9000-561	£23	19	M9116-GGA-1N4	£301	22
A28AA-9113	£200	26	CR-PS110-1	£501	44	FED2611-2	POA	47	M9000-604	£18	21/22	M9116-GGC-1N	£254	20
A28AA-9118	£175	26	CR-PS150-1	£520	44	FMB0351-0	POA	47	M9000-607	£14	19	M9116-GGC-1N4	£359	22
A28QA-9101	£312	26	CR-PT150-1	£653	44	FLT001N001R	£52	25	M9000-Z01DN	£66	19	M9124-ADA-1N	£303	20
A28QA-9110	£203	26	CR-PT250-1	£658	44	FTG015N602R	£25	33	M9102-AGA-1S	£79	19	M9124-ADC-1N	£344	20
A28QA-9111	£215	26	CR-PT400-1	£667	44	FTG015N603R	£31	33	M9102-AGA-1S	£79	19	M9124-ADD-1N	£364	20
A28QA-9113	£255	26	CR-PT550-1	£681	44	FTG13A-600R	£25	26/27	M9100-100A	£67	17	M9124-ADE-1N	£364	20
A28QA-9114	£241	26	CR-PT750-1	£696	44				M9100-100B	£67	17	M9124-ADF-1N	£364	20
A28QA-9115	£204	26	D			G			M9100-100C	£67	17	M9124-AGA-1N	£293	20
A28QA-9117	£258	26	DIS12T-1C	£106	43	G-2010 Series	POA	34	M9102-AGA-5S	£69	19	M9124-AGC-1N	£331	20
A28QJ-9100	£211	26	DIS12V-1C	£106	43	GH-5119-5610	£1,203	24	M9102-IGA-1S	£86	19	M9124-AGC-1N	£331	20
A36AGA-9101	£329	27	DIS230T-1C	£106	43	GH-5219-6610	£1,051	24	M9102-IGA-5S	£92	19	M9124-AGE-1N	£354	20
A36AGA-9102	£300	27	DIS230V-1C	£106	43	GH-5229-2610	£999	24	M9104-AGA-1S	£78	19	M9124-AGE-1N	£354	20
A36AGA-9103	£263	27	DMPR-KC003	POA	21/22	GH-5619-7611	£1,472	24	M9104-AGA-5S	£74	19	M9124-AGF-1N	£354	20
A36AGB-9103	£273	27	DP0100-AZ	£356	28	GH-5629-3611	£1,649	24	M9104-GGA-1S	£148	19	M9124-AGF-1N4	£318	20
A36AHA-9105	£293	27	DP0100-AZ-D	£411	28	GH-5629-4611	£1,688	24	M9104-GGA-5S	£152	19	M9124-AGA-1N	£318	20
A36AHA-9107	£368	27	DP0100-AZ-D-SP	£491	28	GH-5729-5610	£2,107	24	M9104-IGA-1S	£86	19	M9124-GDA-1N1	£318	20
A36AHA-9108	£344	27	DP0100-AZ-SP	£412	28	GH-5729-6610	£2,330	24	M9104-IGA-5S	£92	19	M9124-GDC-1N	£351	20
A36AHB-9103	£348	27	DP0250-R8-AZ	£356	28	GH-5729-7610	£2,954	24	M9108-ADA-1N	£161	20	M9124-GDC-1N1	£351	20
A36AHB-9104	£344	27	DP0250-R8-AZ-D	£411	28	GMT008N600R	£12	33	M9108-ADA-1N4	£226	22	M9124-GGA-1N	£310	20
A36AHB-9105	£494	27	DP2500-R8	£272	28				M9108-ADA-5	£163	18	M9124-GGC-1N	£346	20
A36AHB-9109	£474	27	DP2500-R8-AZ	£411	28	H			M9108-ADA-1N4	£226	22	M9132-ADA-1N	£354	20
A99BA-200C	£43	37	DP2500-R8-AZ	£356	28	HE-67S3-ON00P	£448	37	M9108-ADC-1N	£202	20	M9132-ADC-1N	£277	20
A99BB-200C	£36	37	DP2500-R8-AZ-D	£411	28	HE-67S3-ON0BT	£429	37	M9108-ADC-5	£205	18	M9132-ADC-1N4	£364	20
A99BB-25C	£33	37	DP2500-R8-D	£329	28	HT-1201-UR	£373	38	M9108-ADD-1N	£174	20	M9132-ADC-1N4	£258	20
A99BB-300C	£41	37	E			HT-1300-UR	£213	38	M9108-ADD-1N4	£281	22	M9132-ADE-1N	£364	20
A99BB-500C	£50	37	EP-1110-7001	£813	34	HT-1301-UR	£260	38	M9108-ADE-1N	£174	20	M9132-ADE-1N4	£364	20
A99BB-600C	£55	37	EP-1110-7002	£856	34	HT-1303-UR	£226	38	M9108-ADE-1N4	£281	22	M9132-AGE-1N	£354	20
A99BC-1500C	£267	37	EP-1110-7003	£826	34	HT-1306-UR	£239	38	M9108-ADF-1N	£174	20	M9132-AGE-1N4	£354	20
ACC-CD-CFK1	£51	37	EP-1110-7004	£856	34	HT-9000-UD1	£279	38	M9108-ADF-1N4	£281	22	M9132-AGC-1N	£271	20
ACC-CD-S	£513	37	EP-2000-7001	£990	34	HT-9000-UD2	£254	38	M9108-AGA-1N	£132	20	M9132-AGC-1N4	£271	20
ACC-DWCLIP-0	£33	37	EP-2000-7004	£976	34	HT-9001-UD1	£306	38	M9108-AGA-1N4	£211	22	M9132-AGD-1N	£354	20
			EP-2000-7004	£976	34	HT-9001-UD2	£306	38	M9108-AGA-5	£173	18	M9132-AGD-1N4	£354	20
			EP-2000-7021	£1,058	34	HT-9003-UD1	£236	38	M9108-AGA-5	£173	18	M9132-AGE-1N	£354	20
B			EP-2000-7024	£1,052	34	HT-9003-UD2	£300	38	M9108-AGC-1N	£202	20	M9132-AGE-1N4	£354	20
BKT024N002R	£6	33	EP-8000-1	£174	34	HT-9005-UD1	£323	38	M9108-AGC-5	£205	18	M9132-AGF-1N	£354	20
BKT034N602R	£7	33	EP-8000-101	£22	34	HT-9005-UD2	£275	38	M9108-AGC-1N4	£249	22	M9132-AGF-1N4	£354	20
BPF0351-0	POA	47	EP-8000-2	£163	34	HT-9005-URW	£236	38	M9108-AGD-1N	£265	22	M9132-AGA-1Z	£217	21
			EP-8000-3	£174	34	HT-9006-UD1	£266	38	M9108-AGD-1N4	£265	22	M9203-AGB-1	£256	21
C450CCN-3C	£159	37	EP-8000-4	£163	34	HT-9006-UD2	£324	38	M9108-AGE-1N	£211	20	M9203-AGB-1Z	£265	21
C450CCN-3C	£204	37	EQ-0100-7001	£39	28	HT-9009-UD1	£263	38	M9108-AGE-1N4	£265	22	M9203-BGA-1	£149	21
C450CPN-3C	£172	37	EQ-6056-7000	£85	28	HT-9009-UD2	£325	38	M9108-AGE-1N4	£265	22	M9203-BGA-1Z	£149	21
C450CQN-3C	£217	37	ER-COM-1C	£23	42	HT-9009-URW	£257	38	M9108-AGF-1N	£174	20	M9203-BUB-1	£213	21
C450RBN-3C	£280	37	ER-COM-2C	£32	42	HX-9100-8001	£55	38/41	M9108-GAA-1.01	£266	23	M9203-BUB-1Z	£222	21
C450RCN-3C	£338	37	ER-COM-3C	£13	42	HX-9100-9001	£118	38	M9108-GAC-1.01	£336	23	M9203-BUB-1Z	£222	21
C450SBN-3C	£95	37	ER-DIS-1C	£57	42				M9108-GDA-1N	£239	20	M9203-GA-1	£239	21
C450SCN-3C	£127	37	ER-FIX-1C	£19	42	I			M9108-GDA-1N1	£239	20	M9203-GA-1Z	£247	21
C450SPN-3C	£106	37	ER-NTC-OC	£18	42	IPG0351-0	POA	47	M9108-GDC-1N	£257	20	M9203-GGB-1	£277	21
C450SQN-3C	£135	37	ER-NTC-1C	£18	42				M9108-GDC-1N1	£257	20	M9203-GGB-1Z	£286	21
C450YNN-1C	£87	37	ER-NTC-2C	£18	42	J			M9108-GGA-1N	£176	20	M9208-100		

Product	Price	Page	Product	Price	Page	Product	Price	Page	Product	Price	Page	Product	Price	Page
M9208-AGC-1	£345	21	MS-NCE2521-0	£2,177	47				P28DP-9340	£289	29	P74EA-9700	£320	30
M9208-BDA-1	£254	21	MS-NCE2526-0	£2,391	47				P28DP-9360	£289	29	P74EA-9701	£351	30
M9208-BDC-1	£300	21	MS-NCE2527-0	£2,462	47	P100AP-300D	£22	32	P28DP-9380	£260	29	P74FA-9700	£319	30
M9208-BGA-1	£230	21	MS-NCE2560-0	£2,165	47	P100AP-301D	£14	32	P28DP-9381	£347	29	P74FA-9701	£452	30
M9208-BGC-1	£277	21	MS-NCE2561-0	£2,177	47	P100AP-302D	£14	32	P28DP-9640	£269	29	P77AAA-9300	£64	31
M9208-BGA-1	£322	21	MS-NCE2566-0	£2,391	47	P100AP-306D	£14	32	P28DP-9660	£269	29	P77AAA-9301	£65	31
M9208-GGC-1	£368	21	MS-NCE2567-0	£2,462	47	P100AP-308D	£13	32	P28DP-9680	£279	29	P77AAA-9302	£65	31
M9220-600	£13	21/22	MS-RAP-0	POA	47	P100AP-309D	£14	32	P28DP-9840	£322	29	P77AAA-9350	£64	31
M9220-601	£15	21	MS-VMA1615-0	£468	47	P100AP-310D	£13	32	P28DP-9860	£368	29	P77AAA-9351	£63	31
M9220-602	£8	21/22	MS-VMA1617-0	POA	47	P100CP-102D	£19	32	P315PR-9202C	£88	45	P77AAA-9400	£75	31
M9220-603	£12	21/22	MS-VMA1630-0	£502	47	P100CP-103D	£22	32	P35AC-9100	£157	33	P77AAA-9450	£75	31
M9220-605	£42	22	MS-VMA1632-0	POA	47	P100CP-104D	£15	32	P35AC-9106	£152	33	P77AAA-9451	£64	31
M9220-610	£10	21/22	MS-VMA1832-0	£675	48	P100CP-106D	£15	32	P35AC-9200	£194	33	P77AAA-9700	£109	31
M9220-612	£9	21/22	MS-ZFR1810-0	£607	48	P100CP-107D	£15	32	P35AC-9200	£194	33	P77AAA-9750	£109	31
M9220-614	£10	21	MS-ZFR1811-0	£206	48	P100CP-108D	£15	32	P35AC-9201	£194	33	P77AAA-9800	£76	31
M9220-AGA-1	£356	22	MS1DR230T-1C	£141	43	P100CP-110D	£11	32	P35AC-9201	£194	33	P77AAA-9850	£76	31
M9220-AGC-1	£408	22	MS1DR230V-1C	£142	43	P100CP-111D	£22	32	P35AC-9202	£192	33	P77AAAW-9300	£79	31
M9220-BDA-1	£319	22	MS1PM12RT-1C	£120	43	P100DA-66D	£19	32	P35AC-9203	£194	33	P77AAAW-9350	£72	31
M9220-BDC-1	£379	22	MS1PM12RV-1C	£120	43	P100DA-67D	£22	32	P35AC-9500	£166	33	P77AAAW-9355	£83	31
M9220-BGA-1	£286	22	MS1PM230T-1C	£127	43	P100DA-68D	£24	32	P35AC-9501	£202	33	P77AAAW-9700	£131	31
M9220-BGC-1	£341	22	MS1PM230V-1C	£123	43	P100DA-69D	£24	32	P35AC-9505	£171	33	P77AAAW-9750	£187	31
M9220-BGA-1	£366	22	MS2DR230T-1C	£185	43	P100DA-70D	£21	32	P35AC-9506	£169	33	P77AAAW-9800	£79	31
M9220-GGC-1	£406	22	MS2DR230V-1C	£181	43	P100DA-71D	£24	32	P35AC-9511	£197	33	P77AAAW-9850	£96	31
M9220-HGA-1	£376	22	MS2DR48DT-1C	£234	43	P100DA-72D	£22	32	P35AC-9512	£204	33	P77AAAW-9855	£100	31
M9220-HGC-1	£406	22	MS2PM12RT-1C	£175	43	P100DA-73D	£22	32	P35AC-9600	£157	33	P77BCA-9300	£72	31
M9304-ADA-1N	£136	19	MS2PM12RV-1C	£178	43	P100DA-74D	£20	32	P35AC-9601	£117	33	P77BCA-9400	£86	31
M9304-ADC-1N	£161	19	MS4DR230T-1C	£237	43	P100DA-75D	£22	33	P35AC-9604	£161	33	P77BCA-9700	£119	31
M9304-AGA-1N	£132	19	MS4DR48T-1C	£237	43	P100DA-76D	£22	33	P45NBB-9361B	£276	29	P77BCB-9300	£88	31
M9304-AGC-1N	£158	19	MS4PM12RT-1C	£206	43	P100EE-17D	£32	33	P45NBB-9381B	£258	29	P77BCB-9800	£89	31
M9304-AKA-1N	£109	19				P100EE-18D	£26	33	P45NBB-9640C	£234	29	P77BEA-9350	£63	31
M9304-GGA-1N	£194	19	N			P100EE-60D	£23	33	P45NBB-9660C	£235	29	P77BEA-9450	£82	31
MS-ADS05U-0	POA	46	NS-AHA7001-0	£517	48	P100EE-61D	£29	33	P45NBB-9660Q	£309	29	P77BEA-9750	£120	31
MS-ADSOLE5U-0	POA	46	NS-AHA7002-0	£517	48	P100EE-68D	£25	33	P45NBB-9680C	£234	29	P77BEB-9350	£85	31
MS-ADX10SQL-0	POA	46	NS-AHB7001-0	£517	48	P163.05	£1.52	5	P45NCA-9056	£287	29	P77BEB-9355	£108	31
MS-ADX10U-0	POA	46	NS-AHB7002-0	£517	48	P165.05	£0.33	5	P45NCA-9104	£280	29	P77BEB-9750	£179	31
MS-ADXSWO-0	POA	46	NS-AHB7003-0	£517	48	P197.15	£1.00	5	P48AAA-9110	£165	30	P77BEB-9850	£84	31
MS-ADXSWSQL-0	POA	46	NS-AHN7001-0	£386	48	P197.25	£1.00	5	P48AAA-9120	£114	30	P77BEB-9855	£112	31
MS-BACEOL-0	£100	48	NS-AHN7001-2	£349	48	P215BR-9110	£281	46	P48AAA-9130	£114	30	P77BES-9350	£88	31
MS-BAT1010-0	£135	48	NS-AHP7001-0	£398	48	P215BR-9111	£297	46	P48AAA-9140	£114	30	P77BES-9750	£107	31
MS-BAT1020-0	£68	48	NS-APA7001-0	£646	48	P215BR-9210	£293	46	P48AAA-9150	£141	30	P77BES-9850	£122	31
MS-BTCVT-1	£847	48	NS-APA7002-0	£646	48	P215LR-9110	£179	46	P48BEA-9140	£155	30	P78ALA-9351	£112	32
MS-BTCVTCBL-700	£20	48	NS-APB7001-0	£646	48	P215LR-9111	£191	46	P499ABS-401C	£80	34	P78ALA-9451	£110	32
MS-DIS1710-0	£363	48	NS-APB7002-0	£646	48	P215LR-9114	£158	46	P499ABS-404C	£80	34	P78LCA-9300	£87	32
MS-EREPORT-0	£1,493	48	NS-APB7003-0	£646	48	P215LR-9116	£256	46	P499ACS-401C	£57	34	P78LCA-9400	£87	32
MS-EXPORT-0	£2,095	48	NS-ATA7001-0	£126	48	P215LR-9130	£179	46	P499ACS-404C	£46	34	P78LCA-9500	£109	32
MS-FAC2611-0	£633	46	NS-ATA7002-0	£126	48	P215LR-9140	£169	46	P499VCS-401C	£62	34	P78LCA-9700	£190	32
MS-FAC2612-1	£671	46	NS-ATA7003-0	£126	48	P215LR-9210	£191	46	P499VBS-401C	£67	34	P78LCW-9300	£211	32
MS-FAC2612-2	£772	46	NS-ATB7001-0	£133	48	P215LR-9610	£156	46	P499VBS-404C	£67	34	P78LCW-9302	£152	32
MS-FAD0351-0	£617	48	NS-ATB7002-0	£133	48	P215LR-9611	£156	46	P499VCS-404C	£51	34	P78LCW-9800	£108	32
MS-FEC1611-0	£859	46	NS-ATB7003-0	£133	48	P215PR-9200	£120	45	P735AAA-9200	£76	30	P78LCW-9801	£163	32
MS-FEC1621-0	£1,185	46	NS-ATC7001-0	£142	48	P215PR-9202	£120	45	P735AAA-9201	£75	30	P78MCA-9300	£92	32
MS-FEC2611-0	£1,182	46	NS-ATC7002-0	£142	48	P215PR-9230	£141	45	P735AAA-9300	£57	30	P78MCA-9400	£92	32
MS-FEC2621-0	£1,629	46	NS-ATD7001-0	£143	48	P215PR-9232	£141	45	P735AAA-9301	£61	30	P78MCA-9700	£195	32
MS-FUSE01-0	£49	49	NS-ATD7002-0	£143	48	P215PR-9250	£143	45	P735AAA-9350	£55	30	P78MCB-9300	£110	32
MS-IOM1711-0	£275	47	NS-ATF7001-0	£126	48	P215PR-9800	£135	45	P735AAA-9351	£60	30	P78MCB-9800	£117	32
MS-IOM2721-0	£242	47	NS-ATF7002-0	£126	48	P215TR-9110	£329	46	P735AAA-9400	£58	30	P78MCS-9300	£104	32
MS-IOM3721-0	£208	47	NS-ATN7001-0	£101	48	P216EEA-100C	£264	45	P735AAW-9300	£60	30	P78PGA-9300	£103	32
MS-IOM3731-0	£249	47	NS-ATN7001-2	£101	48	P216EEA-1K	£335	45	P735AAW-9350	£53	30	P78PGA-9400	£120	32
MS-IOM4711-0	£632	47	NS-ATN7003-0	£101	48	P232A-B-AAC	£41	28	P735AAW-9850	£77	30	P78PGA-9700	£227	32
MS-LDT1102-0	£1,005	49	NS-ATN7003-2	£94	48	P233A-10-AAC	£40	29	P735BCA-9300	£57	30	P78PGB-9300	£129	32
MS-NAE3510-2	£4,886	47	NS-ATP7001-0	£111	48	P233A-10-AHC	£61	29	P735BCB-9300	£60	30	P78PGB-9800	£117	32
MS-NAE3511-2	£5,173	47	NS-ATP7001-2	£111	48	P233A-10-AKC	£49	29	P735BEA-9350	£56	30	P78PLM-9350	£141	32
MS-NAE3520-2	£4,983	47	NS-ATP7002-0	£111	48	P233A-10-PAC	£44	29	P735BEB-9350	£56	30	P78PLM-9850	£168	32
MS-NAE3521-2	£5,277	47	NS-ATP7003-0	£111	48	P233A-10-PHC	£49	29	P735BEB-9850	£77	30	P903ST.1	£5.56	5
MS-NAE4510-2	£9,485	47	NS-ATP7003-2	£101	48	P233A-10-PKC	£61	29	P736ALA-9351	£87	31	P903ST.3	£7.96	5
MS-NAE4511-2	£9,916	47	NS-ATV7001-0	£152	48	P233A-4-AAC	£50	29	P736LCA-9300	£85	31	P903ST.4	£9.32	5
MS-NAE4520-2	£9,674	47	NS-ATV7002-0	£152	48	P233A-4-AHC	£51	29	P736LCA-9400	£96	31	PA-20xy-Z2K2	POA	13
MS-NAE4521-2	£10,114	47	NS-BCN7004-0	£974	48	P233A-4-AKC	£49	29	P736LCW-9300	£96	31	PA-21xy-Z2K7	POA	13
MS-NAE5510-2E	£12,796	47	NS-DTN7043-0	£141	48	P233A-4-PAC	£50	29	P736LCW-9800	£103	31	PA-20xy-Z3K2	POA	13
MS-NAE5511-2E	£13,310	47	NS-DTN7083-0	£141	48	P233A-4-PHC	£47	29	P736MCA-9300	£87	31	PA-21xy-Z3K7	POA	13
MS-NAE5520-2E	£14,253	47	NS-MHL7001-0	£550	48	P233A-4-PKC	£61	29	P736MCA-9800	£103	31	PA-20xy-Z6K2	POA	13
MS-NAE5521-2E	£13,820	47	NS-MHL7002-0	£550	48	P233A-50-AAC	£40	29	P736MCA-9850	£96	31	PA-21xy-Z6K7	POA	13
MS-NCE2500-0	£1,252	47	NS-MNN7001-0	£246	48	P233F-P3-AAC	£49	29	P736PGA-9300	£92	31	PA-20xy-Z7K2	POA	13
MS-NCE2506-0	£1,440	47	NS-MNN7003-0	£246	48	P28DA-9341	£325	29	P736PGB-9300	£101	31	PA-21xy-Z7K7	POA	13
MS-NCE2510-0	£2,023	47	NS-MTB7001-0	£405	48	P28DA-9660	£338	29	P736PLM-9370	£105	31	PLT112-1R	£8	25
MS-NCE2511-0	£2,236	47	NS-MTB7002-0	£405	48	P28DJ-9360	£529	29	P74DA-9300	£214	30	PLT112-2R	£7	25
MS-NCE2516-0	£2,391	47	NS-MTL7001-0	£404	48	P28DJ-9861	£518	29	P74DA-9600	£222	30	PLT69-11R	£2	25
MS-NCE2517-0	£2,462	47	NS-MTL7002-0	£405	48	P28DJ-9870	£518	29	P74EA-9300	£204	30	PM-8902-0500	£126	35
MS-NCE2520-0	£2,165	47	NS-WALLPLATE-0	£14	48	P28DP-9300	£251	29	P74EA-9600	£252	30	PM-		

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PM-8905-0500	£117	35	TC-8903-1152-WK	£139	35	TS-6340D-D10	£51	40	V5210CC	£31	5	VA1000-P2	£111	13
PM-8907-0300	£116	35	TC-8903-1183-WK	£166	35	TS-6340E-000	£38	40	V5210DC	£31	5	VA1000-S2	£94	13
PT-5217-7011	£447	28	TC-8904-2131-WK	£107	35	TS-6340K-F00	£26	40	V5210EC	£31	5	VA1000-SRU	£66	13
PT-5217-7101	£447	28	TC-8904-2132-WK	£120	35	TS-6340S-000	£51	40	V5210JC	£31	5	VA1125-GGA-1	£647	13
R			TC-8906-2131-WK	£159	35	TS-6350C-E10	£44	40	V5210KC	£34	5	VA1220-GGA-1	£820	13
R-3710-8205	£19	34	TC-8906-2132-WK	£143	35	TS-6350D-A10	£41	40	V5210MC	£55	5	VA1420-GGA-1	£819	13
RA-3000-7126	£951	13	TC-8907-1031-WK	£159	35	TS-6350D-B10	£44	40	V5210ZC	£31	5	VA7810-ADA-11	£500	14
RA-3000-7127	£827	13	TC-8907-1032-WK	£146	35	TS-6350D-C10	£51	40	V5290BC	£31	5	VA7810-ADA-12	£509	14
RA-3000-7226	£910	13	TC-8907-2031-WK	£157	35	TS-6350D-D10	£51	40	V5290CC	£31	5	VA7810-ADC-11	£558	14
RA-3000-7227	£827	13	TC-8907-2032-WK	£140	35	TS-6350E-000	£38	40	V5290DC	£31	5	VA7810-ADC-12	£565	14
RA-3000-7325	£948	13	TC-8931-2112-W	£94	35	TS-6350S-000	£51	40	V5290EC	£31	5	VA7810-AGA-11	£382	14
RA-3000-7326	£948	13	TC-8933-1112-W	£158	35	TS-6360C-E10	£44	40	V5510BC	£45	5	VA7810-AGA-12	£390	14
RA-3000-7327	£948	13	TC-8941-2141-WK	£150	35	TS-6360D-A10	£41	40	V5510CC	£45	5	VA7810-AGA-11	£413	14
RA-3003-7126	£1,207	13	TC-8942-2041-WK	£150	35	TS-6360D-B10	£44	40	V5510DC	£45	5	VA7810-AGC-12	£413	14
RA-3003-7127	£1,244	13	TC-8942-2041-WK	£150	35	TS-6360D-C10	£46	40	V5510EC	£45	5	VA7810-AGH-11	£413	14
RA-3003-7127	£1,244	13	TC-8943-1141-WK	£129	35	TS-6360D-D10	£51	40	V5510JC	£52	5	VA7810-AGH-12	£413	14
RA-3003-7226	£1,207	13	TC-8943-1141-WK	£125	35	TS-6360E-000	£38	40	V5510KC	£52	5	VA7810-GGA-11	£455	14
RA-3003-7227	£1,244	13	TC-8944-2141-WK	£125	35	TS-6360K-F00	£26	40	V5510MC	£63	5	VA7810-GGA-12	£455	14
RA-3003-7326	£1,165	13	TC-8946-2141-WK	£157	35	TS-6360K-000	£26	40	V5510MC	£63	5	VA7810-GGA-12	£455	14
RA-3003-7327	£1,165	13	TC-8947-2041-WK	£159	35	TS-6360S-000	£51	40	V5590BC	£45	5	VA7810-GGC-11	£517	14
RA-3041-7126	£1,255	13	TE-7000-8002	£123	39	TUC0311-2	£205	41	V5590CC	£45	5	VA7810-GGC-12	£517	14
RA-3041-7126	£1,492	13	TE-7000-8002-W	£122	39	TUC0311-2Bundle	£315	41	V5590DC	£45	5	VA7820-GGA-11	£484	14
RA-3041-7226	£1,492	13	TE-7000-8003	£120	39				V5590EC	£52	5	VA7820-GGA-12	£484	15
RA-3041-7325	£1,515	13	TE-7000-8003-W	£122	39	V			V5810BC	£41	5	VA7820-GGC-11	£625	14
RA-3041-7326	£1,407	13	TE-9100-8501	£31	39/40	V46AA-9300	£137	23	V5810CC	£41	5	VA7820-GGC-12	£625	15
RA-3100-7126	£1,007	13	TE-9100-8502	£35	41	V46AA-9301	£109	23	V5810DC	£41	5	VA7830-GGA-11	£484	14
RA-3100-7127	£1,007	13	TL-BRTRP-0	£808	48	V46AA-9510	£139	23	V5810EC	£41	5	VA7830-GGA-12	£484	15
RA-3100-7226	£934	13	TL-JCIBPP-DVDO	£98	48	V46AA-9600	£116	23	V5810JC	£45	5	VA7830-GGC-11	£631	14
RA-3100-7326	£1,055	13	TL-JCIBPP-DVD6	£18	48	V46AA-9602	£151	23	V5810KC	£45	5	VA7830-GGC-12	£625	15
RA-3100-7327	£1,137	13	TM-1100-8931	£18	39/40	V46AA-9606	£154	23	V5810MC	£56	5	VA9104-IGA-1S	£137	18
RA-3103-7127	£1,343	13	TM-1140-0000	£52	39	V46AA-9608	£147	23	VA-7070-21	£46	6	VA9104-GGA-1S	£175	18
RA-3103-7226	£1,165	13	TM-1150-0000	£68	39	V46AA-9609	£147	23	VA-7070-23	£46	6	VA9203-AGA-1Z	£217	18
RA-3103-7227	£1,255	13	TM-1160-0000	£73	39	V46AA-9950	£139	23	VA-7071-21	£46	6	VA9203-AGB-1Z	£265	18
RA-3103-7325	£1,340	13	TM-1160-0002	£93	39	V46AA-9951	£117	23	VA-7071-23	£46	6	VA9203-BGA-1	£149	18
RA-3103-7326	£1,283	13	TM-1160-0005	£73	39	V46AB-9300	£144	23	VA-7077-21	£46	6	VA9203-BGB-1	£205	18
RA-3103-7327	£1,381	13	TM-1160-0007	£86	39	V46AB-9510	£144	23	VA-7077-23	£46	6	VA9203-BUA-1	£166	18
RA-3141-7226	£1,421	13	TM-1170-0005	£68	39	V46AB-9600	£122	23	VA-7078-21	£46	6	VA9203-BUB-1	£213	18
RA-3141-7325	£1,596	13	TM-1170-0007	£77	39	V46AB-9605	£136	23	VA-7078-23	£46	6	VA9203-GGA-1Z	£247	18
RA-3141-7326	£1,525	13	TM-1190-0000	£73	39	V46AB-9950	£130	23	VA-7150-1001	£198	14	VA9203-GGB-1Z	£286	18
RLY13A603R	£158	28	TM-1190-0005	£73	39	V46AB-9951	£162	23	VA-7150-1003	£198	14	VA9208-AGA-1	£299	17
RLY13A627R	£208	28	TM-2140-0000	£53	40/41	V46AC-9300	£185	23	VA-7150-8201	£205	14	VA9208-AGC-1	£342	17
RLY13A635R	£205	28	TM-2150-0000	£56	40/41	V46AC-9510	£142	23	VA-7150-8203	£205	14	VA9208-BDA-1	£255	17
RS-1140-0000	£73	39	TM-2160-0000	£73	40/41	V46AC-9600	£190	23	VA-7152-1001	£308	14	VA9208-BDC-1	£299	17
RS-1160-0000	£105	39	TM-2160-0002	£72	40/41	V46AC-9605	£164	23	VA-7152-8201	£322	14	VA9208-BGA-1	£233	17
RS-1160-0005	£105	39	TM-2160-0005	£61	40/41	V46AC-9951	£185	23	VA-7200-1001	£340	14	VA9208-BGC-1	£277	17
RS-1180-0000	£138	39/41	TM-2160-0007	£61	40/41	V46AD-9300	£344	23	VA-7202-1001	£499	14	VA9208-GGA-1	£321	17
RS-1180-0002	£181	39/41	TM-2190-0000	£61	40/41	V46AD-9510	£410	23	VA-7480-0001	£101	6	VA9208-GGC-1	£364	17
RS-1180-0005	£139	39/41	TM-2190-0005	£61	40/41	V46AD-9511	£475	23	VA-7480-0003	£107	6	VAP1000-24-C	£504	4
RS-1180-0007	£181	39/41	TM-9100-8900	£13	39/40	V46AD-9600	£418	23	VA-7480-0011	£101	6	VAP3000-24-C	£840	4
RS-1190-0000	£96	39	TM-9100-8901	£24	39	V46AE-9300	£458	23	VA-7480-0013	£107	6	VF-998-100	£43	17
RS-1190-0005	£96	39	TM-9100-8902	£39	39	V46AE-9510	£469	23	VA-7481-0001	£101	6	VF-998-101	£43	17
S			TM-9100-8902-W	£39	39	V46AE-9512	£438	23	VA-7481-0003	£107	6	VF-998-102	£43	17
SEC002N600	£10	33	TS-6300D-000	£9	40	V46AE-9600	£476	23	VA-7481-0011	£101	6	VF-998-103	£43	17
SEC002N602	£11	33	TS-6300W-E200	£18	40	V46AR-9300	£552	23	VA-7481-0013	£107	6	VF-998-104	£77	17
SEC002N606	£17	33	TS-6300W-E300	£32	40	V46AR-9600	£573	23	VA-7482-0011	£107	6	VF-998-105	£77	17
SEC002N607	£14	33	TS-6300W-E400	£26	40	V46AS-9300	£1,017	23	VA-7482-1001	£107	6	VF-998-303	£201	17
SEC002N616	£10	33	TS-6300W-F200	£20	40	V46AS-9301	£1,036	23	VA-7482-2001	£107	6	VF-998-304	£268	17
SEC002N617	£12	33	TS-6300W-F300	£33	40	V46AT-9300	£1,435	23	VA-7700-1001	£181	14	VF-998-305	£278	17
SEC002N618	£12	33	TS-6300W-F400	£26	40	V46AT-9301	£1,435	23	VA-7700-1003	£159	14	VF-998-307	£671	17
SEC002N621	£10	33	TS-6300W-G200	£20	40	V47AA-9161	£292	23	VA-7706-1001	£366	14	VF-998-308	1006	17
SEC002N622	£17	33	TS-6300W-G300	£33	40	V47AB-9160	£358	23	VA-7740-1001	£227	14	VFB025H	£134	17
SEC002N624	£22	33	TS-6300W-G400	£27	40	V47AC-9160	£400	23	VA-7740-1003	£227	14	VFB032H	£137	17
SEC002N626	£14	33	TS-6300W-H200	£20	40	V47AD-9160	£530	23	VA-7746-1001	£412	14	VFB040H	£141	17
SEC002N627	£18	33	TS-6300W-H300	£34	40	V47AD-9161	£422	23	VA-9072-13	£2,519	17	VFB050H	£144	17
SEC002N628	£19	33	TS-6300W-H400	£29	40	V47AE-9161	£647	23	VA-9072-14	£1,679	17	VFB065H	£154	17
SEC002N631	£10	33	TS-6300W-I200	£21	40	V47AE-9161	£778	23	VA-9072-23	£2,351	17	VFB080H	£181	17
T			TS-6300W-I300	£41	40	V47AR-9160	£809	23	VA-9072-24	£1,511	17	VFB100H	£218	17
T90	£13	4	TS-6300W-I400	£30	40	V47AR-9161	£809	23	VA-9075-13	£4,031	17	VFB100L	£218	17
TBG16A-600R	£36	32/33	TS-6330C-E10	£44	40	V48AB-9510	£311	24	VA-9075-14	£2,855	17	VFB125H	£238	17
TC-8901-2131-WK	£150	35	TS-6330D-A10	£41	40	V48AB-9600	£311	24	VA-9075-24	£1,948	17	VFB125L	£238	17
TC-8901-2132-WK	£98	35	TS-6330D-B10	£44	40	V48AC-9510	£352	24	VA-9077-13	£5,374	17			

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VFB400H	£2,754	17	VG7203DT	£228	8	VG82A8S1N	£471	10	VG98A5S1L	£268	11
VFB400L	£2,754	17	VG7203ET	£228	8	VG82A9S1N	£471	10	VG98B1S1K	£280	11
VFB450H	£3,695	17	VG7203FT	£228	8	VG82B1S1N	£477	10	VG98B1S1L	£291	11
VFB450L	£3,695	17	VG7203GT	£228	8	VG82C1S1N	£496	10	VG98C1S1K	£291	11
VFB500H	£5,038	17	VG7203LT	£259	8	VG82D1S1N	£498	10	VG98C1S1L	£303	11
VFB500L	£5,038	17	VG7203NT	£329	8	VG82E1S1N	£547	10	VG98D1S1K	£338	11
VG1205AD	£72	15	VG7203PT	£412	8	VG82F1S1N	£681	10	VG98D1S1L	£355	11
VG1205AE	£72	15	VG7203RT	£553	8	VG82G1S1N	£810	10	VG98E1S1K	£362	11
VG1205AF	£72	15	VG7203ST	£739	8	VG82H1S1N	£1,020	10	VG98E1S1L	£385	11
VG1205AG	£72	15	VG7401AT	£165	8	VG82J1S1N	£1,203	10	VG98F1S1K	£338	11
VG1205AL	£72	15	VG7401BS	£165	8	VG82K1S1N	£1,959	10	VG98F1S1L	£426	11
VG1205AN	£72	15	VG7401BT	£165	8	VG82L1S1N	£2,614	10	VG98G1S1K	£530	11
VG1205BL	£76	15	VG7401CS	£165	8	VG88A1S1N	£647	10	VG98G1S1L	£559	11
VG1205BN	£76	15	VG7401CT	£165	8	VG88A2S1N	£647	10	VG98H1S1K	£728	11
VG1205CN	£78	15	VG7401DS	£165	8	VG88A3S1N	£647	10	VG98H1S1L	£763	11
VG1205CP	£78	15	VG7401DT	£165	8	VG88A4S1N	£647	10	VG98J1S1K	£1,078	11
VG1205DP	£143	15	VG7401ES	£165	8	VG88A5S1N	£647	10	VG98J1S1L	£1,136	11
VG1205DR	£143	15	VG7401ET	£165	8	VG88A6S1N	£647	10	VP100AAA	£179	4
VG1205ER	£187	15	VG7401FS	£165	8	VG88B1S1N	£650	10	VP100AAE	£179	4
VG1205ES	£187	15	VG7401FT	£165	8	VG88C1S1N	£659	10	VP100AAG	£190	4
VG1205FS	£254	15	VG7401GS	£165	8	VG88D1S1N	£688	10	VP100BAJ	£202	4
VG1205FT	£254	15	VG7401GT	£165	8	VG88E1S1N	£790	10	VP100BAN	£167	4
VG12E5GT	£505	15	VG7401LS	£165	8	VG88F1S1N	£905	10	VP100CAU	£230	4
VG12E5GU	£505	15	VG7401LT	£168	8	VG88G1S1N	£1,082	10	VP100CAW	£248	4
VG12E5HU	£547	15	VG7401NT	£259	8	VG88H1S1N	£1,384	10	VP100DAW	£275	4
VG12E5HW	£547	15	VG7401PT	£281	8	VG88J1S1N	£1,860	10	VP100DAY	£282	4
VG1805AD	£116	15	VG7401RT	£384	8	VG88K1S1N	£3,016	10	VP101AAA	£171	4
VG1805AE	£116	15	VG7401ST	£486	8	VG88L1S1N	£3,592	10	VP101AAE	£171	4
VG1805AF	£116	15	VG7403AT	£214	8	VG88A1S1N	£601	10	VP101AAG	£183	4
VG1805AG	£116	15	VG7403BT	£214	8	VG88A2S1N	£601	10	VP101BAJ	£208	4
VG1805AL	£116	15	VG7403CT	£214	8	VG88A3S1N	£601	10	VP101BAN	£162	4
VG1805AN	£116	15	VG7403DT	£214	8	VG88A4S1N	£601	10	VP101BBB	£1,035	4
VG1805BL	£112	15	VG7403ET	£214	8	VG88A5S1N	£601	10	VP101EBB	£1,035	4
VG1805BN	£116	15	VG7403FT	£214	8	VG88A6S1N	£601	10	VP101EBC	£1,221	4
VG1805CP	£115	15	VG7403GT	£228	8	VG88B1S1N	£603	10	VP101EBD	£1,386	4
VG1805DP	£154	15	VG7403LT	£261	8	VG88C1S1N	£744	10	VP101FBD	£1,188	4
VG1805ER	£148	15	VG7403NT	£338	8	VG88D1S1N	£662	10	VP101FBF	£2,140	4
VG1805ES	£244	15	VG7403PT	£391	8	VG88E1S1N	£876	10	VP101GBF	£2,140	4
VG1805FS	£233	15	VG7403RT	£615	8	VG88F1S1N	£981	10	VPA050-C	£1,512	4
VG1805FT	£355	15	VG7403ST	£730	8	VG88G1S1N	£1,144	10	VPA065-C	£1,613	4
VG1805GU	£340	15	VG7802AS	£182	8	VG88H1S1N	£1,456	10	VPA080-C	£1,848	4
VG1805HU	£493	15	VG7802AT	£182	8	VG88J1S1N	£1,987	10	VPA100-C	£2,183	4
VG1805JV	£471	15	VG7802BS	£182	8	VG88K1S1N	£3,167	10	VPA125-C	£3,097	4
VG18E5GT	£905	15	VG7802BT	£182	8	VG88L1S1N	£3,771	10	VPA150-C	£3,293	4
VG18E5GU	£905	15	VG7802CS	£182	8	VG94A1S1K	£256	11	VT7200C5031	£213	36
VG18E5HU	£926	15	VG7802CT	£182	8	VG94A1S1L	£268	11	VT7200F5031	£248	36
VG18E5JV	£968	15	VG7802DS	£182	8	VG94A2S1K	£256	11	VT7300C5031	£284	35
VG6210EC	£25	5	VG7802DT	£182	8	VG94A2S1L	£268	11	VT7300F5031	£300	35
VG6210JC	£34	5	VG7802ES	£182	8	VG94A3S1K	£256	11			
VG6210LC	£56	5	VG7802ET	£182	8	VG94A3S1L	£268	11	W		
VG6510EC	£41	5	VG7802FS	£182	8	VG94A4S1K	£256	11	WEL003N602R	£135	26/27
VG6510JC	£49	5	VG7802FT	£182	8	VG94A4S1L	£268	11	WMB0351-0	POA	47
VG6510LC	£92	5	VG7802GS	£182	8	VG94A5S1K	£256	11	WPF0351-0	POA	47
VG6810EC	£29	5	VG7802GT	£182	8	VG94A5S1L	£268	11	WRN12-1	£18	33
VG6810JC	£40	5	VG7802LS	£184	8	VG94B1S1K	£280	11	WRZ-TTB0000-0	£247	48
VG6810LC	£63	5	VG7802LT	£184	8	VG94B1S1L	£291	11	WRZ-TTD0000-0	£247	48
VG7201AS	£138	8	VG7802NT	£271	8	VG94C1S1K	£277	11	WRZ-TTP0000-0	£247	48
VG7201AT	£138	8	VG7802PT	£341	8	VG94C1S1L	£303	11	WRZ-TTR0000-0	£239	48
VG7201BS	£138	8	VG7802RT	£461	8	VG94D1S1K	£338	11	WRZ-TTS0000-0	£247	48
VG7201BT	£138	8	VG7802ST	£619	8	VG94D1S1L	£355	11			
VG7201CS	£138	8	VG7804AT	£287	9	VG94E1S1K	£530	11	Y		
VG7201CT	£138	8	VG7804BT	£287	9	VG94E1S1L	£385	11	Y65T31-0	£60	37
VG7201DS	£138	8	VG7804CT	£287	9	VG94F1S1K	£728	11			
VG7201DT	£138	8	VG7804DT	£287	9	VG94F1S1L	£426	11			
VG7201ES	£138	8	VG7804ET	£287	9	VG94G1S1K	£1,078	11			
VG7201ET	£138	8	VG7804FT	£287	9	VG94G1S1L	£559	11			
VG7201FS	£138	8	VG7804GT	£287	9	VG94H1S1K	£728	11			
VG7201FT	£138	8	VG7804HT	£356	9	VG94H1S1L	£763	11			
VG7201GS	£138	8	VG7804NT	£385	9	VG94J1S1K	£1,078	11			
VG7201GT	£138	8	VG7804PT	£518	9	VG94J1S1L	£1,136	11			
VG7201LT	£143	8	VG7804RT	£685	9	VG98A1S1K	£256	11			
VG7201NT	£205	8	VG7804ST	£807	9	VG98A1S1L	£268	11			
VG7201PT	£252	8	VG82A1S1N	£471	10	VG98A2S1K	£256	11			
VG7201RT	£389	8	VG82A2S1N	£471	10	VG98A2S1L	£268	11			
VG7201ST	£445	8	VG82A3S1N	£471	10	VG98A3S1K	£256	11			
VG7203AT	£228	8	VG82A4S1N	£471	10	VG98A3S1L	£268	11			
VG7203BT	£228	8	VG82A5S1N	£471	10	VG98A4S1K	£256	11			
VG7203CT	£228	8	VG82A6S1N	£471	10	VG98A4S1L	£268	11			
			VG82A7S1N	£471	10	VG98A5S1K	£256	11			

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