MAKING MODERN LIVING POSSIBLE

Commercial
Product Selection Guide

www.danfoss-randall.co.uk

Contact Details
Danfoss Randall Limited

Danfoss Randall's UK based sales and manufacturing site

Danfoss Randall Limited, Ampthill Road, Bedford, MK42 9ER

Reception
Tel: 0845 1217 400
Fax: 0845 1217 515

UK Sales
Tel: 0845 1217 500
Fax: 0845 1217 510

Devi Sales
Tel: 0845 434 9990
Fax: 0845 1217 510

Customer Service
Tel: 0845 1217 502

Training
Tel: 0845 1217 431
Fax: 0845 1217 513

Literature
Tel: 0845 1217 431
Fax: 0845 1217 513

Technical Support
Tel: 0845 1217 505
Fax: 0845 1217 510

Republic of Ireland
Reception
Tel: 1800 930 242

Sales
Tel: 1800 930 243
Fax: 1800 556 691

Technical Support
Tel: 1800 930 244

Efficient lean production facility

State of the art, temperature controlled auto assembly cell

On-site product testing laboratory used internally and externally for product validation and research

Photography Acknowledgements:
Martin O'Hara, Pedro Tavares , Yuri Arcurs , Sean Prior, Christopher Nuzzaco and Jonathan Ross.

Commercial Product Selection Guide
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Website
www.danfoss-randall.co.uk

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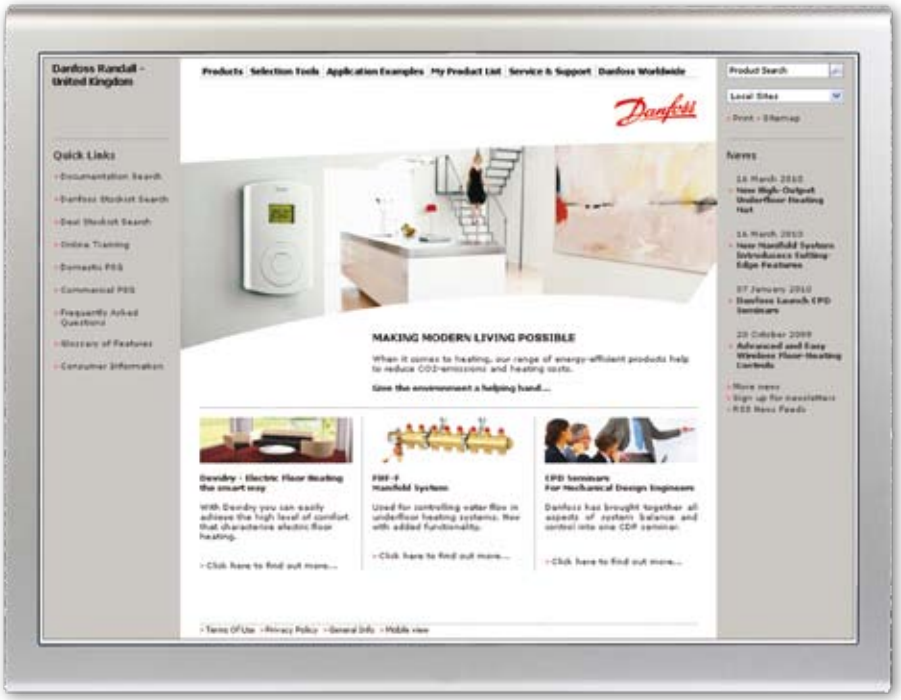

Today's high demand for energy-saving controls, plus the continual introduction of new products, has left many installers searching for answers. Optimum energy-efficiency in buildings increasingly calls for the use of advanced, more-effective controls. Some installers remain unaware of the latest, ground-breaking products that are essential to their continued professional success.

A great starting place for this information is **www.danfoss-randall.co.uk**. After many months of research, dedicated work, structured thought, imagination and unswerving attention to detail an easily navigable on-line encyclopaedia of clear and easily accessible information on controls for domestic, commercial and industrial heating/cooling applications is available. Visitors to the site will also find valuable advice, tips and detailed connection diagrams.

Navigation of the website is extremely quick and easy, and is helped by its cool, uncluttered style. With just a few clicks, product listings, selection tables and illustrations appear on screen instantly. Favourite products can be conveniently saved as a list for future visits.

Datasheets, instructions and user guides may be downloaded in pdf format and printed. Clear wiring connection diagrams for all popular controls are provided.

An advice section entitled 'Understanding Heating Controls', which explains controls usage and explodes many of the myths that have grown up surrounding domestic heating controls, is likely to be of major interest to all. This section can be easily downloaded and printed.

Full contact details are given to enable site visitors to obtain Sales Office support, order literature, obtain details of Training Seminars and pose specific controls problems to a Danfoss expert.

Danfoss Randall offer a range of online training modules for key commercial product ranges and a choice of CPD Seminars. Further information is available on www.danfoss-randall.co.uk

Thermostatic Radiator Valves
Accurate, Reliable, Energy Saving Controls

Danfoss are world leaders in the design and manufacture of radiator thermostats. Having invented the concept in 1943 Danfoss have, in the ensuing years, gone on to develop and manufacture numerous generations of radiator thermostats, offering ever improved performance.

The knowledge and experience of radiator thermostats possessed by Danfoss is unsurpassed, bringing together more than half a century of design, manufacturing and application knowledge that is second to none.

The rapid growth in the sale of radiator thermostats has, to a large extent, been down to the simplicity of the products, in terms of application and ease of use. Generally the more sophisticated the design, the more energy efficient and reliable the product is and Danfoss are at the top of the list when it comes to energy efficiency and reliability.

The need for high performance is never greater than in the demanding commercial heating market. In addition to expectations of high performance, specifiers and building owners also expect products which can withstand inevitable heavy handling and, in some cases misuse, plus be long lasting into the bargain.

The Danfoss RA2000 range is based on a saturated vapour sensor to provide the ultimate in control performance. The reason for this much improved performance is the well defined sensor location, and the small mass of the gas charge (saturated vapour) compared to other types (e.g. liquid or wax).

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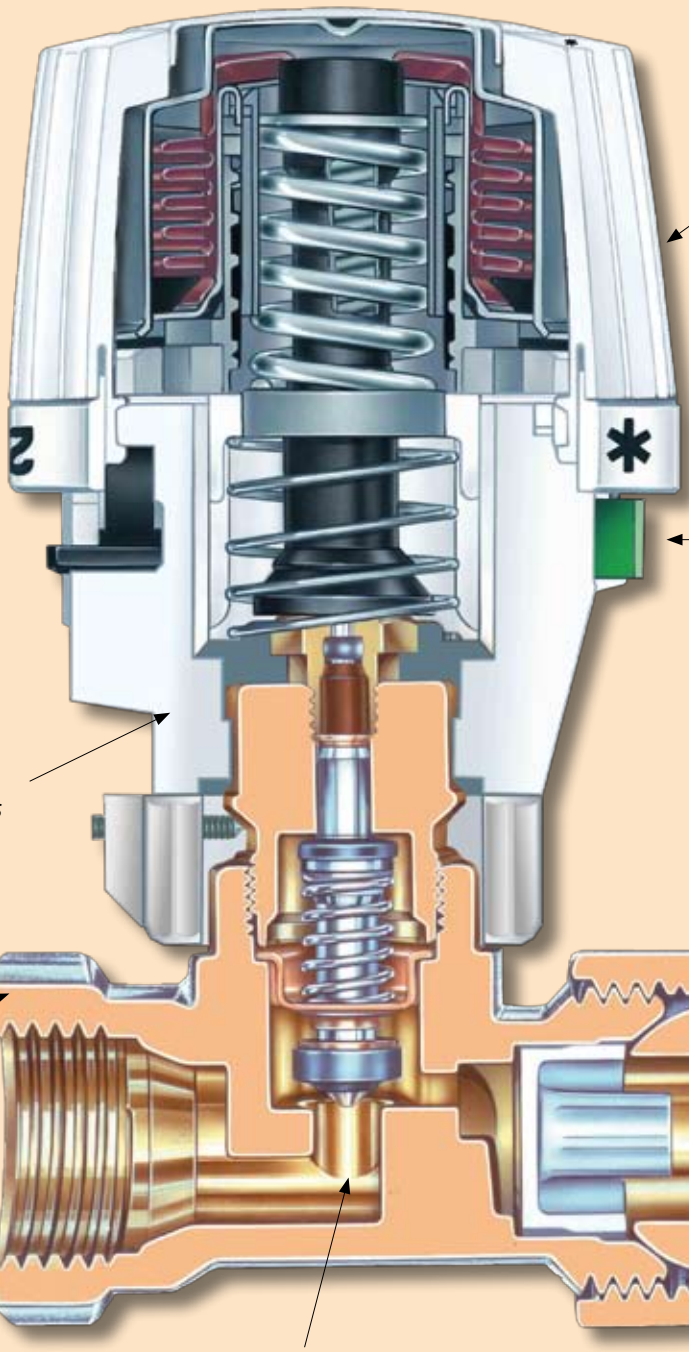
Working Principle

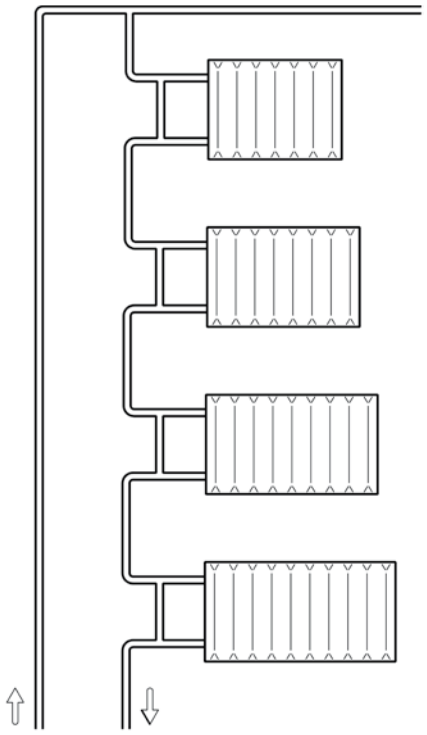


Single Pipe and Two Pipe Systems

There are two main types of radiator system, each with unique operating properties and each requiring a different valve type selection. See below for a quick guide to single and two pipe heating systems:

Single Pipe System

As the name implies, a single pipe system is a collection of radiators all connected to a single loop of pipe work throughout the building. Each radiator has the flow and return connected to the same pipe. Natural convection allowing heated water to rise into the radiator, displacing cooler water back into the single pipe circuit.

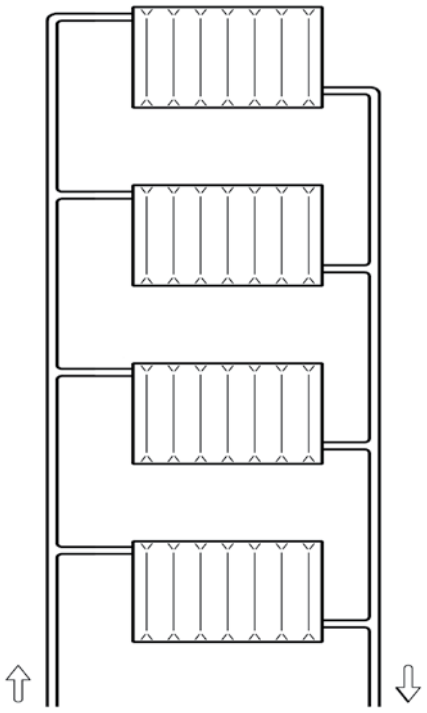


Single pipe systems can suffer from certain system specific problems:

- Because each radiator in the circuit extracts heat from the heated water, as you get further down the circuit the flow temperature is reduced requiring larger radiators to be fitted towards the end of the circuit.
- Larger pipe size required to feed the radiators.
- It is difficult to compensate for undersized radiators by increasing the water flow.

Single pipe systems are rarely fitted from new today, however many systems are still in operation and can be found in many industrial buildings, factories and schools. Designed for single pipe heating systems, the RA-G single pipe thermostatic valves have large diameter valve cones which deliver high capacity flow and control.

Two Pipe System



In the two pipe system there are separate flow and return pipes, with some form of bypass (preferably automatic) between the flow and the return. Because the flow and return in these systems is separate, the temperature of the water reaching each radiator is basically the same meaning radiator output is roughly the same at each branch of the circuit.

- Two pipe systems benefit from lower material costs due to pipe work and radiator surface area being smaller generally than in a one pipe system.
- Same size radiators can be used throughout the system.
- System balance is important to reduce noise and temperature variations in the system.

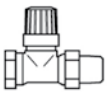
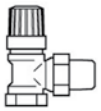
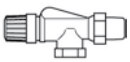
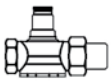
Two pipe systems can be fitted with pre-setting (RA-N) or fixed capacity (RA-FN) valves together with a thermostatic sensor from the RA2000 range.

Commercial Radiator Thermostat
Selection Guide

- *Approved combination*
  Refer to notes for any restrictions/advice

1 *Mount sensor horizontally*
2 *Consider use of remote sensor to improve performance*
3 *Remote sensor is recommended*
4 *Valve body flow selector must be commissioned*

Description	Built-in Sensors			Remote Sensors (0-2m)			2/5/8m Wall Adjusters
	Standard	Low Temp.	Tamperproof	Standard	Low Temp.	Tamperproof	
Symbol							
Model	RA2910	RA2914	RA2920	RA2912	RA2916	RA2922	RA5062 RA5065 RA5068
Codes	013G291000	013G291400	013G292000	013G291200	013G291600	013G292200	013G506200 013G506500 013G506800
Temperature Range	5-26°C	5-22°C	5-26°C	5-26°C	5-22°C	5-26°C	6-28°C

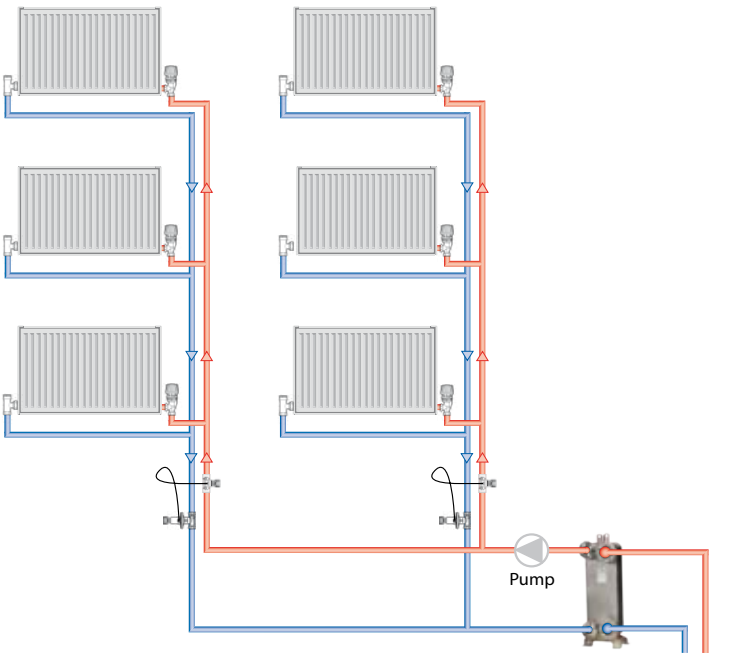
Valve Options							Sensor Options						
Symbol			Size	Standard Valves		Valves with pre-setting							
				Type	Code No.	Type	Code No.						
2-Pipe System	Straight		8/10mm	RA-FS 15	013G628300	N/A		• 4	• 4	• 4	• 4	• 4	• 4	• 4
			15mm	RA-FS 15	013G628100	N/A								
			3/8″	RA-FN 10	013G002200	RA-N 10	013G003200	• 1	• 1	• 1	•	•	•	•
			1/2″	RA-FN 15	013G002400	RA-N 15	013G003400							
			1/2″/15mm	RA-FN 15	013G008400	RA-N 15	013G0034AA							
			3/4″	RA-FN 20	013G002600	RA-N 20	013G003600							
			1″	RA-FN 25	013G002800	RA-N 25	013G003800							
	Vertical Angle		3/8″	RA-FN 10	013G002100	RA-N 10	013G003100	• 2	• 3	• 2	•	•	•	•
			1/2″	RA-FN 15	013G002300	RA-N 15	013G003300							
			1/2″/15mm	RA-FN 15	013G0023AA	RA-N 15	013G0033AA							
			3/4″	RA-FN 20	013G002500	RA-N 20	013G003500							
			1″	RA-FN 25	013G002700	RA-N 25	013G003700							
	Horizontal Angle		3/8″	RA-FN 10	013G014100	RA-N 10	013G015100	•	•	•	•	•	•	•
			1/2″/15mm	RA-FN 15	013G014900	RA-N 15	013G015300							
			3/4″	RA-FN 20	013G014500	RA-N 20	013G015500							
1-Pipe System	Straight		1/2″	RA-G 15	013G338400	N/A		• 1	• 1	• 1	•	•	•	•
			3/4″	RA-G 20	013G338600	N/A								
			1″	RA-G 25	013G338800	N/A								
	Vertical Angle		1/2″	RA-G 15	013G338300	N/A		• 2	• 3	• 2	•	•	•	•
			3/4″	RA-G 20	013G338500	N/A								
			1″	RA-G 25	013G338700	N/A								

Combi Packs
RA2000

RA-FN Vertical *RA2910* *RLV 15 Vertical*

Description	Contains	Code No
Vertical Angle ½" / 15mm Combi pack	1 x RA2910 Thermostatic Head 1 x RA-FN15 Valve (inc 15mm compression fitting)	013G602100
Vertical Angle ¾" Combi Pack	1 x RA2910 Thermostatic Head 1 x RA-FN20 Valve	013G602200
Vertical Angle + Lockshield Valve ½" / 15mm Combi Pack	1 x RA2910 Thermostatic Head 1 x RA-FN15 Valve (inc 15mm compression fitting) 1 x RLV-S15 ½"/15mm Lockshield	013G602300
Vertical Angle + Lockshield Valve ¾" Combi Pack	1 x RA2910 Thermostatic Head 1 x RA-FN20 Valve 1 x RLV-S20 ¾" Lockshield	013G602400

Application



- ***Convenient pack based solution***
- ***Packs available with or without lockshield***
- ***4 unique valve combinations covering the most popular RA2000 combinations***

Complementing the range of individual separates available in the RA2000 range are the RA2000 Combi Packs. The range of four packs brings together the most popular RA2000 components into a convenient package allowing for simple ordering of all components with one code number.

Packs come complete with a standard RA2910 thermostatic head and are available in either ½" (complete with 15mm compression adaptors) or ¾" variations and with or without a lockshield valve.

Fixed Capacity Valve Bodies
RA-FN Valves for 2-Pipe Systems

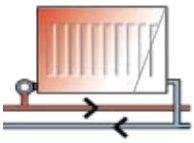
- ***RA-FN valves without pre-setting***
- ***RA-FN valves are easily recognised by a grey cover cap***
- ***May also be used with RAS-D² and RAS-C² sensors (RA-FN only)***
- ***Wide range of fittings available see page 20***

RA-FN valves are designed for use in 2-pipe heating systems where circulation through both pipe work and radiator is pumped. They are conventional uni-directional valves without pre-setting; system balancing must be made using lockshield valves installed on the radiator return connection. Please refer to pages 16 and 17 for matching lockshield valves.

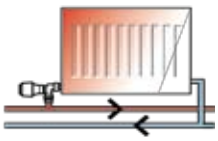
A wide range of compression fittings for copper, PEX and ALUPEX pipe are available for use with RA-FN valves, please refer to page 20.

All valves incorporate a gland-seal assembly that can be replaced without the need for special tools and without draining down the system.

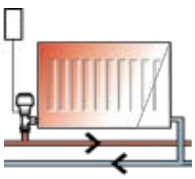
RA-FN valves are suitable for use with all RA2000 sensors and may also be used with RAS-D² and RAS-C² sensors. Please refer to our technical department for capacity information if using RAS-D² or RAS-C² sensors.



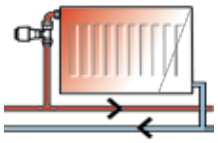
RA-N side angle left



RA-N horizontal angle



RA-N vertical angle



RA-N straight

RA-FN Straight

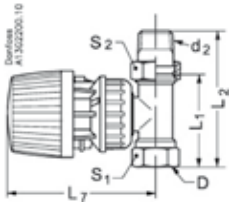
RA-FN Horizontal Angle

RA-FN Vertical

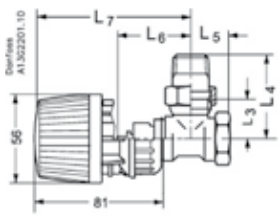
RA-FN Valve Bodies for 2-Pipe Systems					
Pattern	**Type**	**Code No**	**Connections**		**Kv Value Xp = 2K(2)**
			Pipe	**Radiator Tail**	
Straight	RA-FN 10	013G002200	3/8″ BSP	3/8″ BSP	0.56
	RA-FN 15	013G002400	½″ BSP	½″ BSP	0.73
	RA-FN 15	013G008400	15mm or ½″ BSP	½″ BSP	0.73
	RA-FN 20	013G002600	¾″ BSP	¾″ BSP	1.04
	RA-FN 25	013G002800	1″ BSP	1″ BSP	1.04
Vertical Angle (1)	RA-FN 10	013G002100	3/8″ BSP	3/8″ BSP	0.56
	RA-FN 15	013G002300	½″ BSP	½″ BSP	0.73
	RA-FN 15	013G0023AA	15mm or ½″ BSP	½″ BSP	0.73
	RA-FN 20	013G002500	¾″ BSP	¾″ BSP	1.04
	RA-FN 25	013G002700	1″ BSP	1″ BSP	1.04
Horizontal Angle	RA-FN 10	013G014100	3/8″ BSP	3/8″ BSP	0.56
	RA-FN 15 UK	013G014900	15mm or ½″ BSP	½″ BSP	0.73
	RA-FN 20	013G014500	¾″ BSP	¾″ BSP	0.80
(1) To ensure optimum performance use remote sensor			*(2) Kv values when used with RA2000 sensors*		
Technical Specifications					
Maximum Operating Temperature					120°C
Maximum Working Pressure					10 Bar
Maximum Differential Pressure					0.6 Bar

Pattern	Type	D	d_2 BSP	L_1	L_2	L_3	L_4	L_5	L_6	L_7*	L_8	L_9	L_{10}	L_{11}	Arc. Flats S_1	Arc. Flats S_2
Straight	RA-FN 10	3/8″	3/8″	60	85				47	96					22	27
	RA-FN 15	½″	½″	67	95				47	96					27	30
	RA-FN 20	¾″	¾″	74	106				52	101					32	37
	RA-FN 25	1″	1″	90	126				52	101					41	46
Vertical Angle	RA-FN 10	3/8″	3/8″			27	52	22	47	96					22	27
	RA-FN15	½″	½″			30	58	26	47	96					27	30
	RA-FN 20	¾″	¾″			34	66	29	52	101					32	37
	RA-FN 25	1″	1″			40	75	34	52	101					41	46
Horizontal Angle	RA-FN 10	3/8″	3/8″						59	108	26	51	22		22	27
	RA-FN 15 UK	½″	½″						60	98	26	54	33	44	27	30
	RA-FN 20	¾″	¾″						61	110	34	66	30		32	27

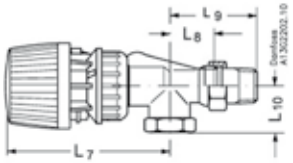
** Add 32mm to L_7 to allow for sensor removal.*



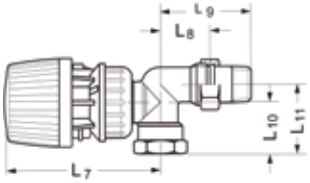
Straight - RA-N or RA-FN



Vertical Angle - RA-N or RA-FN



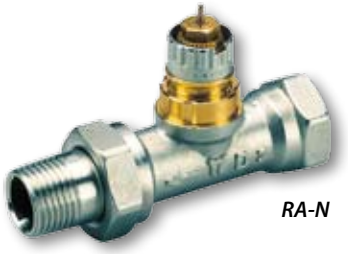
Horizontal Angle - RA-N 10, 15 or 20 & RA-FN 10 or 20



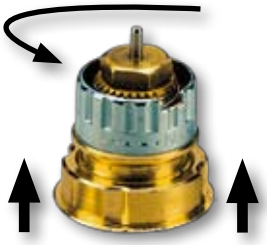
Horizontal Angle - RA-FN 15 UK

Pre-Setting Valve Bodies
RA-N Valves for 2-Pipe Systems

RA-N



RA-N



Calibrated Setting Scale RA-N

- ***RA-N valves with pre-setting for larger heating systems***
- ***RA-N valves in flow***
- ***RA-N valves are easily recognised by a red cover cap***
- ***Available in vertical angle, horizontal angle, side angle and straight pattern versions in 3/8", 1/2", and 1" sizes***

RA-N are uni-directional valves with integrated pre-setting. Pre-setting allows the commissioning engineer to precisely set the flow rate through the valve by adjusting the valve capacity to match the radiator heat output requirement.

Pre-setting is carried out by setting a calibrated orifice within the valve. The setting is achieved by turning a scale located in the top part of the valve body. The setting mechanism is concealed once the thermostat sensor is fitted. This type of pre-setting is significantly more accurate than that possible with conventional lockshield valves. When pre-setting valves are used the role of the lockshield valve is simply to provide isolation for radiator removal.

RA-N Valve Bodies for 2-Pipe Systems with Pre-Setting						
Pattern	**Type**	**Code No**	**Connections**		**Kv Value** [1][3] **(Xp = 2K)**	
			Pipe	**Radiator Tail**	**Min**	**Max**
Straight	RA-N 10	013G003200	3/8" BSP	3/8" BSP	0.04	0.56
	RA-N 15	013G003400	1/2" BSP	1/2" BSP	0.04	0.73
	RA-N 15	013G0034AA	15mm or 1/2" BSP	1/2" BSP	0.04	0.73
	RA-N 20	013G003600	3/4" BSP	3/4" BSP	0.10	1.04
	RA-N 25	013G003800	1" BSP	1" BSP	0.10	1.04
Vertical Angle [2]	RA-N 10	013G003100	3/8" BSP	3/8" BSP	0.04	0.56
	RA-N 15	013G003300	1/2" BSP	1/2" BSP	0.04	0.73
	RA-N 15	013G0033AA	15mm or 1/2" BSP	1/2" BSP	0.04	0.73
	RA-N 20	013G003500	3/4" BSP	3/4" BSP	0.10	1.04
	RA-N 25	013G003700	1" BSP	1" BSP	0.10	1.04
Horizontal Angle	RA-N 10	013G015100	3/8" BSP	3/8" BSP	0.04	0.56
	RA-N 15	013G015300	1/2" BSP	1/2" BSP	0.04	0.73
	RA-N 15	013G0153AA	15mm or 1/2" BSP	1/2" BSP	0.04	0.73
	RA-N 20	013G015500	3/4" BSP	3/4" BSP	0.16	0.80
Side Angle [4]	RA-N 10L	013G023100	3/8" BSP	3/8" BSP	0.04	0.56
	RA-N 10R	013G023200	3/8" BSP	3/8" BSP	0.04	0.56
	RA-N 15L[5]	013G233000	1/2" BSP	1/2" BSP	0.04	0.73
	RA-N 15R[5]	013G023400	1/2" BSP	1/2" BSP	0.04	0.73

(1) Kv value at Xp = 2 when used with RA2000 sensors. (2) To ensure optimum performance use remote sensor.
(3) Refer to setting table supplied with valves to adjust Kv. (4) L = Left, R = Right
(5) Also available in chrome finish. Details available at request.

Technical Specifications	
Maximum Operating Temperature	120°C
Maximum Working Pressure	10 Bar
Maximum Differential Pressure	0.6 Bar

Pattern	**Type**	**D**	**d_2**	L_1	L_2	L_3	L_4	L_5	L_6	L_7*	L_8	L_9	L_{10}	**Arc. Flats**	
		BSP												S_1	S_2
Straight	RA-N 10	3/8"	3/8"	60	85				47	96				22	27
	RA-N 15	1/2"	1/2"	67	95				47	96				27	30
	RA-N 20	3/4"	3/4"	74	106				52	101				32	37
	RA-N 25	1"	1"	90	126				52	101				41	46
Vertical Angle	RA-N 10	3/8"	3/8"			27	52	22	47	96				22	27
	RA-N15	1/2"	1/2"			30	58	26	47	96				27	30
	RA-N 20	3/4"	3/4"			34	66	29	52	101				32	37
	RA-N 25	1"	1"			40	75	34	52	101				41	46
Horizontal Angle	RA-N 10	3/8"	3/8"						59	108	26	51	22	22	27
	RA-N 15	1/2"	1/2"						60	109	26	55	27	27	30
	RA-N 20	3/4"	3/4"						61	110	34	66	30	32	27
Side Angle	RA-N 10	3/8"	3/8"						47	103	27	52	27	22	27
	RA-N 15	1/2"	1/2"						47	96	30	58	33	27	30

** Add 32mm to L_7 to allow for sensor removal.*

See page 10 for dimensional drawings.

RA-N 10
Guideline basis RA2000 sensor

ΔT(K)			
10K	15K	20K	
~Watt			
100	200	250	1
250	400	550	2
400	650	850	3
650	1000	1350	4
900	1350	1800	5
1200	1800	2400	6
1350	2050	2750	7
2050	3050	4100	N

RA-N 15
Guideline basis RA2000 sensor

ΔT(K)			
10K	15K	20K	
~Watt			
100	200	250	1
250	400	550	2
400	650	850	3
700	1100	1450	4
1100	1650	2150	5
11450	2150	2900	6
1850	2800	3700	7
2650	4000	5350	N

RA-N 20
Guideline basis RA2000 sensor

ΔT(K)			
10K	15K	20K	
~Watt			
350	550	700	1
550	800	1100	2
600	900	1200	3
950	1400	1900	4
1250	1900	2550	5
1650	2500	3350	6
2650	4000	5350	7
3800	5700	7600	N

RA-N 20 UK
Guideline basis RA2000 sensor

ΔT(K)			
10K	15K	20K	
~Watt			
550	850	1150	1
700	1100	1450	2
900	1350	1800	3
1250	1900	2550	4
1700	2550	3400	5
2150	3250	4350	6
2650	4000	5350	7
2900	4350	5850	N

Δp=10kPa

Valves for 1-Pipe Systems
RA-G

- *RA-G valves in flow*
- *Suitable for use with all RA2000 sensors*
- *Available in both vertical angle and straight pattern designs in ½", ¾" and 1" sizes*

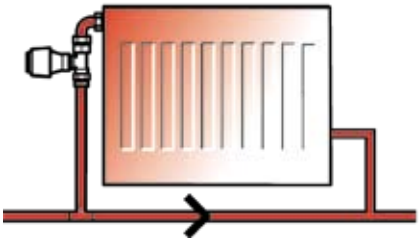
RA-G valves are high capacity low resistance valves for use in conventional 1-pipe heating systems in which water circulation through the radiator is mainly by thermo-siphon. In such systems the circulating pressure available to overcome the frictional resistance of the valve and the radiator is extremely low and is generally insufficient to overcome the resistance of normal 2-pipe radiator thermostats.

RA-G valves are specifically designed for use in such systems and have large diameter valve cones which deliver high capacities at low proportional offsets ensuring that comfort temperatures can be maintained under all load conditions.

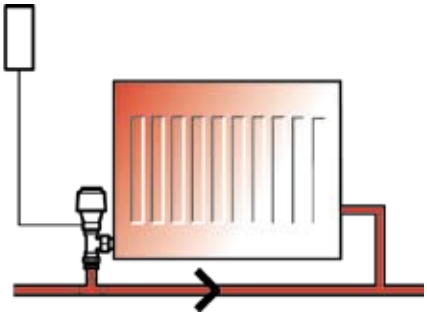
All valves incorporate a gland-seal assembly that can be replaced without the need for special tools and without draining down the system.

RA-G straight

RA-G angled



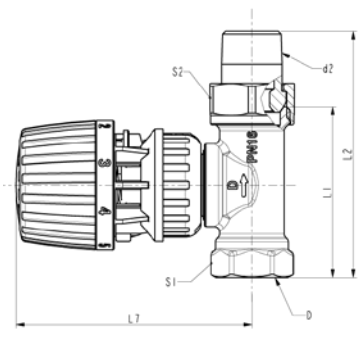
RA-G straight

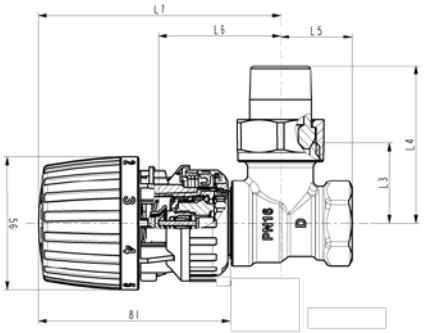


RA-G vertical angle

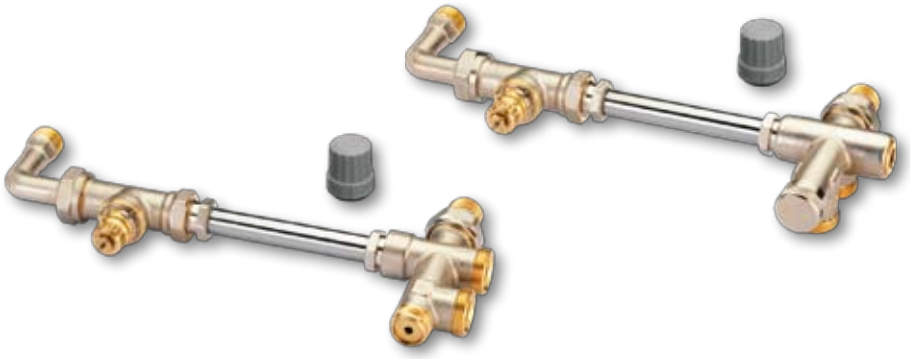
RA-G Valve Bodies for 1-Pipe Systems					
Pattern	**Type**	**Code No**	**Connections**		**Kv Value Xp = 2K[2]**
			Pipe[3]	**Radiator Tail**	
Straight	RA-G 15	013G167500	½" BSP	½" BSP	1.63
	RA-G 20	013G167700	¾" BSP	¾" BSP	2.06
	RA-G 25	013G167900	1" BSP	1" BSP	2.27
Vertical Angle [1]	RA-G 15	013G167600	½" BSP	½" BSP	2.06
	RA-G 20	013G167800	¾" BSP	¾" BSP	2.20
	RA-G 25	013G168000	1" BSP	1" BSP	2.41
Please note: *(1) To ensure optimum performance use remote sensor* *(2) Kv values when used with RA2000 Sensors* *(3) Not suitable for use with Fittings listed on page 20*					
Technical Specifications					
Maximum Operating Temperature					120°C
Maximum Working Pressure					10 Bar
Maximum Differential Pressure (RA-G 25)					0.16 Bar
Maximum Differential Pressure (RA-G 15 & 20)					0.2 Bar

Type	DN	D	d_2	L_1	L_2	L_3	L_4	L_5	L_6	L_7	S_1	S_2
RA-G 15	15	½"	½"	68	96	30	58	27	52	103	27	30
RA-G 20	20	¾"	¾"	74	106	34	66	30	54	103	32	37
RA-G 25	25	1"	1"	90	126	42	78	34	57	106	41	46

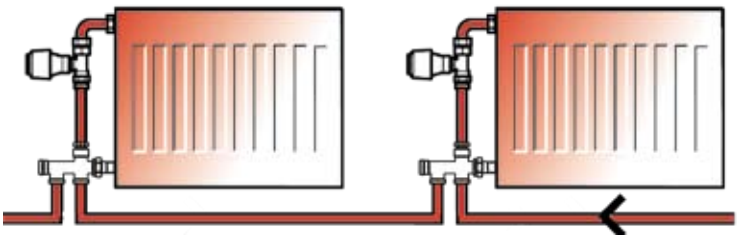




Manifold Assemblies for 1-Pipe Systems
RA-KE and RA-KEW



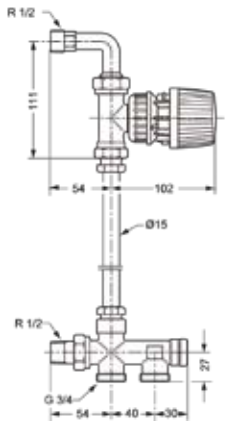
RA-KE *RA-KEW*

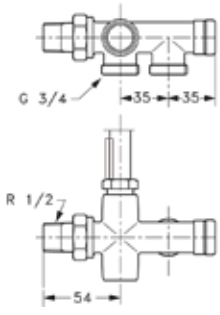


Manifold assemblies used in 1-pipe systems

Product	Code No	Radiator Connection ISO 7-1	System Connection ISO 228-1	Kvs Value (m^3/h) [1]	Max operation pressure (bar)	Max. diff. pressure (bar)[2]	Test pressure (bar)	Max. water temp (°C)
Valve body with angle piece [3]	013G336200	R ½		2.5	10	0.6	16	120
Manifold valve RA-KE [3]	013G336600		G ¾					
Manifold valve RA-KEW [3]	013G336800							
Connection pipe L650 x ø 15mm L950 x ø 15mm	013G337800 013G337700							
Set pack for floor connection	013G334100	Valve body and manifold valve RA-KE						
Set pack for wall connection	013G334300	Valve body and manifold valve RA-KEW						

1) Capacity of manifold assembly. Bypass through radiator: 35%.
2) The maximum differential pressure specified is the maximum pressure at which the valves give satisfactory regulation. As with any device which imposes a pressure drop in the system, noise may occur under certain flow/pressure conditions. To ensure quiet operation, maximum pressure drop should not exceed 30 to 35 kPa. The differential pressure can be reduced by using Danfoss differential pressure regulators.
3) Includes compression fittings for connection pipe





- *Versatile control units for all types of radiator*
- *Standard ½" side connections*
- *Suitable for 1-pipe pumped systems*
- *Suitable for use with all RA2000 sensors*
- *Range of compression fittings available*

The manifold assemblies RA-KE and RA-KEW are versatile control units for all types of radiators with standard ½" side connections. RA-KE and RA-KEW valves are for 1-pipe pumped systems.

The manifold assembly includes a manifold valve body with shut off facility, a connection pipe and a radiator valve body.

The centre distance between connection pipe is 35mm, which allows system pipes to be connected using a junction box.

Danfoss manifold assemblies can be used with all RA2000 sensors.

A wide range of compression fittings for steel, copper, PEX and AluPex piping allows fast and flexible installation. See page 20.

To avoid deposits and corrosion the water quality should comply to VDI 2035 guidelines

Built-in Sensors - Standard and Tamperproof
RA2000

- *RA2910 temperature range 5-26°C*
- *RA2920 tamperproof*
- *All models have locking and limiting feature*
- *Use with RA-N, RA-FN or RA-G valves*

RA2000 sensors are high performance temperature sensors ideally suited for commercial applications. The temperature sensor uses frictionless bellows charged with a small volume of liquified gas. The sensor relies upon the state change from liquid to a gas as the temperature of the liquid increases to modulate the valve towards the closed position. When the temperature falls the gas condenses back to a liquid and the spring within the sensor allows the valve to modulate open until the bellows pressure and spring pressure are equal, and the valve cone is stationary.

This type of saturated vapour pressure sensor has many advantages including low thermal mass giving quick reaction times and a defined sensor location at coolest part of bellows system.

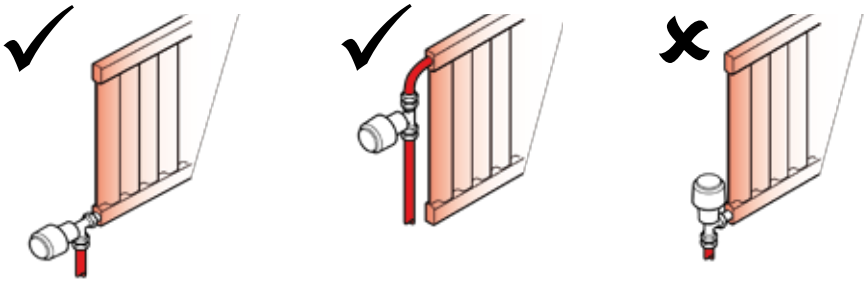
This latter feature gives the product a very low flow temperature dependence making it ideal for use in systems with weather compensated flow temperatures.

The range includes standard temperature range (5-26°C) and low temperature range (5-22°C) models. Both incorporate range locking and limiting features that allow the commissioning engineer to lock or limit the setting range of the sensor.

For best performance built-in temperature sensors should be mounted horizontally. Care should be taken not to cover the thermostat or to locate it where it may be influenced by heat from electrical appliances or cold draughts.

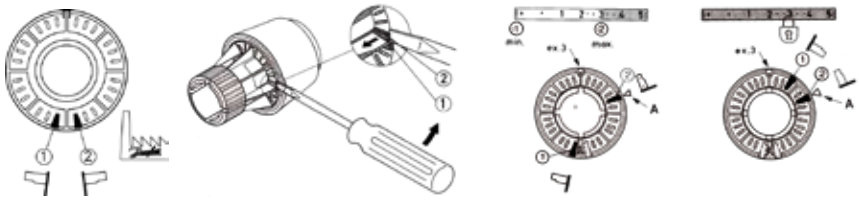
RA2910 Built in Sensor

RA2920 Tamperproof Sensor

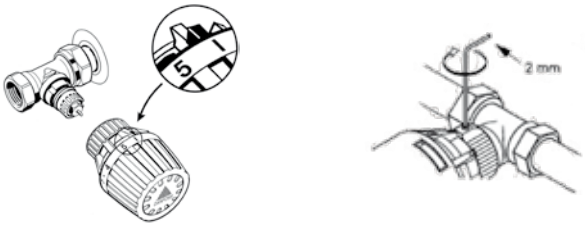


RA2000 Built-in Sensors			
Type	**Code No**	**Sensor (max sensor temp 60°C)**	**Temp Range Xp = 2K**
RA2910	013G291000	Built-in	5-26°C
RA2914	013G291400	Built-in, low temperature range model	5-22°C
RA2920	013G292000	Tamperproof	5-26°C

Locking and Limiting



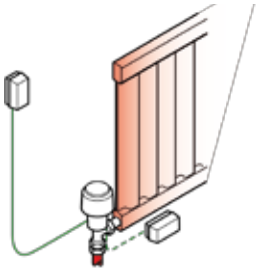
Sensor Mounting

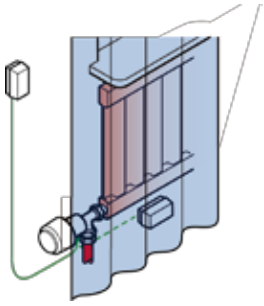


Remote Sensors and Adjusters
RA2000

RA2912 Remote Sensor

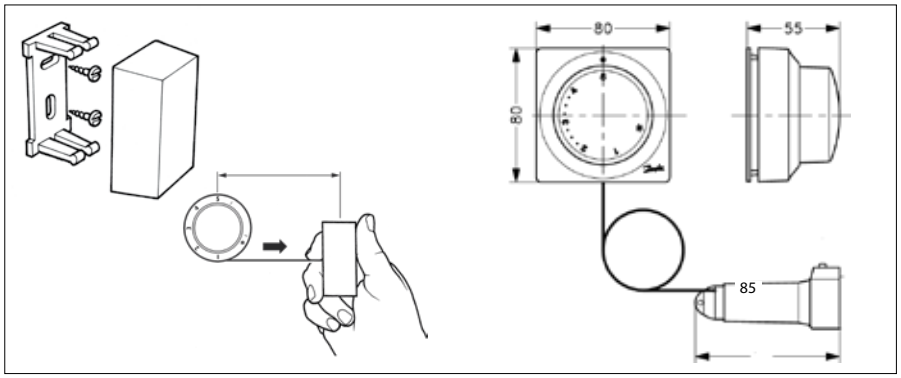
RA5062 Remote Adjuster





RA2000 Remote Sensors			
Type	**Code No**	**Sensor (max sensor temp 60°C)**	**Temp Range Xp = 2K**
RA2912	013G291200	Remote Sensor, 0-2m capillary tube	5-26°C
RA2916	013G291600	Remote Sensor, 0-2m capillary tube	5-22°C

RA2000 Remote Sensor Adjusters			
Type	**Code No**	**Sensor (max sensor temp 60°C)**	**Temp Range Xp = 2K**
RA5062	013G506200	2m Capillary includes locking and limiting	8-28°C
RA5065	013G506500	5m Capillary includes locking and limiting	8-28°C
RA5068	013G506800	8m Capillary includes locking and limiting	8-28°C
RA5075	013G075000	15m Capillary includes locking and limiting	8-28°C



- *All models have locking and limiting*
- *Capillary can be adjusted between 0-2 metres on remote sensors*
- *Remote adjusters available*
- *Use with RA-N, RA-FN or RA-G valves*

Utilising the same sensor technology as the built-in sensor, remote sensors are ideal for use in situations where built-in sensors may be adversely affected by heat gains or cold draughts.

Remote sensors comprise a setting unit that is mounted on the valve and a remote sensor which can be located up to 2 metres from the setting unit. The two components are interconnected by an ultra-thin capillary tube. During installation, the required length of tube is pulled out and fixed to the wall with clips or by staple gun.

The range includes standard (5-26°C) and low (5-22°C) temperature range models. Both incorporate range locking and limiting features that allow the commissioning engineer to lock or limit the setting range of the sensor.

The RA2000 range also includes versions that take both sensing and temperature adjustment away from the valve. These remote temperature adjusters are ideal for use in situations where radiators are encased or where the demand is to locate the temperature adjustment at a position more convenient than on the radiator e.g. in residential accommodation for the elderly or disabled. The product is also an ideal solution for heated ceiling applications.

The remote temperature adjuster models comprise an actuator that is mounted on the valve and a thermostat unit which provides temperature sensing and adjustment. These are interconnected by an ultra-thin capillary tube. During installation the required length of capillary is pulled out and fixed to the wall using clips or staples.

Lockshield Valves with Drain-Off
RLV

- *Straight or angled versions*
- *Use in 1 or 2 pipe systems*
- *Maximum flow temperature 120°C*
- *Maximum working pressure 10 bar*

The RLV range of lockshield valves match the finish and style of RA-G, RA-FN and RA-N valve bodies. They are available in vertical angle and straight pattern versions in 3/8", 1/2" and 3/4" sizes for screwed pipe-work and 15mm for copper pipe-work.

Adjustment of the valve is made using a 6mm Allen key. Once set, a screw-on brass cover conceals the valve setting mechanism.

In addition to providing a balancing and isolation function, RLV lockshield valves also incorporate a drain-down / filling feature. To utilise this feature a drain-off accessory is mounted to the valve in place of the decorative cap. The system can then be drained down or filled by connecting a hose to the drain down adapter.

RLV 15 Vertical

RLV 15 Straight

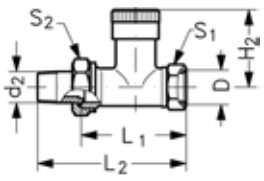
Drain Cock Adaptor

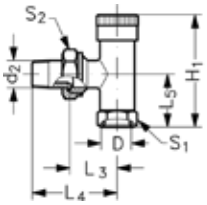
RLV Commercial Lockshield Valves				
Pattern	**Type**	**Code No**	**Connection Sizes**	
			Pipe	**Radiator**
Vertical Angle	RLV 10	003L014100	3/8"	3/8"
	RLV 15	003L014300	½"	½"
	RLV 15	003L014315	15mm	½"
	RLV 20	003L014500	¾"	¾"
Straight	RLV 10	003L014200	3/8"	3/8"
	RLV 15	003L014400	½"	½"
	RLV 15	003L014415	15mm	½"
	RLV 20	003L014600	¾"	¾"

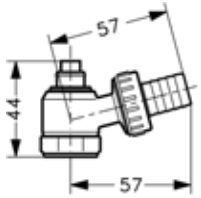
Drain-cock Adaptor and Compression Fittings for RLV Series Valves	
Code No	**Description**
003L015200	Drain-cock adaptor for use with RLV models only, not RLV-S

Specification	
Maximum working pressure	10 Bar
Maximum working temperature	120°C
Test pressure	16 Bar
Valve body finish	Nickel Plated
Gland seal type	Double O-ring
Supplied with LSV cap (nickel plated brass)	Yes
Supplied with wheel head cap	No

Dimensions

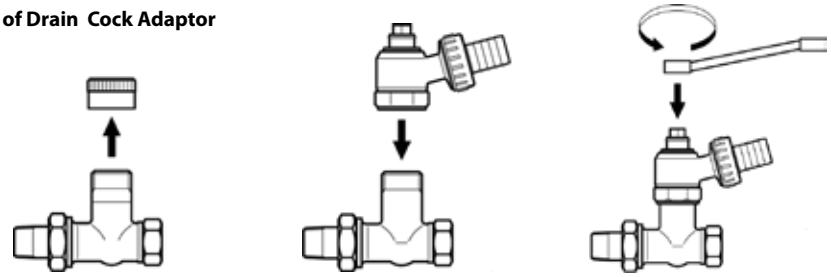






Type	**D**	**d_2**	**H_1**	**H_2**	**L_1**	**L_2**	**L_3**	**L_4**	**L_5**	**S_1**	**S_2**
RLV 10	R_p3/8	R_p3/8	55	40	49	75	26	52	22	22	27
RLV 15	R_p½	R_p½	59	40	51	80	29	58	27	27	30
RLV 20	R_p¾	R_p¾	62	42	59	91	34	66	30	32	37

Use of Drain Cock Adaptor



Lockshield Valves Without Drain Off
RLV-S

RLV-S 15 Vertical

RLV-S 15 Straight

- *Straight or angled versions*
- *Use in 1 or 2-pipe systems*
- *Maximum flow temperature 120°C*
- *Maximum working pressure 10 bar*

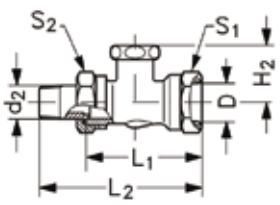
The RLV-S range of lockshield valves match the finish and style of RA-G, RA-FN and RA-N valve bodies. They are available in vertical angle and straight pattern versions in 3/8", 1/2" and 3/4" sizes for screwed pipe-work and 15mm for copper pipe-work.

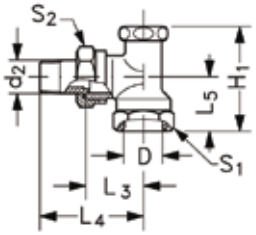
Adjustment of the valve is made using a 6mm Allen key. Once set, a screw-on brass cover conceals the valve setting mechanism.

The RLV-S does not incorporate a drain down feature.

RLV-S Commercial Lockshield Valves				
Pattern	**Type**	**Code No**	**Connection Sizes**	
			Pipe	**Radiator**
Vertical Angle	RLV-S 10	003L012100	3/8"	3/8"
	RLV-S 15	003L012300	½"	½"
	RLV-S 15	003L012315	15mm	½"
	RLV-S 20	003L012500	¾"	¾"
Straight	RLV-S 10	003L012200	3/8"	3/8"
	RLV-S 15	003L012400	½"	½"
	RLV-S 15	003L012415	15mm	½"
	RLV-S 20	003L012600	¾"	¾"
Specification				
Maximum working pressure			10 Bar	
Maximum working temperature			120°C	
Test pressure			16 Bar	
Valve body finish			Nickel Plated	
Gland seal type			Double O-ring	
Supplied with LSV cap (nickel plated brass)			Yes	
Supplied with wheel head cap			No	

Dimensions





Type	**D**	**d_2**	**H_1**	**H_2**	**L_1**	**L_2**	**L_3**	**L_4**	**L_5**	**S_1**	**S_2**
RLV-S 10	G_p3/8	R_p3/8	42	26	51	75	27	51	23	22	27
RLV-S 15	G_p½	R_p½	52	28	53	80	30	57	27	27	30
RLV-S 20	G_p¾	R_p¾	52	28	61	92	34	65	30	32	37

Proportional Controller for Heating Circuits
FEV-IF and FEV-FF

- *Proportional Controllers for heating circuits*
- *Can be used with RA-N, RA-G and RA-C*
- *FEV-IF can be used in floor, ceiling or radiator heating*
- *FEV-FF can be used with fancoil or induction units*

The FEV is a proportional controller which opens or closes the heating valve as a function of the temperature deviation.

FEV sensors can be applied in combination with RA-N RA-G or RA-C valves. The FEV sensors are equipped with a direct acting valve-controller that opens the valve when the temperature drops below the set temperature. If the set temperature is equal to or higher than the room temperature the valve is closed.

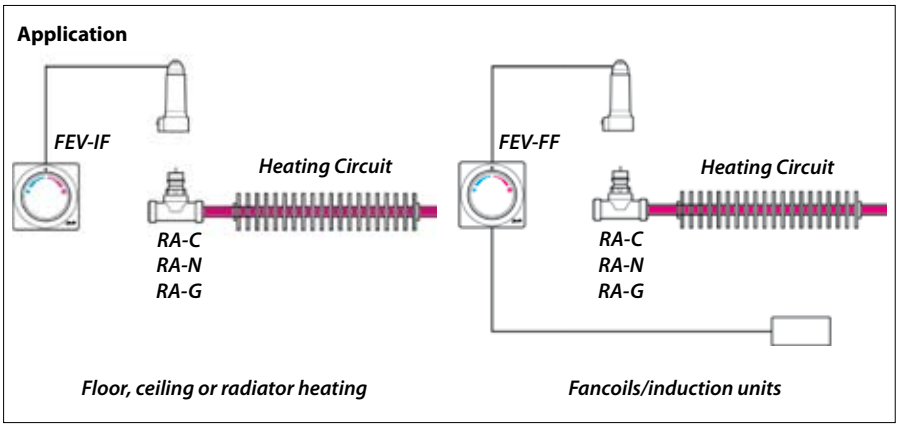
FEV-IF
To be applied in systems with ceiling, floor or radiator heating. The temperature adjuster/sensor should be mounted on an internal wall at a height of approximately 1.5 metres in such a way that the room temperature can be measured accurately.

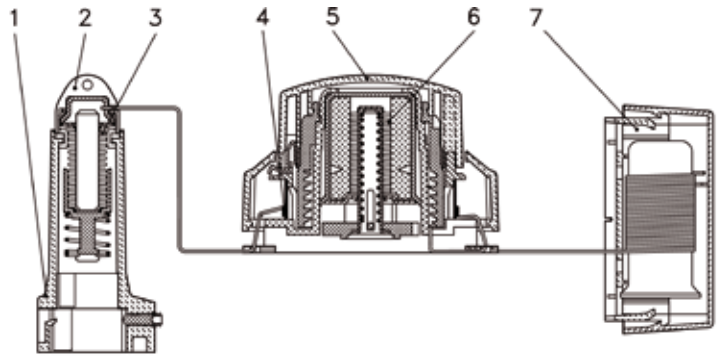
FEV-FF
To be applied in systems with fancoils or induction units. By placing the remote sensor in the room-air inlet of the unit a smaller response time to temperature changes can be achieved which will result in a more accurate temperature control.

FEV-IF with integrated sensor

FEV-FF with remote sensor

Type	Code No.	Sensor	Capillary Tube	Setting Range
FEV-IF	013G546700	Integrated Sensor	5 metres	17-27°C
FEV-FF	013G546600	Remote Sensor	2 + 2 metres	





1. *Heating adapter*
2. *Actuator*
3. *Adjustment bellows*
4. *Capillary reel*
5. *Remote temperature adjuster*
6. *Bellows*
7. *Remote temperature sensor (FEV-FF)*

Spare Parts and Accessories
Gland Seals, Sensors and Adapters

Gland Seals

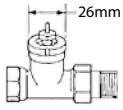
Valve Adaptor

Manual Positive Shut-Off Dial

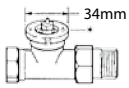
Gland Seals					
013G029000	Gland Seal Assembly for RA-FS, RA-FR, RA-FN, RA-N and RA-G Valves				
013U007000	Gland Seal Assembly for RAV and RAVL Valves				
Accessories for RA2000 Sensors and Valves					
013G123200	Anti-Theft for Sensors (50 pieces)				
013L123400	Range Displacement Caps (20 pieces)				
013G123700	Threaded Range Limiting pins (30 pieces)				
013G123300	RA2020 Scale Cover (20 pieces)				
013G123600	Toolkit, comprising Allen Key and Locking Pin Tool				
013G123000	Accessory Bag for RA2000 Remote Sensor Base, Fixing Screw and Capillary Caps				
Accessories for RA2000 Remote Adjusters					
013G519300	Adaptor for RA5062, 5065 and 5068 for RAV Valves				
013G519200	Adaptor for RA5062, 5065 and 5068 for RAVL Valves				
Accessories for RA-FS, RA-FN, RA-N & RA-G Valves					
Code No	**Description**	**RA-FS**	**RA-FN**	**RA-N**	**RA-G**
013G500000	Manual Positive Shut-Off Dial	•	•	•	•
013G500100	Blanking Cap for Valve Outlet	•			
013G027500	Spare Protective Cap	•	•	•	•

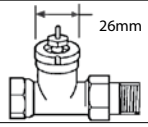
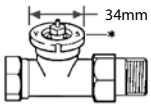
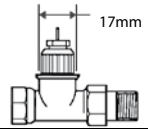
Selecting a suitable replacement sensor

RAVL thermostats are replaced by RA/VL



RAV thermostats are replaced by RA/V



RA2000 Replacement Sensors and Gland Seals						
Existing Valve Body Dimensions	Existing Valve Body Type	Replacement Sensor - *please note: the Code No's have changed*				
		New Code No	Old Code No	Sensor Type	Description	Temp Range (Xp = 2k)
	RAVL	013G295000	013G221000	RA/VL	Built-In Sensor	5 - 26°C
		013G295200	013G221200	RA/VL	Remote Sensor 2m Capillary	
	RAV	013G296000	013G231000	RA/V	Built-In Sensor	5 - 26°C
		013G296200	013G231200	RA/V	Remote Sensor 2m Capillary	
	RA-FN RA-G RA-N	Refer to RA2000 Sensors on p. 10-12				

Gland Seal

- *Just two gland seals cover the whole range of Danfoss valves*
- *Can be replaced without draining down the system*

Replacement Sensor

- *Allows easy up-grade of old valves without the need to drain down*
- *Versions available for RAVL and RAV valve bodies*
- *Available in built-in and remote sensor versions*

Gland Seals

All gland seals in Danfoss radiator thermostats are designed to provide a long and trouble free in-service life. However, periodically it may be necessary to replace seals should failure occur.

All valves produced by Danfoss since early 1960's incorporate gland seal assemblies which can be replaced without draining down the system.

Valve Adaptor

Adaptors to convert RA2000 remote temperature adjusters for use with RAV and RAVL bodies already installed.

Manual Positive Shut-Off Dial

The RA manual positive shut-off dial fits onto all valve bodies in the RA Series and can be used for manual opening and closing of the valve.

Replacement Sensors

Replacement sensors incorporate RA2000 sensor technology and design, and provide a simple and straight forward way to upgrade older radiator thermostats without the need to drain down the system.

Copper Fittings
For Copper, PEX and ALUPEX Pipe

ALUPEX Fittings Internal/External

PEX Fittings Internal/External

Copper Fittings Internal/External

For Valves with Female Threaded Connections	
Compression Fittings for:	**RA-FN, RA-N** Radiator Thermostat Valve Bodies, **RLV** and **RLV-S** Lockshield Valve Bodies
Pipe Type:	**Copper**
013G410000	3/8" x 10mm
013G410200	3/8" x 12mm
013G410800	1/2" x 8mm
013G411000	1/2" x 10mm
013G411200	1/2" x 12mm
013G411500	1/2" x 15mm
Pipe Type:	**PEX**
013G414200	1/2" x 12 x 0.2mm
013G414400	1/2" x 14 x 2.0mm
013G414700	1/2" x 15 x 2.5mm
013G415600	¾" x 16 x 2.0mm
Pipe Type:	**ALUPEX**
013G417200	1/2" x 12 x 2mm
013G417400	1/2" x14 x 2mm
Please note: Copper pipe must be in accordance with BS2871 part 1/BSEN1057. It is recommended to use supporting bushes with soft copper pipes. PEX pipe must be in accordance with DIN16892/16893 or BS7291 part 1:1990 or part 3:1990. Maximum operating pressure and temperature are given by the pipe manufacturer. However, 6 bar and 95°C must not be exceeded.	
Design: For use with valves having a female threaded connection. Fitting comprises olive and externally threaded compression nut, dimension of female thread is included in the description. For PEX and ALUPEX a pipe support insert is also included.	

For Valves with Male Threaded Connections	
Compression Fittings for:	**RA-KE**, **RA-KEW** and **FHF-F**
Pipe Type:	**Copper**
013G412000	3/4" x 10mm
013G412200	3/4" x 12mm
013G412500	3/4" x 15mm
Pipe Type:	**PEX**
013G416500	3/4" x 15mm x 1.7mm
013G415500	3/4" x 15mm x 2.5mm
013G416300	3/4" x 16mm x 2.2mm
013G415900	3/4" x 18mm x 2.5 mm
013G416100	3/4" x 20mm x 2.5mm
Pipe Type:	**ALUPEX**
013G418400	3/4" x 14mm x 2.0mm
013G418500	3/4" x 15mm x 2.5mm
013G418600	3/4" x 16mm x 2.0mm
013G418800	3/4" x 18mm x 2.0mm
013G419000	3/4" x 20mm x 2.0mm
Please note: Copper pipe must be in accordance with BS2871 part1/BSEN1057. It is recommended to use supporting bushes with soft copper pipes. PEX pipe must be in accordance with DIN16892/16893 or BS7291 part 1:1990 or part 3:1990. Maximum operating pressure and temperature are given by the pipe manufacturer. However, 6 bar and 95°C must not be exceeded.	
Design: For use with valves having a 3/4" male threaded connection. Fitting comprises olive and internally threaded compression nut. For PEX and ALUPEX a pipe support insert is also included.	

Motorised Control Valves
For Optimum Control In Any Construction

Danfoss markets a comprehensive range of motorised control valves with different functions and features, all competitively priced. Our control valves are available in a range of different materials and with a variety of different connection types and sizes. Our motorised control valve range meets the requirements of virtually every application.

Terminal Units and Zone Controls - Our range of 2, 3 and 4-port terminal unit valves for use in fan-coil, induction unit and zone control applications provide stable control, consistently low noise levels and fewer control fluctuations, all of which guarantee longer lifetime for both valves and actuators. All valves are available in both linear and logarithmic characteristic versions, these are complemented by a range of 3-point and 0-10 volt modulating actuators.

Heating and Cooling - A range of valves for use in water and glycol based heating and cooling systems is also available in both 2-port and 3-port versions in a wide range of sizes, with linear, logarithmic or split characteristics. A full range of on/off, 3-position and 0-10 modulating actuators, some with safety function and spring return, complete the range. Applications include air handling units, chillers, boilers and fan-coil unit control.

Other Application Areas - Danfoss also produce rotating shoe valves and butterfly valves, more information on these products is available on demand.

www.danfoss-randall.co.uk

Motorised Control Valves
Selection Guide

Actuator Codes: * denotes spring direction SU = Spring Up SD = Spring Down (Check valve direction) ** TWA-Z NO close and TWA-Z NC opens port A-AB when operate with VZL valves				TWA-Z	ABNM	AMV(E) 110NL-120NL		AMV/E/H 130-140	
									
Supply	3-Position	Modulating	Safety Function	ON/OFF	0-10V			H = Knob Version	
24	✓		✗			AMV 110NL	AMV 120NL	AMV 130	AMV 140
24	✓		✓	TWA-Z					
24		✓	✗		ABNM	AME 110NL	AME 120NL	AME 130	AME 140
230	✓		✗					AMV 130	AMV 140
230	✓		✓	TWA-Z					
potentiometer	✓	✗	✓	✗	✗	✗	✗	✗	✗
switch	✓	✗	✓	✗	✗	✗	✗	✗	✗
			Speed (s/mm)	24	24	24	12	24	12
			F (N)	100	100	130	130	200	200
			Stroke (mm)	3	3	5	5	5.5	5.5

PN Bar	Tmax °C	Valve Type	DN mm	Kvs m³/h	stroke mm						
16	-10 - +120°	ABQM  Down to close	10LF	0-150 l/h	2.25	✓	✓	✓	✓	✓	✓
			10	0-275 l/h							
			15LF	0-275 l/h							
			15	0-450 l/h							
			20	0-900 l/h							
			25	0-1700 l/h	4.5	✗	✗				
			32	0-3200 l/h							
16	2-100°C	VZL2, VZL4  Up to close	15	0.25; 0.4; 0.63	3	✓	✓	✗	✗	✓	✓
				1; 1.6							
			20	2.5; 3.5							
16	2-120°C	VZ2; VZ3; VZ4  Up to close	15	0.25; 0.4; 0.63; 1	5.5	✗	✗	✗	✗	✓	✓
			20	2.5; 4							
16	2-120°C	VRBZ 2/3  Up to close	20	6.3	5.5	✗	✗	✗	✗	✓	✓
			25	10							
			32	13							
			40	16							

Please note:
Zone valves AMZ 112 and 113 are not shown in the table because valve and actuator are sold as a package and not as a single unit.

Actuator Codes:
* denotes spring direction
SU = Spring Up
SD = Spring Down
(Check valve direction)

Supply	3-Position	Modulating	Safety Function	AMV(E) 435	AME 15QM	AMV/E 438SU	AMV(E) 55	AMV(E) 85	AME 55QM	AME 85QM	AMV/E 25SD
											
24	✓		✗	AMV435	AME15QM		AMV 55	AMV 85	AME 55QM	AME 85QM	
24	✓		✓			AMV 438SU					AMV 25SD
24		✓	✗	AME 435	AME15QM		AME 55	AME 85	AME 55QM	AME 85QM	
24		✓	✓			AME 438SU					AME 25SD
230	✓		✗	AMV 435			AMV 55	AMV 85			
230	✓		✓			AMV 438SU					AMV 25SD
potentiometer	✓	✗	✓	1P only or 1S only		✓	✓	✓	✓	✓	✓
switch	✓	✗	✓			✓	✓	✓	✓	✓	✓
			Speed (s/mm)	7.5	11	11	8	8	8	8	15
			F (N)	400	500	1000	2000	5000	2000	5000	450
			Stroke (mm)	20	15	15	40	40	40	40	15

PN Bar	Tmax °C	Valve Type	DN mm	Kvs m³/h	stroke mm							
16	2-120°C	VRB/VRG  Up to close	15	0.63; 1; 1.6; 2.5; 4	10	✓	✗	✓	✗	✗	✗	✗	✗
			20	6.3									
			25	10									
			32	16									
			40	25									
			50	40									
25	200°C	VF  Down to close	15	0.63; 1; 1.6; 2.5; 4	10	✓	✗	✓	✗	✗	✗	✗	✓
			20	6.3									
			25	10									
			32	16	15								
			40	25									
			50	40									
			65	63	20			✗	✓				✗
			80	80									
			100	145	30	✗							
			125	220	40				✗	✓			
			150	320									
25	200°C	VFS  Down to close	15	0.4; 0.63; 1; 1.6; 2.5; 4	15	✗	✗	✗	✗	✗	✗	✗	✓
			20	6.3									
			25	10									
			32	16									
			40	25									
			50	40									
			65	63	40				✗	✓			✗
			80	100									
			100	145									
16	-10 - +200°C	ABQM  Down to close	40	7.5	10	✗	✓	✗	✗	✗	✗	✗	✗
			50	12.5	10								
			65	20	15								
			85	28	15								
			100	38	15								
			125	190	25		✗				✓		
			150	145	25								
			200	190	27	✗	✗	✗	✗	✗	✗	✓	
			250	280	27								

Fan Coil Control Valves with a 2.8mm Stroke
VZL 2 and VZL 4

- *Reduced cost valves for control of fan coil systems along with thermic, 3-point control or modulating actuators*
- *15mm and 20mm compression ends for connection to copper pipework using a nut and olive (not supplied)*
- *2 and 4 port versions available*
- *2.8mm stroke to enable use with TWA-Z thermic actuator*

VZL 2

VZL 4

Use with TWA-Z thermic, AMV/AMV (-H) 130 or 140 Actuators

Technical Data	*(valves supplied without fittings)*
Nominal pressure	PN 16
Nominal size	DN 15 to DN 20
Flow characteristic	Linear
Mixing characteristic	Linear
Medium temperature	2 to 120°C
Control ratio	Minimum 30:1
Leakage loss, closed valve	A - AB ≤ 0.05% of Kvs
	B - AB ≤ 1% of Kvs
Thread connection	External thread - Compression
Stroke	2.8mm
Material: Body	Brass
Material: Stem	Brass
Material: Seat cone	Brass
Material: Stuffing box	EPDM

Three-way valves

Code No.	Type	DN (mm)	Kvs (m3/h)	Max Δp (bar)	Weight (kg)
065Z204000	VZL 2 DN 15	15	0.25	2.5	0.27
065Z204100	VZL 2 DN 15	15	0.40	2.5	0.27
065Z204200	VZL 2 DN 15	15	0.63	2.5	0.27
065Z204300	VZL 2 DN 15	15	1.0	2.0	0.27
065Z204400	VZL 2 DN 15	15	1.6	2.0	0.27
065Z204500	VZL 2 DN 20	20	2.5	1.0	0.27
065Z204600	VZL 2 DN 20	20	2.5	1.0	0.27

Four-way valves

Code No.	Type	Kvs (A- AB) (m3/h)	Kvs (B - AB) (m3/h)	Max Δp (bar)	Weight (kg)
065Z206000	VZL 4 DN 15	0.25	0.25	2.5	0.39
065Z206100	VZL 4 DN 15	0.40	0.25	2.5	0.39
065Z206200	VZL 4 DN 15	0.63	0.40	2.5	0.39
065Z206300	VZL 4 DN 15	1.0	0.63	2.0	0.39
065Z206400	VZL 4 DN 15	1.6	1.0	2.0	0.39
065Z206500	VZL 4 DN 20	2.5	1.6	1.0	0.59
065Z206600	VZL 4 DN 20	3.5	2.5	1.0	0.59

Code No.	Type
065F000600	Stuffing box

Fan Coil Control Valves with a 5.5mm Stroke
VZ2, 3 and 4-way

VZ2

VZ3

VZ4

- *Valves for control of fan coil systems along with 3-point control or modulating actuators*
- *15mm and 20mm compression ends for direct connection to copper pipework (not supplied)*
- *5.5mm stroke to prevent reduced flow caused by build up*
- *Valve body and plug made of de-zincing free brass to eliminate erosion*
- *Option for flat connections - available on request*

Use with AMV/AMV (-H) 130 or 140 Actuators

Technical Data	*(Valves supplied without compression nuts and olives)*
Nominal pressure	PN 16
Nominal size	DN 15 to DN 20
Flow characteristic	Logorithmic
Mixing characteristic	Linear
Medium temperature	2 to 120°C
Control ratio	Minimum 1:50
Leakage rate: Through way	Maximum 0,05% of Kvs
Leakage rate: Mixing way	Maximum <1% of Kvs
Threaded connection	External (Compression)
Material: Body	Brass (dezincing)
Material: Stem	Stainless steel
Material: Plug	Brass
Material: Stem packing	EPDM

Two-way valves

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
065Z501000	VZ2 15/0.25	15	0.25	5.5	0.4
065Z501100	VZ2 15/0.4	15	0.4	5.5	0.4
065Z501200	VZ2 15/0.6	15	0.6	5.5	0.4
065Z501300	VZ2 15/1.0	15	1.0	5.5	0.4
065Z501400	VZ2 15/1.6	15	1.6	5.5	0.4
065Z501500	VZ2 15/2.5	15	2.5	5.5	0.4
065Z502000	VZ2 20/2.5	20	2.5	5.5	0.5
065Z502100	VZ2 20/4.0	20	4.0	5.5	0.5

Three-way valves

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
065Z511000	VZ3 15/0.25	15	0.25	5.5	0.4
065Z511100	VZ3 15/0.4	15	0.4	5.5	0.4
065z511200	VZ3 15/0.6	15	0.6	5.5	0.4
065Z511300	VZ3 15/1.0	15	1.0	5.5	0.4
065Z511400	VZ3 15/1.6	15	1.6	5.5	0.4
065Z511500	VZ3 15/2.5	15	2.5	5.5	0.4
065Z512000	VZ3 20/2.5	20	2.5	5.5	0.5
065Z512100	VZ3 20/4.0	20	4.0	5.5	0.5

Four-way valves

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight kg)
065Z521000	VZ4 15/0.25	15	0.25	5.5	0.5
065Z521100	VZ4 15/0.4	15	0.4	5.5	0.5
065Z521200	VZ4 15/0.6	15	0.6	5.5	0.5
065Z521300	VZ4 15/1.0	15	1.0	5.5	0.5
065Z521400	VZ4 15/1.6	15	1.6	5.5	0.5
065Z521500	VZ4 15/2.5	15	2.5	5.5	0.5
065Z522000	VZ4 20/2.5	20	2.5	5.5	0.6
065Z522100	VZ4 20/4.0	20	4.0	5.5	0.6

Plant Short Stroke Control Valves
VRBZ 2- and 3-way

- *Low pressure plant valves in 20-40mm for use with 3-point, modulating and spring return fan coil actuators*
- *Internal or external versions available*
- *Internal version can be directly connected to BSP pipework*
- *External version comes with couplings for BSP connection*
- *Valve body and plug made of RG5 brass to eliminate erosion*
- *Stuffing box available for future maintenance*

VRBZ 2

VRBZ 3

Use with AMV/AME (-H) 130 or 140, AMV/AME 13SU (Spring return) actuators

Technical Data	
Nominal pressure	PN 16
Nominal size	DN 20 to DN 40
Flow characteristic	Linear
Mixing characteristic	Linear
Medium temperature	2 to 120°C
Control ratio	Minimum 1:50
Leakage rate: Through way	Maximum 0,05% of Kvs
Leakage rate: Mixing way	Maximum 2% of Kvs
Threaded connection	External according to ISO 228/1 Internal according to DIN 2999
Material: Body	Rg5
Material: Stem	Stainless steel
Material: Plug	Brass
Material: Stem Packing	EPDM

Two-way valves - internal thread

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
065Z722001	VRBZ2 20/6.3 int.	20	6.3	5.5	1.2
065Z722501	VRBZ2 25/10 int.	25	10	5.5	1.4
065Z723201	VRBZ2 32/13 int.	32	13	5.5	2.1
065Z724001	VRBZ2 40/16 int.	40	16	5.5	2.9

Three-way valves - internal thread

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
065Z722000	VRBZ3 20/6.3 int.	20	6.3	5.5	1.2
065Z722500	VRBZ3 25/10 int.	25	10	5.5	1.4
065Z723200	VRBZ3 32/13 int.	32	13	5.5	2.1
065Z724000	VRBZ3 40/16 int.	40	16	5.5	2.9

Two-way valves - external thread

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
065Z742002	VRBZ2 20/6.3 ext.	20	6.3	5.5	1.1
065Z742502	VRBZ2 25/10 ext.	25	10	5.5	1.4
065Z743202	VRBZ2 32/13 ext.	32	13	5.5	2.0
065Z744002	VRBZ2 40/16 ext.	40	16	5.5	2.9

Three-way valves - external thread

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
065Z742001	VRBZ3 20/6.3 ext	20	6.3	5.5	1.1
065Z742501	VRBZ3 25/10 ext.	25	10	5.5	1.4
065Z743201	VRBZ3 32/13 ext.	32	13	5.5	2.0
065Z744001	VRBZ3 40/16 ext.	40	16	5.5	2.9

Actuators for Fan Coil Control Valves
AMV/E/H 130/140

AMV/E -H 130/140

AMV/E 130/140

- *200 N actuators for control of fan coil valves*
- *For use in 3-point control and modulating applications*
- *Fast and standard speed stroking options available*
- *Low noise emissions of less than 33dB*
- *Comes with detachable 1.5m cable*
- *Built-in end stop switches to reduce energy consumption*
- *Modulating version can be sequenced to control two actuators with one 0-10v signal*
- *External position indicator*
- *Modulating control signal can be analogue or digital*
- *Option for external manual override*

Use with VZ, VZL and VRBZ valves

Technical Data	***AMV (3-point control)***
Supply voltage	24Vac, 230Vac +10 to -15%
Frequency	50/60Hz
Consumption	1 VA (24Vac), 8 VA (230Vac)
Power output	200 N
Spindle travel	5.5mm
Spindle speed	24 s/mm (AMV 130), 12mm (AMV 140)
Grade of enclosure	IP 42
Medium temperature in pipe	2 to 120°C
Ambient temperature	0 to 55°C
	AME (Modulating)
Supply voltage	24Vac, +10 to -15%
Frequency	50/60Hz
Consumption	1.3 VA
Power output	200 N
Spindle travel	5.5mm
Spindle speed	24 s/m (AMV 130), 12 s/mm (AMV 140)
Grade of enclosure	IP 42
Medium temperature in pipe	2 to 120°C
Ambient temperature	0 to 55°C

Code No.	Type	Supply Voltage Vac	Spindle Speed (s/mm)	Stroke (mm)	Weight (kg)
082H803600	AMV 130	24	24	5.5	0.4
082H803700	AMV 130	230	24	5.5	0.4
082H804400	AME 130	24 (0 - 10Vac)	24	5.5	0.4
082H804000	AMV-H 130	24	24	5.5	0.34
082H804100	AMV-H 130	230	24	5.5	0.34
082H804600	AME-H 130	24 (0 - 10Vac)	24	5.5	0.34
082H803800	AMV 140	24	12	5.5	0.4
082H803900	AMV 140	230	12	5.5	0.4
082H804500	AME 140	24 (0 - 10Vac)	12	5.5	0.4
082H804200	AMV-H 140	24	12	5.5	0.34
082H804300	AMV-H 140	230	12	5.5	0.34
082H804700	AME-H 140	24 (0 - 10Vac)	12	5.5	0.34

Accessories Actuator AMV/E H 130/140	
Code No.	**Type**
082H805200	5m cable for AMV(E) 130/140 - 24Vac
082H805300	5m cable for AMV 130/140 - 230Vac

Plant Control Valves (External Thread)
VRB (RG5 Bronze) 2-port and 3-port

- *Plant valves for 15-50mm, used with 3-point, modulating and spring return plant actuators*
- *Complete with couplings for BSP connection*
- *New quick connection between the valve on the actuator*
- *Made of RG5 Bronze to eliminate erosion*

VRB 2 (external thread)

VRB 3 (external thread)

Use with AMV/AME 435 or AMV/AME 438

Technical Data	
Nominal size	DN 15 to DN 50
Control Characteristic	LOG: port A-AB; LIN: port B-AB
Cavitation Factor z	≥0.4
Leakage acc. to standard IEC 534	A-AB ≤0.05% of k_{vs}, B-AB≤1.0% of k_{vs}
Nominal Pressure	PN16
Maximum Closing Pressure	4 bar
Medium	Circulation water/glycolic water up to 50%
Medium pH	Min. 7, Max. 10
Medium temperature	2 (-10) to 120°C
Material: Valve Body	Red bronze CuSn5ZN5Pb5 (Rg5)
Material: Valve Stem	Stainless steel
Material: Valve Cone	Brass
Material: Stuffing Box Sealing	EPDM

VRB two-way valves - external thread (tail pieces included)

Type	Code	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
VRB2 15/0.63	065Z017101	15	0.63	10	0.61
VRB2 15/1.0	065Z017201	15	1.0	10	0.61
VRB2 15/1.6	065Z017301	15	1.6	10	0.61
VRB2 15/2.5	065Z017401	15	2.5	10	0.61
VRB2 15/4.0	065Z017501	15	4.0	10	0.61
VRB2 20/6.3	065Z017601	20	6.3	10	0.78
VRB2 25/10	065Z017701	25	10	10	1.00
VRB2 32/16	065Z017801	32	16	15	1.57
VRB2 40/25	065Z017901	40	25	15	2.62
VRB2 50/40	065Z018001	50	40	15	3.76

VRB three-way valves - external thread (tail pieces included)

Type	Code	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
VRB3 15/0.63	065Z015101	15	0.63	10	0.70
VRB3 15/1.0	065Z015201	15	1.0	10	0.70
VRB3 15/1.6	065Z015301	15	1.6	10	0.70
VRB3 15/2.5	065Z015401	15	2.5	10	0.70
VRB3 15/4.0	065Z015501	15	4.0	10	0.70
VRB3 20/6.3	065Z015601	20	6.3	10	0.93
VRB3 25/10	065Z015701	25	10	10	1.21
VRB3 32/16	065Z015801	32	16	15	1.95
VRB3 40/25	065Z015901	40	25	15	3.39
VRB3 50/40	065Z016001	50	40	15	5.46

Accessories - **Adapter** (for old actuators)

Actuators	max. Δp (bar)	Code
AMV(E) 15, 25, 35, 323, 423, 523	4.0	065Z031100

Accessories - **Stem Heater**

Actuators	Power Supply	Code
AMV(E) 435	24V	065Z031500
AMV(E) 438 SU		065B217100

Plant Control Valves (Internal Thread)
VRB (RG5 Bronze) 2-port and 3-port

VRB 2 (internal thread)

VRB3 (internal thread)

- *Plant valves for 15-50mm, used with 3-point, modulating and spring return plant actuators*
- *Direct connection to BSP pipework without the need for couplings*
- *New quick connection between the valve on the actuator*
- *Made of RG5 Bronze to eliminate erosion*

Use with AMV/AME 435 or AMV/AME 438

Technical Data	
Nominal size	DN 15 to DN 50
Control Characteristic	LOG: port A-AB; LIN: port B-AB
Cavitation Factor z	≥0.4
Leakage acc. to standard IEC 534	A-AB ≤0.05% of k_{vs}, B-AB≤1.0% of k_{vs}
Nominal Pressure	PN16
Maximum Closing Pressure	4 bar
Medium	Circulation water/glycolic water up to 50%
Medium pH	Min. 7, Max. 10
Medium temperature	2 (-10) to 120°C
Material: Valve Body	Red bronze CuSn5ZN5Pb5 (Rg5)
Material: Valve Stem	Stainless steel
Material: Valve Cone	Brass
Material: Stuffing Box Sealing	EPDM

VRB two-way valves - internal thread

Type	Code	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
VRB2 15/0.63 int.	065Z023100	15	0.63	10	0.60
VRB2 15/1.0 int.	065Z023200	15	1.0	10	0.60
VRB2 15/1.6 int.	065Z023300	15	1.6	10	0.60
VRB2 15/2.5 int.	065Z023400	15	2.5	10	0.60
VRB2 15/4.0 int.	065Z023500	15	4.0	10	0.60
VRB2 20/6.3 int.	065Z023600	20	6.3	10	0.77
VRB2 25/10 int.	065Z023700	25	10	10	0.98
VRB2 32/16 int.	065Z023800	32	16	15	1.43
VRB2 40/25 int.	065Z023900	40	25	15	2.54
VRB2 50/40 int.	065Z024000	50	40	15	3.496

VRB three-way valves - external thread

Type	Code	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
VRB3 15/0.63 int.	065Z021100	15	0.63	10	0.71
VRB3 15/1.0 int.	065Z021200	15	1.0	10	0.71
VRB3 15/1.6 int.	065Z021300	15	1.6	10	0.71
VRB3 15/2.5 int.	065Z021400	15	2.5	10	0.71
VRB3 15/4.0 int.	065Z021500	15	4.0	10	0.71
VRB3 20/6.3 int.	065Z021600	20	6.3	10	0.91
VRB3 25/10 int.	065Z021700	25	10	10	1.15
VRB3 32/16 int.	065Z021800	32	16	15	1.81
VRB3 40/25 int.	065Z021900	40	25	15	3.35
VRB3 50/40 int.	065Z022000	50	40	15	5.13

Accessories - **Adapter** (for old actuators)

Actuators	max. Δp (bar)	Code
AMV(E) 15, 25, 35, 323, 423, 523	4.0	065Z031100

Accessories - **Stem Heater**

Actuators	Power Supply	Code
AMV(E) 435	24V	065Z031500
AMV(E) 438 SU		065B217100

Plant Control Valves (Flanged)
VF2/3 PN16 2-Port and 3-Port Flanged Valves

- *PN16 flanged valves in 15mm-150mm for use with 3-point, modulating and spring return actuators*
- *Made with a cast iron body, stainless steel spindle and brass plug*
- *Can be used with glycol concentrations of up to 50%*
- *Stem heaters available for temperatures down to -10°C*

VF 2

VF 3

Use with AMV/AME 435 or AMV/AME 438 for valve sizes up to 80mm
Use with AMV/AME 55 for valve size 100mm
Use with AMV/AME 85 for valve sizes 125-150mm

Technical Data	
Nominal pressure	PN 16
Nominal size	DN15 to DN 150
K_{vs} value	0.63-320m³/h
Flow characteristic	Logarithmic: port A-AB
Mixing characteristic	Linear: port B-AB
Temperature	Circulation water/glycolic water up to 50 % 2 (-10) to 130°C (DN 15-100) 2 (-10) to 200°C (DN 125, 150) At temperatures from -10°C up to +2°C use stem heater
Leakage rate: Mixing way	Maximum 1.0% of Kvs
Flange connection	Flange PN 16 acc. to EN 1092-2
Compliance with Pressure Equipment Directive 97/23/EC	

Two-port valves

Type	Code	DN (mm)	Kvs (m³/h)	Stroke (mm)
VF2 15/0.63	065Z027100	15	0.63	10
VF2 15/1.0	065Z027200		1.0	
VF2 15/1.6	065Z027300		1.6	
VF2 15/2.5	065Z027400		2.5	
VF2 15/4.0	065Z027500		4.0	
VF2 20/6.3	065Z027600	20	6.3	
VF2 25/10	065Z027700	25	10	
VF2 32/16	065Z027800	32	16	15
VF2 40/25	065Z027900	40	25	
VF2 50/40	065Z028000	50	40	
VF2 65/63	065Z028100	65	63	20
VF2 80/100	065Z028200	80	100	
VF2 100/145	065B320500	100	145	30
VF2 125/220	065B323000	125	220	40
VF2 150/230	065B325500	150	320	

Three-port valves

Type	Code	DN (mm)	Kvs (m³/h)	Stroke (mm)
VF3 15/0.63	065Z025100	15	0.63	10
VF3 15/1.0	065Z025200		1.0	
VF3 15/1.6	065Z025300		1.6	
VF3 15/2.5	065Z025400		2.5	
VF3 15/4.0	065Z025500		4.0	
VF3 20/6.3	065Z025600	20	6.3	
VF3 25/10	065Z025700	25	10	
VF3 32/16	065Z025800	32	16	15
VF3 40/25	065Z025900	40	25	
VF3 50/40	065Z026000	50	40	
VF3 65/63	065Z026100	65	63	20
VF3 80/100	065Z026200	80	100	
VF3 100/145	065B168500	100	145	30
VF3 125/220	065B312500	125	220	40
VF3 150/320	065B315000	150	320	

Accessories - **Adapter** (for old actuators)

DN	Actuators	max. Δp (bar)	Code
15-50	AMV(E) 15, 25, 35, 323, 423, 523	4.0	065Z031100
65-80	AMV(E) 55, 56, 323, 423, 523	2.5	065Z031200

Accessories - **Stem Heater**

DN	Actuators	Power Supply	Code
15-80	AMV(E) 435	24 V	065Z031500
15-50	AMV(E) 438 SU		065B217100
100	AMV(E) 55, 56		065Z702000
125, 150	AMV(E) 85, 86		065Z702100

Steam Control Valves (Flanged)
VFS2 PN25 Flanged Valves

VFS2

Use with AMV/AME 15/16 or AMV/AME 25/35 SU for spring return up to 50 mm. Use AMV/AME 55 above 50mm

- *PN25 flanged valves in 15mm-100mm for use with 3-point, modulating and spring return actuators*
- *Made with a cast iron body with stainless steel spindle and plug*
- *Can be used with glycol concentrations of up to 50%*
- *Stem heaters available for installation with temperatures down to -10°C*
- *Adapter available for temperatures over 150°C*

Technical Data	
Nominal pressure	PN 25
Nominal size	DN 15 to DN 100
Control characteristic	Logarithmic
Medium temperature	2 (-10) to 200°C
Control ratio	Minimum 1:50
Leakage rate	Maximum 0.05% of Kvs
Flange connection	ISO 7005-2
Material: Body	GGG 40,3
Material: Plug, seat and stem	Stainless steel
Material: Stem packing	PTFE rings

Code No.	Type	DN (mm)	Kvs (m3/h)	Stroke (mm)	Weight (kg)
065B151000	VFS2 15/0.4	15	0.4	15	3.6
065B151100	VFS2 15/0.63	15	0.63	15	3.6
065B151200	VFS2 15/1.0	15	1.0	15	3.6
065B151300	VFS215/1.6	15	1.6	15	3.6
065B151400	VFS2 15/2.5	15	2.5	15	3.6
065B151500	VFS2 15/4.0	15	4.0	15	3.6
065B152000	VFS2 20/6.3	20	6.3	15	4.3
065B152500	VFS2 25/10	25	10	15	5.0
065B153200	VFS2 32/16	32	16	15	8.7
065B154000	VFS2 40/25	40	25	15	9.5
065B155000	VFS2 50/40	50	40	15	11.7
065B336500	VFS2 65/63	65	63	40	23.0
065B338000	VFS2 80/100	80	100	40	28.1
065B340000	VFS2 100/145	100	145	40	40.7

Actuators (for valves up to size DN50)

Code No.	Type	Supply Voltage Vac	Spindle Speed (s/mm)	Stroke (mm)	Weight (kg)
082H303600	AMV 25 SD	24	11	15	1.8
082H303700	AMV 25 SD	230	11	15	1.8
082H303800	AME 25 SD	24 (0-10v)	11	15	1.8

For actuators for valves above DN50 see page 34.

Accessories

Code No.	Type
065B217100	Stem heater for AMV/E 15,16 ,25 ,35 (at temperature from 0°C to -10°C)
065Z702000	Stem heater for AMV/E 55, 56 (at temperature from 0°C to -10°C)
065Z702100	Stem heater for AMV/E 85, 86 (at temperature from 0°C to -10°C)

Actuators for Plant Control Valves
AME and AMV 435

- *400N actuator for control of 15-80mm valves*
- *For use in 3-point control and modulating applications*
- *Standard or fast speed control built into the actuator*
- *Manual override*
- *Self stroking function*
- *Diagnostic LED viewable on the cover*
- *Standby function*
- *Intelligent anti-hunting feature*
- *Quick connection between the valve and the actuator*

AME 435

AMV 435

Use with VRB, VRG, VL and VF in sizes 15-80mm

Technical Data

	AME 435 Modulating
Power supply	24 VAC/DC; ±10%
Power Consumption	4.5VA
Frequency	50/60Hz
Control input Y	0-10 V (2-10 V) Ri = 95 kΩ, 0-20 mA (4-20 mA) Ri = 500 Ω
Output signal X	0-10V (2-10V) RL = 650 Ω (maximal load)
Close of force	400 N
Max. stroke	20 mm
Speed	7.5 s/mm or 15 s/mm
Max. medium temperature	130 °C
Ambient temperature	0 to 55°C
Storage and transport temperature	–40 to +70 °C
Protection class	II
Degree of protection	IP 54
Weight	0.45 kg
CE - marking in accordance with standards	Low Voltage Directive (LVD) 2006/95/EC: EN 60730-1, EN 60730-2-14 EMC Directive 2004/108/EC: EN 61000-6-2, EN 61000-6-3

	AMV 435 3-Point Control
Power supply	24 VAC/DC, 230 VAC; +10 to –15%
Power consumption	2 VA
Frequency	50 Hz or 60 Hz (for VAC power supply)
Control input	3 point
Close of force	400 N
Max. stroke	20 mm
Speed	7.5 s/mm or 15 s/mm
Max. medium temperature	130°C
Ambient temperature	0 to 55 °C
Storage and transport temperature	–40 to +70 °C
Protection class	II
Degree of protection	IP 54
Weight	0.45 kg
CE - marking in accordance with standards	Low Voltage Directive (LVD) 2006/95/EC: EN 60730-1, EN 60730-2-14 EMC Directive 2004/108/EC: EN 61000-6-2, EN 61000-6-3

Type	Code	Description
AMV 435	082H016200	Supply Voltage: 24V Spindle Speed: 11 s/mm Spindle Stroke: 15mm
AMV 435	082H016300	Supply Voltage: 230V Spindle Speed: 11 s/mm Spindle Stroke: 15mm
AME 435	082H016100	Supply Voltage: 24V (0-10V) Spindle Speed: 11 s/mm Spindle Stroke: 15mm

Accessories - **Stem Heater**

Type	DN	Power Supply	Code
Stem Heater	15-80	24V	065Z031500

Accessories - **Adapter**

Valves	DN	Max Δp (bar)	Code
For old VRB, VRG, VF and VL valves	15	9	065Z031300
	20	4	
	25	2	
	32	1	
	40	0.8	
	50	0.5	

Actuators for Plant Control Valves
AME 438 SU and AMV 438SU

AME 438SU

AMV 438SU

- *450N actuator, standard speed actuator for use where spring return function is required*
- *For use in 3-point and modulating applications*
- *Diagnostic LED (AME)*
- *Self-stroking*
- *For use with valves up to 50mm*

Use with VRG, VRB, and VF valves in sizes 15-50mm

Technical Data

	AME 438SU Modulating
Power supply	24 VAC/DC; ±10%
Power Consumption	14 VA
Frequency	50/60Hz
Control input Y	0-10 V (2-10 V) Ri = 24 kΩ, 0-20 mA (4-20 mA) Ri = 500 Ω
Output signal X	0-10V (2-10V)
Close of force	450 N
Max. stroke	15 mm
Speed	15 s/mm
Max. medium temperature	150 °C
Ambient temperature	0 to 55°C
Storage and transport temperature	–40 to +70 °C
Protection class	II
Degree of protection	IP 54
Weight	2.3 kg
CE - marking in accordance with standards	Low Voltage Directive (LVD) 2006/95/EC: EN 60730-1, EN 60730-2-14 EMC Directive 2004/108/EC: EN 61000-6-2, EN 61000-6-3

	AMV 438SU 3-Point Control
Power supply	24 VAC/DC, 230 VAC; +10 to –15%
Power consumption	12 VA
Frequency	50 Hz or 60 Hz
Control input	3 point
Close of force	450 N
Max. stroke	15 mm
Speed	15 s/mm
Max. medium temperature	150°C
Ambient temperature	0 to 55 °C
Storage and transport temperature	–40 to +70 °C
Protection class	II
Degree of protection	IP 54
Weight	2.3 kg
CE - marking in accordance with standards	Low Voltage Directive (LVD) 2006/95/EC: EN 60730-1, EN 60730-2-14 EMC Directive 2004/108/EC: EN 61000-6-2, EN 61000-6-3

Type	Code	Description
AMV 438 SU	082H012200	Supply Voltage: 24V Spindle Speed: 15 s/mm Spindle Stroke: 15mm
AMV 438 SU	082H012300	Supply Voltage: 230V Spindle Speed: 15 s/mm Spindle Stroke: 15mm
AME 438 SU	082H012100	Supply Voltage: 24V (0-10V) Spindle Speed: 15 s/mm Spindle Stroke: 15mm

Accessories - **Stem Heater**

Type	DN	Code
Stem Heater	15-50	065B217100

Accessories - **For AMV**

Type	Code
Additional switches (2x)	082H701500
Additional switches (2x) and potentiometer (10kΩ)	082H701600
Additional switches (2x) and potentiometer (1kΩ)	082H701700

Actuators for Plant Control Valves
AMV/E 55/85

- *2000N actuator, standard speed, for control of 100mm flanged plant valves*
- *For use in 3-point control and modulating applications*
- *Fast and standard speed stroking options available*
- *Self stroking function on modulating version*
- *Diagnostic LED (AME)*
- *Kv turn down function for improved control (AME)*
- *Manual override*
- *5000N, at standard speed, actuator for control of flanged plant valve sizes 125mm and 150mm (AMV/E 85)*

AMV/E 55

AMV/E 85

Use with VF, VL and VFS valves between 100 and 150mm

Technical Data

	AMV (3-point control)	***AME (Modulating)***
Supply voltage	24Vac, 230Vac +10 to -15%	24Vac +10 to -15%
Frequency	50/60Hz	50/60Hz
Consumption	7VA(AMV 55)	9VA, (AME 55)
Power output	2000N (AMV55)	2000N (AME 55)
Spindle travel	40mm	40mm
Spindle speed	8 s/mm (AMV 55)	8 s/mm (AME 55)
Grade of enclosure	IP 54	IP 54
Medium temperature in pipe	2 to +200°C	2 to +200°C
Ambient temperature	0 to 55°C	0 to 55°C

	AMV (3-point control)	***AME (Modulating)***
Supply voltage	24Vac, 230Vac + 10 to -15%	24Vac +10 to -15%
Frequency	50/60Hz	50/60Hz
Consumption	10.5VA (AMV 85)	12.5VA (AME 85)
Power output	5000N	5000N
Spindle travel	40mm	40mm
Spindle speed	8 s/mm (AMV 85)	8 s/mm (AME 85)
Grade of enclosure	IP 54	IP 54
Medium temperature in pipe	2 to +200°C	2 to +200°C
Ambient temperature	-15 to +55°C	-5 to +50°C

Code No.	Type	Supply Voltage Vac	Spindle Speed (s/mm)	Stroke (mm)	Weight (kg)
082H302000	AMV 55	24	8	40	3
082H302100	AMV 55	230	8	40	3
082H302200	AME 55	24 (0 - 10V)	8	40	3
082G145000	AMV 85	24	8	40	10.7
082G145100	AMV 85	230	8	40	10.7
082G145200	AME 85	24 (0 - 10V)	8	40	10.7

Code No.	Type
082H703700	Additional switch (2x) - AMV 55
082H703500	Potentiometer (10 kOhm/30mm) - AMV 55
082H703600	Potentiometer (10 kOhm/40mm) - AMV 55
082H703800	Potentiometer (1 kOhm/30mm) - AMV 55
082H703900	Potentiometer (1 kOhm/40mm) - AMV 55
082H707200	Additional switch (2x) - AMV 85/8/24
082H707100	Additional switch (2x) - AMV 85/8/230
082H708300	Additional switch (2x) & Potentiometer (10 kOhm - AMV 85/8/24
082H708200	Additional switch (2x) & Potentiometer (10 kOhm) - AMV 85/8/230

Butterfly Valve
VFY-WA with Electric Actuator

VFY-WA

- *Butterfly valve in 25mm-300mm complete with 24V or 230V On/Off actuators*
- *Comes built with actuator already connected to the valve*
- *Wafer style connection with 4 centring lugs*
- *Complete with position indicator and manual adjustment dial*
- *Small in build for installation in a confined space*
- *30 second opening and closing speed*
- *Spare valves and actuators available*

Technical Data

Power supply	24V and 230V
Actuator speed	30 sec/90°
Actuator working temperature	minimum -10°C, maximum +50°C
Valves DN	DN 25 - DN 300
Leakage rate	Acc. to PED 97/23/CE, EN 12266-1, Rate A*
Valves pressure rating	16 bar from DN 32 - DN300 10 bar for DN 25
Medium	Chilled water 35% Glycol, Hot Water
Medium temperature	2 - 120°C
Protection code	IP 65 (DN 25 - DN 125) IP 66 (DN 150, 200) IP 67 (DN 250, 300)
Liner	EPDM
Material: Valve body	Cast iron EN GJL 250 (DIN GG25)
Flange:	Acc. to ISO 5211 and NF E 29-402 standards
Flange connection:	Between counter flanges acc. EN 1092-1

Code No.	Type	DN (mm)	Voltage	Kvs (m3/h)	Stroke (mm)	Weight (kg)
082G735000	VFY - WA	25	230	20	10	3.4
082G735100	VFY - WA	32/40	230	20	16	3.4
082G735200	VFY - WA	50	230	35	16	4.0
082G735300	VFY - WA	65	230	35	16	4.5
082G735400	VFY - WA	80	230	45	16	5.0
082G735500	VFY - WA	100	230	100	16	8.0
082G735600	VFY - WA	125	230	100	16	9.2
082G735700	VFY - WA	150	230	150	16	10.5
082G735800	VFY - WA	200	230	300	16	22.7
082G735900	VFY - WA	250	230	600	16	26.3
082G736000	VFY - WA	300	230	600	16	25.6
082G736100	VFY - WA	25	24	20	10	3.4
082G736200	VFY - WA	32/40	24	20	16	3.4
082G736300	VFY - WA	50	24	35	16	4.0
082G736400	VFY - WA	65	24	35	16	4.5
082G736500	VFY - WA	80	24	45	16	5.0
082G736600	VFY - WA	100	24	100	16	8.0
082G736700	VFY - WA	125	24	100	16	9.2
082G736800	VFY - WA	150	24	150	16	10.5
082G736900	VFY - WA	200	24	300	16	22.7
082G737000	VFY - WA	250	24	600	16	26.3
082G737100	VFY - WA	300	24	600	16	25.6

Rotary Valves
HRB & HFE

- *3 or 4 way*
- *Internal thread (HRB) or flanged connections (HFE)*
- *Linear characteristic*
- *Mixing or diverting applications*

A range of 3 and 4 way motorised valves for use in systems where there is no need for defined control characteristics and where a certain amount of leakage from closed valves can be accepted. (see technical specifications)

Available in size ranges from DN15 – DN150 in both flanged and screwed variants these cast iron valves perform competently for both mixing and diverting applications.

The new HRB range replaces the older HRE (Cast Iron) and HRB (Brass) valves.

HRB3

HFE3

HRB4

HFE4

Pressure Range PN6 (HFE), PN10 (HRB)
Max. required torque (unloaded) Up to DN50, 5Nm, DN100, 10Nm, DN150, 15Nm
Medium Temperature 0-110°C
Media Water 7-10pH

HRB
Leakage with valve closed and max. differential pressure:
3-way valve - diverting max. 0.02% of Kvs
- mixing max. 0.05% of Kvs
4-way valve max. 1.0% of Kvs
Materials
Body and Slide CuZn36Pb2As (brass DZR, CW 602N)0
Shaft and Bushing PPS Composite
O-Rings EPDM

HFE
Leakage with valve closed and max. differential pressure:
3-way valve - diverting max. 0.5% of Kvs
- mixing max. 1.0% of Kvs
4-way valve max. 1.5% of Kvs
Materials
Body and Cover Cast Iron GG20
Slide Shoe Brass Casting
Spindle Stainless Steel
Gland Double O-ring

HRB

DN (mm)	Kvs	Connec-tion	HRB 3	HRB4
15	0.63	Rp ½"	065B222000	
	1.0		065B222100	
	1.63		065B222200	
	2.5		065B222300	065B224000
20	4.0	Rp ¾"	065B222400	065B224100
	6.3		065B222500	065B224200
25	6.3	Rp 1"	065B222600	
	10		065B222700	065B224300
32	16	Rp 1¼"	065B222800	065B224400
40	25	RP 1½"	065B222900	065B224500
50	40	Rp 2"	065B223000	065B224600

HFE

DN (mm)	Kvs	HFE 3	HFE 4
32	28	065B513200	065B613200
40	44	065B514000	065B614000
50	60	065B515000	065B615000
65	90	065B516500	065B616500
80	150	065B518000	065B618000
100	225	065B520000	065B620000
125	280	065B522500	065B622500
150	400	065B525000	065B625000

Accessories for HRB

Component	Application	Code No.
Coupling	AMB 162 and AMB 182	082G423500 [1)]

1) Supplied with actuator

Spare Parts for HFE

Type	For DN	Code No.
O-Rings	DN 20-40 mm	065B000300
	DN 50-150 mm	065B000400

Accessories for HFE

Component	Application	Code No.
Coupling (Linkage Kit)	AMB 162, AMB 182	082G423000 [1)]

1) Supplied with actuator

Electrical Actuator
AMB 162 & AMB 182

AMB 162/182

- *24Vac/dc or 230Vac versions*
- *3 Point control*
- *0-10V or 2-10V control*
- *Available with or without limit switches*
- *Linkage kits for variety of valves available*

The AMB162 actuator is designed for operation in central heating systems in conjunction with either 3 or 4 port rotary valves (HRE/HFE). The actuators are suitable for connection to controllers using either 3 point control, standard voltage or current output (0-10v or 2-10v selectable).

Mounting is achieved using the linkage kit (MS-NRE supplied) and is suitable for a range of manufacturers valves as well as the Danfoss HRE and HFE models. See table for more details on linkage kits.

Technical Data	
Supply voltage	24Vac/Vdc, 230Vac 50-60 Hz
Power consumption	2.5VA (5 Nm) and 3.5 VA (10/15 Nm)
Operating torque	5, 10 or 15 Nm
Wire	2 m (3 x 0.5mm^2)
Actuator limit switch	2 A/250 Vac
Control mode	3-point or 0-10 V/2-10V
Rotation angle	Electrically limited to 90°
Manual operation	Mechanical disengagement
Ambient temperature (during operation)	0°C to 50°C
Transport and stock temperature	-10°C to +80°C
Protection class	II (without earthing wire)
Enclosure	IP42
Weight	0.46 kg AMB 162 / 0.54 kg AMB 182

Type	Supply Voltage	Torque	Speed	Control Signal	Remark	Code No.
AMB 162	24 Vac	5Nm	140 s	3-point	-	082G403000
			140 s		S*	082G403100
	230 Vac		70 s		-	082G403200
			140 s		-	082G403400
			140 s		S*	082G403500
			670 s		-	082G404000
	24 Vac/Vdc		140 s	0-10 V	-	082G405000
AMB 182	24 Vac/Vdc	15Nm	140 s	0-10 V	-	082G405500
			280 s		-	082G405600
	24 Vac	10Nm	70 s	3-point	-	082G406200
		15Nm	280 s		-	082G406400
	230 Vac	10Nm	70 s		-	082G406700
		15Nm	280 s		-	082G406900
			280 s		S*	082G407900

S* Complete with aux. switch

Linkage Kits			
Mounting Kit	**Make**	**Type**	**Code No.**
MS-NRE	Danfoss	HFE (HRE old, HRB old)	082G423000
	ESBE	MG, G, F, T, TM	
		H, HG	
	TA	VRTE	
	Termomix	B, C, D	
	Sauter	MH32, MH42	
MS-NRE6-D	Danfoss	HRB	082G423500

Accessories

Type	Description	Code No.
AUX Switch	Auxiliary signal switch	082G401200

On/Off Zone Valves
AMZ 112 and AMZ 113

- *2-port and 3-port mixing or diverting valves*
- *Can be used in heating and solar applications*
- *Able to act as a dedicated diverting valve in commercial applications*
- *Built-in end switch*
- *Can be used with RET230 or TP7000 electronic room controls*

The ON / OFF zone valves type AMZ 112 and AMZ 113 are typical used in connection with:

- Domestic and commercial central heating applications
- Domestic hot water applications
- Solar energy plants
- Priority control of hot water supply and heating (diverting function)
- Priority control of boiler and solid fuel installations (diverting function).

The ON/OFF zone valves can be applied together with most Danfoss room thermostats, particularly type RET230 (single poled switch) and programmable room thermostats type TP5000Si and TP7000.

The actuator can be controlled by a SPST or SPDT switch.

The limit stop switch can be used for start / stop of a fan or a circulation pump in an entirely open valve.

AMZ 112

AMZ 113

Actuator		
Type	**AMZ 112**	**AMZ 113**
Supply voltage	230 V, 50/60 Hz	230 V, 50/60 Hz
Micro switch	5 (1) A, 250 V, 50 Hz	5 (1) A, 250 V, 50 Hz
Power consumption	7.5 VA by operation 3.0 VA by standby	7.5 VA by operation
Electrical protection class	Class II acc. EN-60335-1	Class 1 acc. EN 60335-1
Enclosure	IP44 acc. IEC 60529	IP44 acc. IEC 60529
Rotation time	30 sec / 90°	60 sec / 180°
Ambient temperature	0-50°C	0-50°C
Humidity	RH 0%-80%	RH 0%-80%
Wire	4 x 0.5mm^2, L=1.5m	4 x 0.5mm^2, L=1.5m

Valve	
Type	**AMZ112, AMZ113**
Medium temperature (°C)	2-130
Nominal pressure (PN)	16
Medium	Circulation water/glycolic water up to 30%
Max. operating torque (Nm)	8
Max. Δp valve (bar)	6

Materials (Valve)	
Body stem	Hot stamped brass CuZn40Pb2 Ni plated
Ball	Hot stamped brass CuZn40Pb2 Ni plated
Gaskets	PTFE - FPM - EPDM
Connection	Internal thread Rp ISO 7/1

AMZ 112 2-port valve/actuator

DN	Kvs (m^3/h)	Connection	Max Δp valve	Code No.
15	17	Rp ½	6 bar	082G550100
20	41	Rp ¾		082G550200
25	68	Rp 1		082G550300
32	123	Rp 1¼		082G551400

AMZ 113 3-port valve/actuator

DN	Kvs (m^3/h)	Connection	Max Δp valve	Code No.
15	3.8	Rp ½	6 bar	082G551100
20	7.7	Rp ¾		082G551200
25	11.6	Rp 1		082G551300

Balancing Valves
For Improved Hydronic Performance

Manual Balancing Valve - MSV

Manual balancing valves are used to balance the flow of water in heating and cooling systems.

Manual balancing valves can be set by calculating the desired setting or by measuring across the valve and adjusting to the desired flow. By throttling (potential) overflows in the system a proper distribution of the available pump capacity is ensured. Measuring can be done using the Danfoss PFM4000 measuring unit (see page 59).

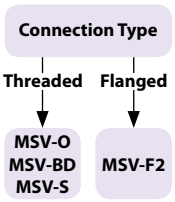
Danfoss manufactures and supplies manual balancing valves for almost any application, with a wide range of sizes from DN15 up to DN400.

Automatic Balancing Valve - ASV

ASV (automatic balancing valves) are used for balancing risers. A set consists of a differential pressure controller ASV-PV) for mounting in the return and an ASV-I or ASV-M for mounting in the supply. An ASV-M is a manual shut-off valve and an ASV-I is a manual balancing valve that can be used to limit the flow.

Danfoss manufactures and supplies automatic balancing valves for almost any application, with a wide range of sizes starting from DN15.

MSV Selection by Connection Type



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Why Use Balancing Valves?

MSV-O

MSV-BD

MSV-F2

There are many reasons to use automatic or manual balancing valves.
Some symptoms of badly balanced heating/cooling systems are:

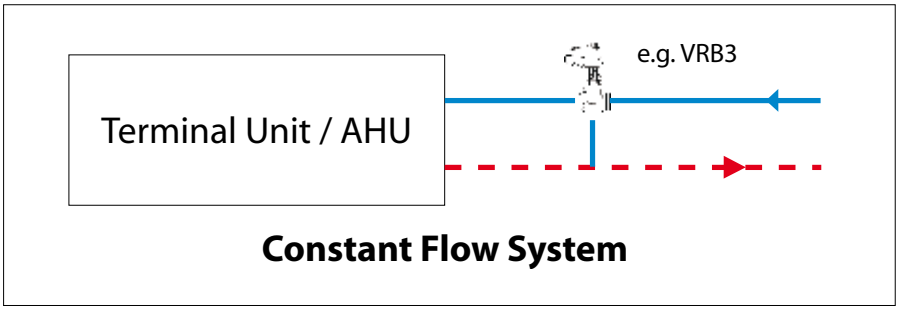
- Noise Problems
- Insufficient Capacity
- Poor/inaccurate control
- Long start-up times
- Energy wastage

Balancing valves can provide a solution to all of these problems providing an economical and cost effective solution to common hydronic problems.

There are two main types of system, each of them present differing challenges when it comes to balancing the system:

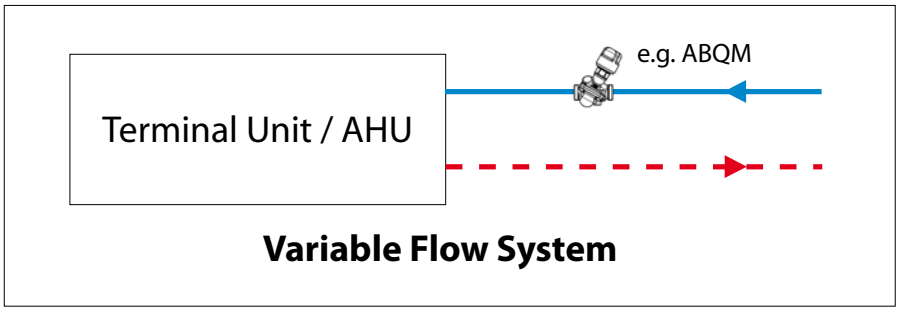
1. ***Constant Flow***

   Involves the use of a 3 port valve and a bypass, to maintain the flow around a system when there is no demand from the terminal units. In these systems, the overall flow remains constant.



2. ***Variable Flow***

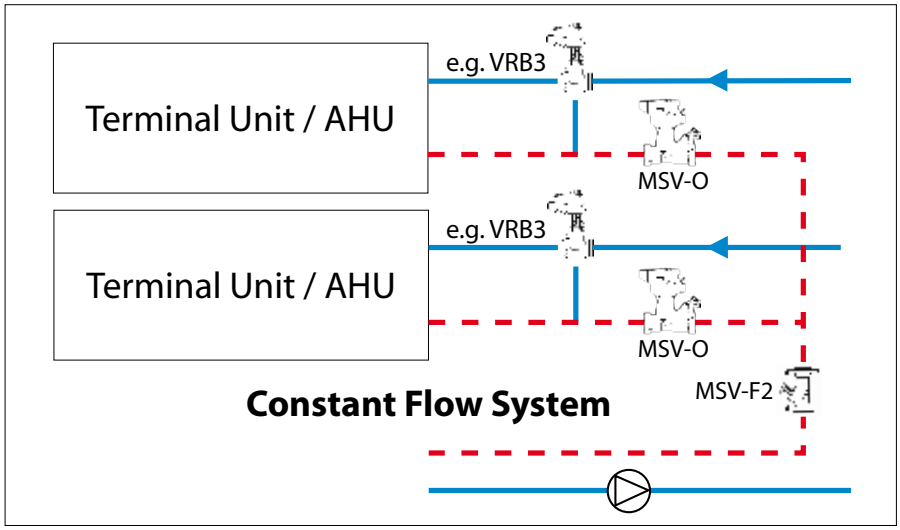
   Involves the use of 2 port valves to shut off the flow to the terminal units when there is no demand. In these systems the overall flow varies depending on demand for heating or cooling.



Solutions for Constant Flow Systems

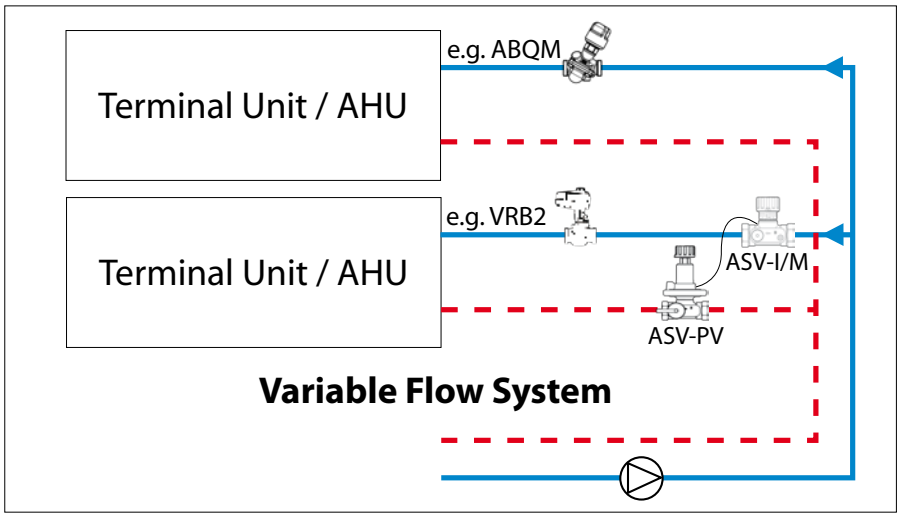
Danfoss offers a range of solutions using both manual and automatic balancing valves, using a combination of the LENO™ MSV-O and MSV-BD valves can provide ease of installation and balancing. In the MSV-O valve, the flow is measured over a fixed venturi orifice, providing very fast and accurate measurement. The MSV-O and MSV-F2 valves can then be adjusted to provide the required flow rates.

In order to reduce installation and commissioning costs, the ABQM valve can be used to good effect as a constant flow regulator (CFR). The setting of the flow is simply a case of calculating the required flow, selecting a valve which covers the flow rate you require and setting the valve (desired flow/max flow x 100 = setting). This means no commissioning or measurement is needed, however the ABQM valves do have nipples for differential pressure recording and verification purposes.



Solutions for Variable Flow Systems

Variable flow systems are perfectly suited to automatic balancing valve solutions (ASV), or by using the ABQM, combined with an actuator (see pages 46 to 49) to act as a flow regulator and control valve in one. As with the constant flow system, when using an ABQM the need for additional valves is removed, and setting up for a required flow is simple using the built in scale on the valve.



ASV-PV

ASV-I

ABQM

Balancing Valve Selection Guide
Cooling Systems

Cooling systems:
Variable Flow
Constant Flow

Constant Flow | *Variable Flow*

Solution based on:
Manual Valves
Automatic Valves

Automatic | *Manual*

Flow Limiters:

ABQM

Manual Valves:
MSV-F2, MSV-O,
MSV-BD,
MSV-S

Solution based on:
Differential Pressure Controllers
Combined Controllers

Pressure Controller | *Combined Control Valves*

Pressure Controller:
Fixed Pressure
Adjustable Pressure

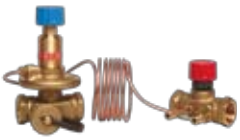
Fixed Pressure | *Adjustable Pressure*

Recommended:

ASV-PV + ASV-M

Recommended:

ASV-PV
ASV-I/M



Combined Controllers:
Actuators TWA-Z
Actuators ABNM
Actuators AMV(E)

Depends on system control or BMS

Recommended:
ABQM + TWA-Z
ABQM + ABNM
ABQM + AMV(E)

Balancing Valve Selection Guide
Heating Systems

Heating systems:
One-pipe System
Two-pipe System

One Pipe | *Two Pipe*

Risers:
With TRV
Without TRV

With TRV | *Without TRV*

Recommended:

ABQM

Recommended:
MSV-O
MSV-BD
MSV-S

Risers:
With TRV
Without TRV

With TRV | *Without TRV*

TRV:
With Pre-setting
With Fixed Capacity

Recommended:
MSV-O
MSV-BD
MSV-S

With Fixed Capacity | *With Pre-setting*

Recommended:

ASV-PV + ASV-I

Recommended:

ASV-PV + ASV-M

Pressure Independent Balancing and Control Valve
ABQM

The ABQM is a PIBCV (Pressure Independent Balancing and Control Valve) which combines the benefits of a control valve and a differential pressure controller, which work in tandem to provide the ultimate in system control and setting accuracy. The differential pressure controller within the valve keeps a constant differential pressure across the valve cone, meaning that changes in system pressure do not affect the control characteristics of the valve.

Setting the valve is simple – all you need to know is the required flow through the valve, and the max flow of the valve. With these two figures you just divide one by the other to establish the correct setting for the valve e.g. Design flow (270l/h) / Valve max flow (450l/h) x 100 = 60% setting on the dial. Different sizes of ABQMs cover a range of maximum flows, enabling the right size valve for the application to be selected easily. The maximal flow speeds of ABQM corresponds with the maximal flow speed through pipe dimensions according to international standards. With a standard M30x1.5 connection the ABQM is suitable for a range of actuators providing control solutions for 0-10v, 3point and on/off control.

The ABQM is perfect for any application where eliminating overflow situations or accurate control valve characteristics are needed. The addition of optional test points on all models means that flow verification and pump optimization is a simple task.

Reduction of cost in an installation, both in terms of materials and installation/commissioning is a key objective. The combined functionality of the ABQM means that it replaces the need for a 2-way control valve and manual balancing valve, reducing initial costs. When this saving is added to the installation and commissioning savings, the ABQM becomes the obvious choice for any installation requiring automatic flow control or control valves.

ABQM

Large ABQM plus AME

ABQM plus TWA-Z

Large ABQM plus AME

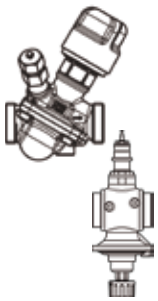
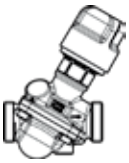
How does it work?

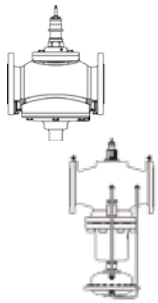
The images below demonstrate the operation of the ABQM in principle.

Flow is controlled through the differential controller (grey) and the control side (gold) of the valve.

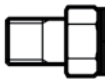
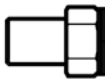
As differential pressure increases across the valve, the membrane is immediately pushed down, closing the pressure controller.

If the differential pressure decreases, the membrane instantly adapts and moves up and opens the pressure controller – keeping a constant differential pressure through the control side of the valve.

ABQM	DN	Q_{max} (l/h)	With measuring points		ABQM	Without measuring points	
			External Thread	Code No.		External Thread	Code No.
	10 LF	150	G ½ A	003Z026100		G ½ A	003Z025100
	10	275		003Z021100			003Z020100
	15 LF	275	G ¾ A	003Z026200		G ¾ A	003Z025200
	15	450		003Z021200			003Z020200
	20	900	G 1 A	003Z021300		G 1 A	003Z020300
	25	1,700	G 1¼ A	003Z021400		G 1¼ A	003Z020400
	32	3,200	G 1½ A	003Z021500		G 1½ A	003Z020500
	40	7,500	G 2 S	003Z070000	*ABQM (DN 10-32) can not be upgraded to ABQM with nipples.*		
	50	12,500	G 2½ A	003Z071000			

	DN	Q_{max} (l/h)	Flange Connection	Code No.
	50	12,500	PN 16	003Z071100
	65	20,000		003Z070200
	80	28,000		003Z070300
	100	38,000		003Z070400
	125	90,000		003Z070500
	150	145,000		003Z070600
	200	190,000		003Z070700
	250	280,000		003Z070800

Accessories and Spare Parts

Type	Comments		Code No.
	To pipe	To valve	
Union connection (1 pcs.) 	R 3/8	DN 10	003Z023100
	R ½	DN 15	003Z023200
	R ¾	DN 20	003Z023300
	R 1	DN 25	003Z023400
	R 1¼	DN 32	003Z023500
	R 1½	DN 40	003Z027900
	R 2	DN 50	003Z027800
Tailpiece welding (1 pcs.) 	Weld.	DN 15	003Z022600
		DN 20	003Z022700
		DN 25	003Z022800
		DN 32	003Z022900
		DN 40	003Z027500
		DN 50	003Z027600
Tailpieces for soldering (2 nuts, 2 gaskets, 2 soldering nipples)	12 x 1 mm	DN 10	065Z701600
	15 x 1 mm	DN 15	065Z701700
Locking ring		DN 10-32	003Z023600
Shut-off & protection piece (max. closing pressure 16 bar)			003Z023000
Shut-off - plastic (max. closing pressure 1 bar)			003Z024000
Handle ABQM (for details refer to instructions)		DN 40-100	003Z069500
		DN 125-250	003Z069600

Combinations ABQM with electrical actuators (ABQM DN 100-100)

Valve Type	Stroke	TWA-Z [2]	AMI 140	ABNM-Z	AMV110NL AME110NL [3]	AME15QM	AMV/E/H 130-140
		082F122600 NC, 230V	**082H804800** AMI 140, 24V 12 s/mm	**082F109400** Thermal actuator 24V (0-0V) **082F107200** Adapter for ABQM (M30 x 1.5)	**082H805600** AMV110NL 24V 24 s/mm **082H805700** AME110NL, 24V 24 s/mm, 0-10V	**082H307500** AME15QM 24V 11 s/mm, 0-10V	**082H803600** AMV 130 24V 24 s/mm **082H804400** AME130, 24V 24 s/mm, 0-10V
DN 10-20	2.25	✓	✓	✓	✓	-	✓
DN 25, 32	4.50	✓ [1]	✓	✓ [4]	✓	-	✓
DN 40, 50	10	-	-	-	-	✓	-
DN 65-100	15	-	-	-	-	✓	-

[1] Up to 60% of Qmax
[2] Only this type of actuator is to be used with ABQM
[3] Minimum recommended ABQM setting is 20%
[4] Up to 80% of Qmax

Combinations ABQM with electrical actuators (ABQM DN 100-100)

Valve Type	Stroke	AME55QM	AME85QM
		082H307800 24V, 8 s/mm, 0-10V	**082G145300** 24V, 8 s/mm, 0-10 V
DN 125	25	✓	-
DN 150	25	✓	-
DN 200	27	-	✓
DN 250	27	-	✓

Technical Data - ABQM Thread Version

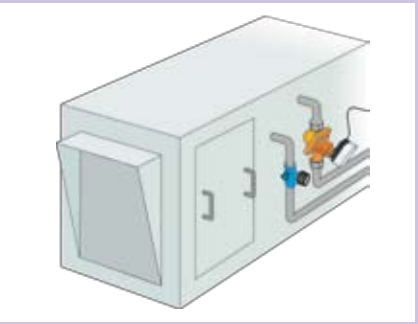
Nominal Diameter	Flow Range (l/h)			Diff.Pressure (kPa)	Pressure Stage (PN)
	Qmin (20%)	Qmin (40%)	Qmax (100%)		
10 Low Flow	30	-	150	16-400	16
10	55	-	275		
15 Low Flow	55	-	275		
15	90	-	450		
20	180	-	900		
25	340	-	1700	20-400	
32	650	-	3200		
40	1500	-	7500	30-400	
50	-	5000	12500		

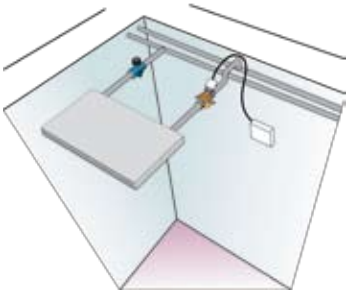
Technical Data - ABQM Flange Version

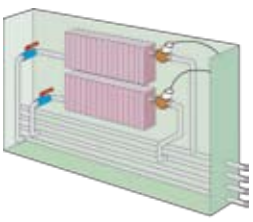
Nominal Diameter	Flow Range (l/h)		Diff.Pressure (kPa)	Pressure Stage (PN)
	Qmin (40%)	Qmax (100%)		
50	5000	12500	30-400	16
65	8000	20000		
80	11200	28000		
100	15200	38000		
125	36000	90000		
150	58000	145000		
200	76000	190000		
250	112000	280000		

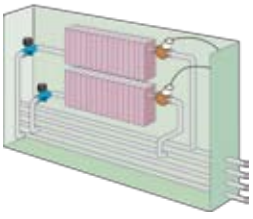
- *No Kv or authority calculations needed. Flow is the only parameter to be considered when designing*
- *Maximum setting corresponds with international standards for flow speeds in pipes*
- *Linear or logarithmic characteristic when combined with gear actuators*
- *Compact design*
- *Easy commissioning*
- *Energy savings*
- *Increased comfort*
- *Easy trouble shooting*
- *Fast start-up - ABQM does not need to be flushed or de-aired before use*

Application Examples









ABQM Actuators
TWA-Z

Use with ABQM DN10-20 and DN25-32 (Qmax 60%) + VZL Valves (TWA-Z Thermal Actuator)

- *Cost effective*
- *On/Off control*
- *Valve position indicator*
- *24 or 230 Vac/dc*
- *Available in Normally Open (NO) or Normally Closed (NC)*

Technical Data	
Type	***TWA-Z***
Supply voltage	24 Vac/Vdc, 230 Vac/Vdc +10 to -15%
Frequency	50/60Hz
Consumption	2 W
Power output	90N
Max Stroke	2.8mm
Full Stroke Time	Approx. 3 minutes
Grade of enclosure	IP 41
Ambient temperature	2 to 60°C

TWA-Z

Type	Power Supply	Code No.
TWA-Z NO	24 Vac/Vdc	082F122000
TWA-Z NC	24 Vac/Vdc	082F122200
TWA-Z NO	230 Vac/Vdc	082F122400
TWA-Z NC	230 Vac/Vdc	082F122600

ABQM Actuators
ABNM

Use with ABQM DN10-20 and DN25-32 (Qmax 85%) ABNM-Z Thermal Actuator

- *Thermoelectric*
- *0-10V control*
- *Automatic calibration - optical path measurement allows very accurate positioning*
- *Theft protection*
- *Ideal for use in fast heating/ cooling systems (e.g. fan coils, air conditioner boxes etc.)*
- *Normally Closed, apply power to open.*

Technical Data	
Type	***ABNM***
Supply voltage	24 Vac, 230 Vac +10 to -15%
Frequency	50/60Hz
Consumption	2 W
Power output	100N
Max Stroke	3.5mm (inc adaptor margin = 4mm)
Full Stroke Time	30 sec p/mm
Grade of enclosure	IP54
Ambient temperature	0 to 60°C

ABNM

Code No.	Type	Description	Supply Voltage (Vac)	Control Voltage (VDC)	Cable Length
082F109100	ABNM	With adapter for Danfoss RA valves	24	0-10	1m
082F109400	ABNM	No valve adapter	24	0-10	1m
082F109500	ABNM	No valve adapter	24	0-10	5m
082F109600	ABNM	No valve adapter	24	0-10	8m

ABQM Actuators
AME 110NL and AMV 110NL

AME 110NL

AMV 110NL

Use with ABQM DN10-32

- *Modulating (AME) or 3 point control (AMV)*
- *Maintenance free*
- *Self positioning*
- *Low noise operation*
- *No tooling required to mount the actuator*
- *IP 42 cover*

Technical Data

Type	***AMV 110 NL***	***AMV 120 NL***
Power supply	24 Vac, +10 to -15%	24 Vac, +10 to -15%
Power consumption	1 VA	1 VA
Frequency	50 Hz/60 Hz	50 Hz/60 Hz
Close of force	130 N	130 N
Stroke	5 mm	5 mm
Speed	24 s/mm	2 s/mm
Max. medium temp. inside the pipe	120°C	120°C
Ambient temperature	0 ...55°C	0 ...55°C
Storage and transport temperature	-40 ... +70°C	-40 ... +70°C
Protection code	IP 42	IP 42
Weight	0.3 kg	0.3 kg

Type	***AME 110 NL***	***AME 120 NL***
Power supply	24 Vac, +10 to -15%	24 Vac, +10 to -15%
Power consumption	2 VA	2 VA
Frequency	50 Hz/60 Hz	50 Hz/60 Hz
Close of force	130 N	130 N
Stroke	5 mm	5 mm
Speed	24 s/mm	12 s/mm
Max. medium temp. inside the pipe	120°C	120°C
Ambient temperature	0 ...55°C	0 ...55°C
Storage and transport temperature	-40 ... +70°C	-40 ... +70°C
Protection code	IP 42	IP 42
Weight	0.3 kg	0.3 kg

Type	**Supply voltage**	**Cable Length**	**Speed**	**Code No.**
AMV 110 NL	24 Vac	1.5m	24 s/mm	082H805600
		5.0m	24 s/mm	082H807600
AMV 120 NL		1.5m	12 s/mm	082H805800
AME 110 NL		1.5m	24 s/mm	082H805700
		5.0m	24 s/mm	082H807700
		10m	24 s/mm	082H808700
AME 120 NL		1.5m	12 s/mm	082H805900

Type	**Supply Voltage**	**Code No.**
Cable (5m)	24 Vac	082H8052300
Cable (10m)		082H805400

ABQM Actuators
AME15QM

Use with ABQM DN40-100

- *Actuator automatically adapts its stroke to valve end positions which reduces commissioning time*
- *Load related 'switch-off' to ensure that actuator and valve are not exposed to overload*
- *Designed for the ABQM valves in sizes from DN40–DN100*
- *Manual hand operation facility*
- *Proportional or 3 point control*
- *Automatic self stroking feature*

Technical Data

Type	***AME15QM***
Power supply	24 Vac, +10 to -15%
Power consumption	4 VA
Frequency	50 Hz/60 Hz
Control input Y	0 ... 10V (2 ... 10V) Ri = 24Ω 0 ... 20 mA (4 ... 20 mA) Ri = 500Ω
Output signal	0 ... 10V (2 ... 10V)
Close of force	500N
Max. stroke	15 mm
Speed	11 s/mm
Max. medium temperature	120°C
Ambient temperature	0 ... 55°C
Storage/transport temperature	-40 ... +70°C
Protection code	IP 54
Weight	0.80 kg

AME15QM

Type	Supply voltage	Code No.
AME 15 QM	24 Vac	082H307500

ABQM Actuators
AME55QM

Use with ABQM DN125-150

- *The advanced design incorporates load related 'switch-off' to ensure that actuators and valves are not exposed to overload*
- *The advanced design incorporates a diagnostic LED, operational data capture and self stroking feature*
- *Manual override*

Technical Data

Type	***AME15QM***
Power supply	24 Vac, +10 to -15%
Power consumption	9 VA
Frequency	50 Hz/60 Hz
Control input Y	0 ... 10V (2 ... 10V) Ri = 24Ω 0 ... 20 mA (4 ... 20 mA) Ri = 500Ω
Output signal	0 ... 10V (2 ... 10V)
Close of force	2000N
Max. stroke	40 mm
Speed	8 s/mm
Max. medium temperature	200°C
Ambient temperature	0 ... 55°C
Storage/transport temperature	-40 ... +70°C
Protection code	IP 54
Weight	3.8 kg

AME55QM

Type	Supply voltage	Code No.
AME 55 QM	24 Vac	082H307800

ABQM Actuators
AME85QM

Technical Data

Type	***AME85QM***
Power supply	24 Vac, +10 to -15%
Power consumption	12.5 VA
Frequency	50 Hz/60 Hz
Control input Y	0 ... 10V (2 ... 10V) Ri = 50Ω 0 ... 20 mA (4 ... 20 mA) Ri = 500Ω
Output signal X	0 ... 10V (2 to 10V)
Close of force	5000N
Max. stroke	40 mm
Speed	8 s/mm
Max. medium temperature	200°C
Ambient temperature	0 ... 55°C
Storage/transport temperature	-40 ... +70°C
Protection code	IP 54
Weight	9.8 kg

AME85QM

Type	Supply voltage	Code No.
AME 85 QM	24 Vac	082G145300

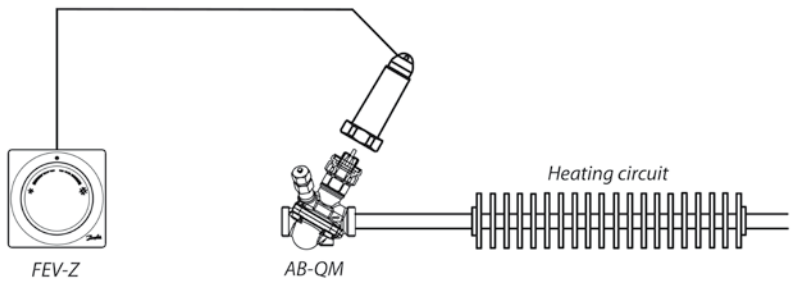
Use with ABQM DN200-250

- ***Position indication***
- ***Automatic adaptation of stroke to the valve's end position to reduce commissioning time (self-stroking)***
- ***Load related 'switch off' to ensure that actuators and valves are not exposed to overload***
- ***Manual operation***
- ***Proportional or 3-point control***

ABQM Climate Sensor
FEV-Z

FEV-Z

Heating: Floor, Ceiling or Radiator Heating



Type	Description	Setting Range	Code No.
FEV-Z	Climate sensor with adapter for ABQM automatic flow limiter, 8 m capillary tube	17 - 27 ˚C	013G545800

- ***Non-electric proportional control***
- ***Direct acting valve controller***
- ***Easy set and install process***
- ***Suitable for ABQM valves DN10 – DN20 and RA-C/N/G valves***
- ***Range limiting function***

The FEV-Z climate sensor is a proportional controller which opens or closes an ABQM automatic flow limiter valve dependant on the difference in temperature from the set-point. If the temperature in the room is equal or below setpoint then the valve will remain open, closing should the space temperature increase above set-point. The FEV-Z is used in climate systems with ceiling, floor or radiator heating.

ABQM Self-Acting Thermostatic Actuator
QT

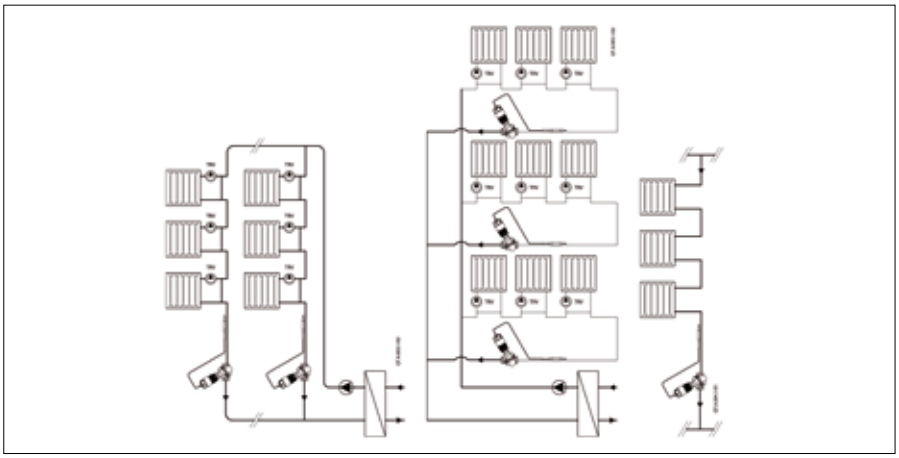
- ***Setting range: 35-50°C, 45-60°C***
- ***Designed for ABQM DN 10-32***
- ***Easy to install external surface sensor***
- ***Reduces actual riser flow to match heat demand***
- ***Improved room temperature control***
- ***Reduced overheating of the building***
- ***Reduced heating cost***

QT is a self-acting thermostatic actuator designed to be used in combination with ABQM in one-pipe heating systems. ABQM together with QT converts a one-pipe heating system into an energy efficient variable flow system, where flow in the risers is dynamically adjusted to match the load in the riser by control of return water temperature.

QT is dedicated to be used with ABQM automatic balancing and control valve.

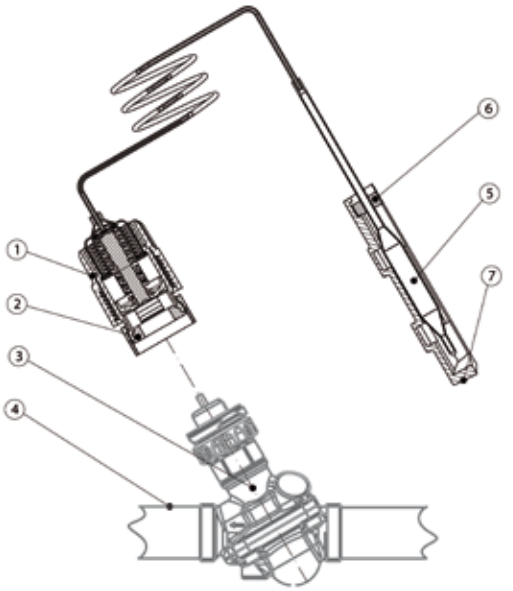
ABQM together with QT is a complete one-pipe solution: ABQT.

QT



QT Thermostatic Actuator	Setting Range	Fits to ABQM	Code No.
	45-60	DN 10-20	003Z038200
		DN 25-32	003Z038300
	35-50	DN 10-20	003Z038400
		DN 25-32	003Z038500
Data			
Setting range	°C	35-50	45-60
Temperature tolerance		±3	
P-Band [1]		5 [1]/8 [2]	
Max temperature at sensor		90	
Capillary tube length	m	0.6	

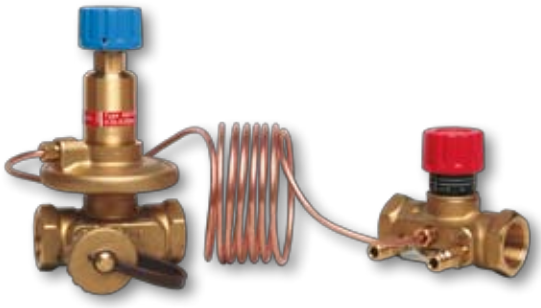
1) with AB-QM DN 10-20, at 50 % flow setting
2) with AB-QM DN 25-32, at 50 % flow setting



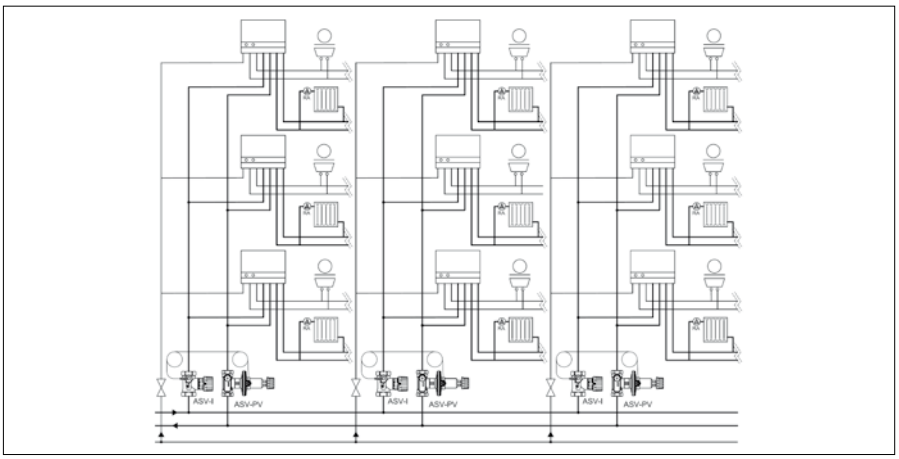
1. Setting dial
2. Adapter
3. ABQM valve
4. Hot water pipe
5. Temperature sensor
6. Rubber selling for sensor
7. Sensor holder

Automatic Balancing Valve
ASV-PV

ASV-PV



ASV-PV and ASV-I



ASV-PV balancing valve inclusive 1.5m impulse tube (G $^{1}/_{16}$ A) and drain cock (G ¾ A)						
Type	**DN**	**Kvs m³/h**	**Connection**		**Δ bar setting range**	**Code No.**
	15	1.6	Internal thread ISO 7/1	Rp ½	0.05 - 0.25	003L760100
	20	2.5		Rp ¾		003L760200
	25	4.0		Rp 1		003L760300
	32	6.3		Rp 1¼		003L760400
	40	10.0		Rp 1½		003L760500
	15	1.6		Rp ½	0.20 - 0.40 [1]	003L761100
	20	2.5		Rp ¾		003L761200
	25	4.0		Rp 1		003L761300
	32	6.3		Rp 1¼		003L761400
	40	10.0		Rp 1½		003L761500
	32	6.3		Rp 1¼	35 - 75	003L761600
	40	10.0		Rp 1½		003L761700
	15	1.6	External thread ISO 228/1	G ¾ A	0.05 - 0.25	003L760600
	20	2.5		G 1 A		003L760700
	25	4.0		G 1¼ A		003L760800
	32	6.3		G 1½ A		003L760900
	40	10.0		G 1¾ A		003L761000
	50	20	External thread ISO 228/1	G 2½ A	0.05 - 0.25	003Z061100
					0.20 - 0.40	003Z062100
					0.35 - 0.75	003Z063100
					0.60 - 1.00	003Z064100

ASV-PV balancing valve inclusive 1.5m impulse tube (G $^{1}/_{16}$ A)						
Type	**DN**	**Kvs m³/h**	**Connection**		**Δ bar setting range**	**Code No.**
	65	1.6	Flange EN 1092-2	PN16	0.20 - 0.40	003Z062300
	80	2.5				003Z062400
	100	4.0				003Z062500
	65	6.3			0.35 - 0.75	003Z063300
	80	10.0				003Z063400
	100	1.6				003Z063500
	65	2.5			0.60 1.00	003Z064300
	80	4.0				003Z064400
	100	6.3				003Z064500

- ***Maintains differential pressure across risers***
- ***ASV-PV valves are settable in different ranges:***
  - 5-25 kPa setting is mostly used for radiator applications
  - 20-40 kPa setting is used for radiator, fan coil, chilled beam and flat station applications
  - 35-75 kPa setting is used for flat station and fan coil, chilled beam applications
  - 60-100 kPa setting is used for large terminal unit applications (air handling units, fan coils etc.)
- ***Shut-off function***
- ***An adapted membrane for every valve dimension which provides constant performance***
- ***Low noise emission***

ASV-PV can control the differential pressure in several ranges if different pressure is needed. ASV valves in dimensions DN 15-40 are supplied with an internal or external thread while DN 50 is supplied with external thread only. A threaded tailpiece can be supplied as an accessory (see page 52). Dimensions DN 65-100 are supplied as flanged valves.

Connection of the valves is simple with all serviceable features at 90° to the pipework, easy connection for the impulse tube and a large selection of spares for all valves in the range.

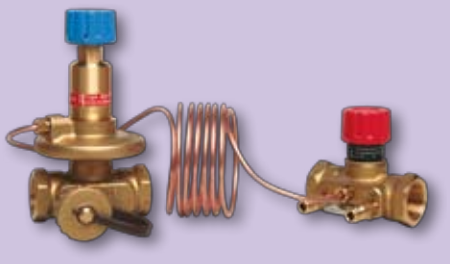
ASV-PV valves are to be mounted in return pipe, in combination with partner valves mounted in flow pipe. As a partner valve ASV-M/ASV-I are recommended for dimensions DN 15 to DN 50 and MSV-F2 for dimensions DN 65 to DN 100.

Shut-off/Flow Limitation Valve
ASV-I

- ***Installed together with ASV-PV to control the differential pressure in risers***
- ***Combined pre-setting, measuring and shut-off valve***
- ***Maximum flow limitation***
- ***Measuring plugs***
- ***Double cone to give maximum stroke limitation***

ASV valves are designed to be used in HVAC circulating systems to control differential pressure in risers or in every terminal unit.

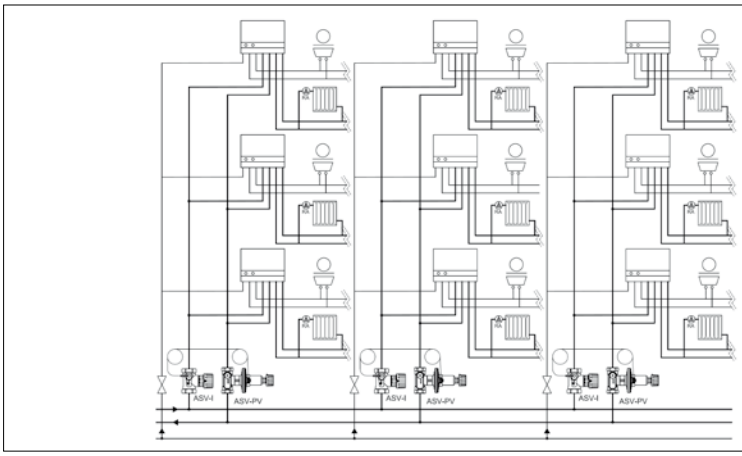
To limit the flow for every circuit, the ASV-I with its pre-setting capability should be used together with constant pressure control provided by an ASV-PV, providing a balanced distribution in the system.

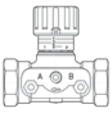
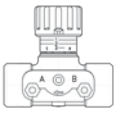


ASV-PV and ASV-I

ASV-I

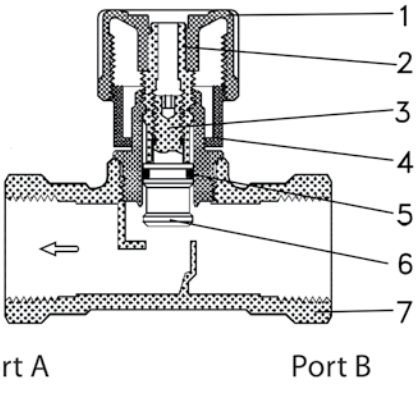
ASV-I DN 50

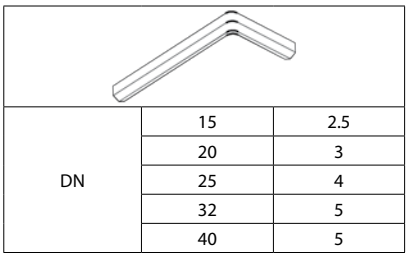


Type	DN	Kvs m³/h	Internal Thread ISO 7/1	Code No.	Type	External Thread ISO 228/1	Code No.
	15	1.6	Rp ½	003L764100		G ¾ A	003L764600
	20	2.5	Rp ¾	003L764200		G 1 A	003L764700
	25	4.0	Rp 1	003L764300		G 1¼ A	003L764800
	32	6.3	Rp 1¼	003L764400		G 1½ A	003L764900
	40	10	Rp 1½	003L764500		G 1¾ A	003L765000
	50	16				G 2¼ A	003L765200

Type	Comments	To pipe	To valve	Code No.
	Tailpiece threaded (1 pcs.)	R2	DN 50 (2¼")	003Z027400[2]
			DN 50 (2½")	003Z027800[1]

Note: ASV-PV DN 50 (2½") and ASV-I/M DN 50 (2¼") have different size connection.
1) To use with ASV-PV DN 50 valves
2) To use with ASV-I and ASV-M DN 50 valves





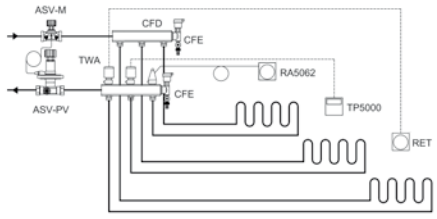
DN		
	15	2.5
	20	3
	25	4
	32	5
	40	5

1. Shut-off dial
2. Shut-off spindle
3. O-rings
4. Valve cone
5. Valve body

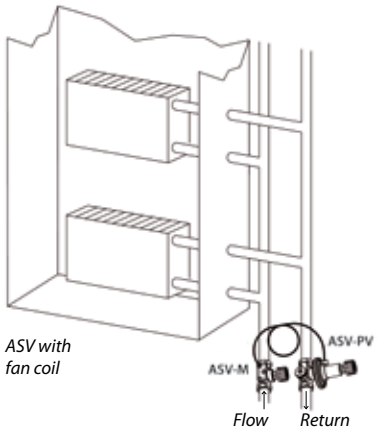
Shut-Off Valve
ASV-M

ASV-M

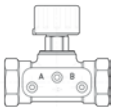
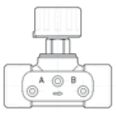
ASV-M DN50



ASV in manifold for floor heating system



ASV with fan coil

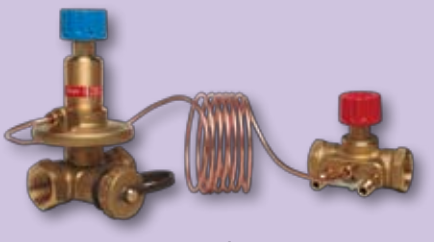
Type	DN	Kvs m³/h	Internal Thread ISO 7/1	Code No.	Type	External Thread ISO 228/1	Code No.
	15	1.6	Rp ½	003L769100		G ¾ A	003L769600
	20	2.5	Rp ¾	003L769200		G 1 A	003L769700
	25	4.0	Rp 1	003L769300		G 1¼ A	003L769800
	32	6.3	Rp 1¼	003L769400		G 1½ A	003L769900
	40	10	Rp 1½	003L769500		G 1¾ A	003L770000
	50	16				G 2¼ A	003L770200

Description		Comments	Code No.
Differential pressure measuring connector		For drain cock	003L814300
Drain Cock		For ASV-PV (DN 15-50)	003L814100
Two measuring nipples and one locking plate		For AAV-I and ASV-M, rectus type	003L814500
Impulse tube, with O-rings		1.5m	003L815200
		2.5m	003Z069000
		5.0m	003L815300
Adapter large ASV [1]		G ¼ - R ¼; G 1/16	003Z069100
Nipple for connecting impulse tube [2]		G 1/16 - R ¼	003L815100
O-ring for impulse tube [3]		2.90 x 1.78	003L817500
Plug for impulse tube connection ASV-I/M 3)		G 1/16 A	003L817400

1) Recommended for use with MSV-F2, connected to measuring hole, it allows connection of impulse tube from ASV while retaining measuring functionality.
2) Recommended for use with MSV-F2, connected to measuring hole. Can also be used for connecting impulse tube directly on the pipe.
3) Set of 10 pieces

- ***Installed together with ASV-PV to control the differential pressure in risers***
- ***Shut-off valve***
- ***Easy to install - all service parts located at 90° angle to valve***
- ***Connection for impulse tube to ASV-PV***
- ***Can be fitted with measuring nipples***

The ASV-M is a manual shut-off valve designed to be used in combination with the pressure controller ASV-PV. The ASV-M is not supplied as standard with nipples for measuring, but can be equipped with them if required.



ASV-PV and ASV-M

Manual Presetting Valve
LENO™ MSV-O

- ***Fixed venturi orifice***
- ***Removable hand wheel for easy mounting***
- ***Numeric presetting scale, visible from more angles***
- ***Easy locking of presetting***
- ***Built-in measuring nipples for 3mm needles***
- ***Open-Closed colour indicator***
- ***Measuring accuracy is 8% up to 25% of maximum setting***
- ***Internal thread***
- ***Sizes DN15LF - DN50***
- ***All LENO™ valves are DZR Brass***

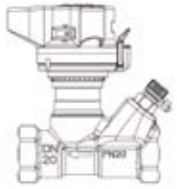
LENO™ MSV-O is a new generation of manual valves for balancing flow in heating, cooling and domestic hot water systems. These combined presetting and shut off valves have a range of unique features and may be mounted in flow or return.

It is recommended to use LENO MSV-O for balancing and shut-off in constant flow systems, i.e. in front of boilers, flat stations or heat pumps in one-family houses.

LENO™ MSV-O has a fixed venturi orifice in the valve body with constant kvs-value.
This feature makes it possible to read flow on the measuring device, without typing in presetting.
This feature saves time for commissioning for each valve installed.

MSV-O

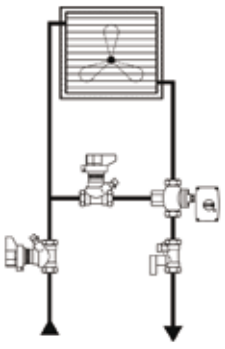
LENO™ MSV-O valve with internal thread

Type	Material	Size	Kvs (m3/h)	Connection	Code No.
	DZR Brass	DN 15 LF	0.63	Rp ½"	003Z402000
		DN 15	2.8	Rp ½"	003Z402100
		DN 20	5.7	Rp ¾"	003Z402200
		DN 25	9.7	Rp 1"	003Z402300
		DN 32	16.6	Rp 1¼"	003Z402400
		DN 40	25.4	Rp 1½"	003Z402500
		DN 50	37.9	Rp 2"	003Z402600

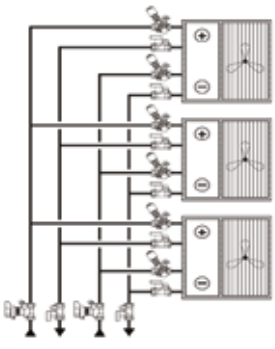
Accessories

Type	Code No.
Standard measuring nipples, 2pcs.	003Z466200
Extended measuring nipples, 60mm, 2 pcs.	003Z456700
Operating handle	003Z465200
Flow measuring instrument PFM4000	003L820000
Flow measuring instrument PFM4000 multi-source	003L820200
Identification tag and strips, 10 pcs.	003Z466000

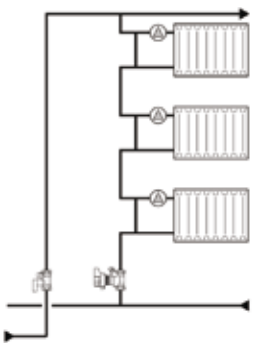
Applications



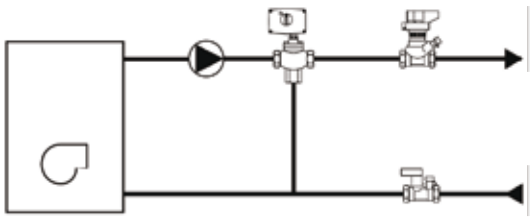
Air handling unit
- For constant flow
- For balancing
- Shut-off function for service/repair



Fan coils
- For flow verification
- Shut-off function for service/repair



Radiators
- For flow verification
- Shut-off function for service/repair



Boiler, flat station or heat pump in 1-family houses.
- For balancing.
- Shut-off function for service/repair.

Manual Presetting Valve
LENO™ MSV-BD

MSV-BD

LENO™ MSV-BD valve with internal thread

Type	Material	Size	Kvs (m3/h)	Connection	Code No.
	DZR Brass	DN 15 LF	2.5	Rp ½"	003Z400000
		DN 15	3.0	Rp ½"	003Z400100
		DN 20	6.0	Rp ¾"	003Z400200
		DN 25	9.5	Rp 1"	003Z400300
		DN 32	18	Rp 1¼"	003Z400400
		DN 40	26	Rp 1½"	003Z400500
		DN 50	40	Rp 2"	003Z400600

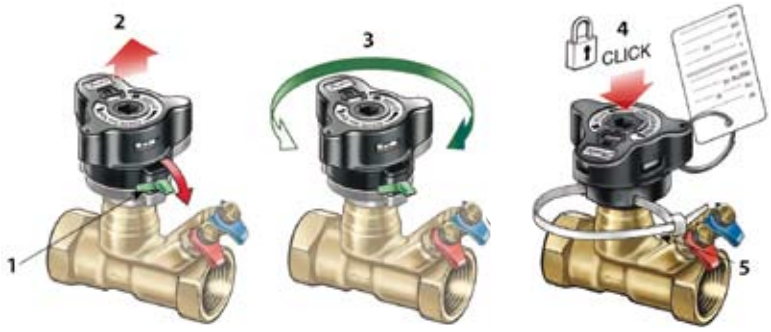
LENO™ MSV-BD valve with external thread

Type	Material	Size	Kvs (m3/h)	Connection	Code No.
	DZR Brass	DN 15 LF	2.5	G ¾ A	003Z410000
		DN 15	3.0	G ¾ A	003Z410100
		DN 20	6.0	G 1 A	003Z410200

LENO™ MSV-BD and MSV-S valve set with internal thread

Type	Material	Size	Kvs (m3/h)	Connection	Code No.
	DZR Brass	DN 15	3.0	Rp ½"	003Z405100
		DN 20	6.0	Rp ¾"	003Z405200
		DN 25	9.5	Rp 1"	003Z405300
		DN 32	18	Rp 1¼"	003Z405400
		DN 40	26	Rp 1½"	003Z405500
		DN 50	40	Rp 2"	003Z405600

Setting and Locking



The valve has a built-in presetting feature for accurate flow ratings. Setting the required flow is made in 5 steps:
1. Release the lock using the green lever.
2. The handle pops up automatically.
3. The calculated value can now be set.
4. The setting is locked when the handled is pressed to click.
5. Seal - the setting can be protected by using a strip as shown.

Shut-Off

In order to shut-off the valve the handle must be pressed down.
The shut-off function features a ball valve, which only requires a 90 degree turn to shut the valve completely.
An indicator window shows the actual setting:
· red = closed
· white = open

- ***Removable hand wheel for easy mounting***
- ***360° rotating measuring station for convenient measuring and draining***
- ***Numeric presetting scale, visible from more angles***
- ***Easy locking of presetting***
- ***Built-in measuring nipples for 3mm needles***
- ***Built-in drain cock with separate flow/return draining***
- ***Open-Closed colour indicator***
- ***Measuring accuracy is 8% up to 25% of maximum setting***
- ***Internal thread***
- ***Sizes DN15LF - DN50***
- ***All LENO™ valves are DZR Brass***

LENO™ MSV-BD is a new generation of manual valves for balancing flow in heating, cooling and domestic hot water systems. These combined presetting and shut off valves have a range of unique features.

It is recommended to use LENO™ MSV-BD in constant flow systems. The valve may be mounted in flow or return.

DN 15 and 20 valves are available with internal or external thread. Other dimensions with internal thread.

Partner Valve/High Quality Ball Valve
LENO™ MSV-S

- ***Removable handle for easy mounting***
- ***Handle can be turned both to the left and to the right when shutting off the ball valve***
- ***Screw will stay in the handle when it is dismounted***
- ***Drain with high kv-value***
- ***6mm hexagon key to drain the valve***
- ***Measure pressure***
- ***Cover caps to protect ¾" drain thread***
- ***Space for insulation between valve body and handle***
- ***Replaceable cover caps (different colours) for easy identification of flow/return, domestic hot/cold water and circulation***
  Red = Flow, domestic hot water
  Blue = Return, domestic cold water
  Green = Circulation (accessory)
- ***Cover cap to protect screw inside handle from dirt***

The MSV-BD/O valves can be coupled with a simple shut-off fitting, which is the MSV-S multifunction ball valve. The usual function of a conventional ball valve is extended by such features as DZR (zinc free brass) valve body, full closure, filling/draining (large capacity), two-directional handle rotation (better space utilisation), removable handle for the ease of installation, large capacity (high Kvs value), and if required pressure measuring possibility. These are similar to that of the MSV-BD valve.

MSV-S

LENO™ MSV-S valve with internal thread

Type	Kvs (m^3/h)	Drain Flow * (l/h)	Connection	Code No.
MSV-S DN 15	3.0	281	Rp ½"	003Z401100
MSV-S DN 20	6.0	277	Rp ¾"	003Z401200
MSV-S DN 25	9.5	316	RP 1"	003Z401300
MSV-S DN 32	18.0	305	RP 1¼"	003Z401400
MSV-S DN 40	26.0	208	Rp 1½"	003Z401500
MSV-S DN 50	40.0	308	Rp 2"	003Z401600
Note: All LENO™ valves are made of DZR, corrosion resistant brass. * Drain flow is measured at 1 bar static pressure and 0.1 bar differential pressure.				

LENO™ MSV-S valve with external thread

Type	Kvs (m^3/h)	Drain Flow * (l/h)	Connection	Code No.
MSV-S DN 15	3.0	281	G ¾" **	003Z411100
MSV-S DN 20	5.9	277	G 1"	003Z411200
Note: All LENO™ valves are made of DZR, corrosion resistant brass. ** Eurocone DIN V 3838				

Accessories

Type	Code No.
Cover cap handle - green, small handle fits DN15 - DN25 valve, 5 pcs	003Z421000
Cover cap handle - green, big handle fits DN32 - DN50 valve, 5 pcs	003Z421100

Materials and parts in contact with water

Valve body	DZR brass
O-rings	EPDM
Ball	Brass/chromium plated
Ball Sealing	Teflon

Max. static working pressure	20 bar
Static test pressure	30 bar
Max. differential pressure	2.5 bar (250 kPa)
Max. flow temperature	120°C
Min. temperature	-20°C
Cooling liquids	Ethylene glycol/ propylene glycol and HYCOOL (max. 30%)

DN	R1/R2 (mm)
15	62/50
20	66/55
25	71/59
32	117/66
40	119/66
50	122/67

Draining - high capacity
Possible drain through the valve using a 6 mm hexagon key. When handle is closed drain follows from the side where the drain is placed.
Drain cock has ¾" thread.

Fitting
Before fitting the valve, make sure that the pipe system is clean and the valve can be turned 360 degrees, if threaded pipe is used.

Flanged Manual Balancing Valve
MSV-F2

MSV-F2

- ***Available in sizes from DN15 – DN400***
- ***Easy pre-setting – digital display***
- ***Stroke limiter and non-rising handwheel for all versions***
- ***Lockable handwheel***
- ***G ¼ thread for various measuring nipples***
- ***Fast and precise flow measurement using measuring orifices together with valve***

The MSV-F2 is the second generation of flanged manual balancing valves from Danfoss. The MSV-F2 can be used in numerous HVAC applications such as Air Handling Units (AHU's), fan coil systems, boiler stations etc.

The MSV-F2 is compact by design, with excellent flow characteristics making it an ideal valve for almost any situation where a larger sized manual balancing valve is needed. It is made of cast iron (GG25 for PN16 versions and GGG40.3 for PN25 versions) and operates within the temperature range of -10 to 130°C (up to 150°C for PN25 versions).

All MSV-F2 valves have flow limitation via a built in stroke limiter and enable a constant pressure drop in constant flow systems.

MSV-F2 valves - PN16

	DN [1] mm	Kvs m³/h	Tmax °C	PN Bar	Code No. (with measuring nipples)
	15	3.1	130	16	003Z108500
	20	6.3			003Z108600
	25	9.0			003Z108700
	32	15.5			003Z108800
	40	32.3			003Z108900
	50	53.8			003Z106100
	65	93.4			003Z106200
	80	122.3			003Z106300
	100	200.0			003Z106400
	125	304.4			003Z106500
	150	400.8			003Z106600
	200	685.6			003Z106700
	250	952.3			003Z106800
	300	1380.2			003Z106900
	350	2046.1			003Z109000
	400	2584.6			003Z109100

1) Flange valves dimension DN 15-40, 350 and 400 available on request

MSV-F2 valves - PN25

	DN [1] mm	Kvs m³/h	Tmax °C	PN Bar	Code No. (with measuring nipples)
	15	3.1	150	25	003Z109200
	20	6.3			003Z109300
	25	9.0			003Z109400
	32	15.5			003Z109500
	40	32.3			003Z109600
	50	53.8			003Z107000
	65	93.4			003Z107100
	80	122.3			003Z107200
	100	200.0			003Z107300
	125	304.4			003Z107400
	150	400.8			003Z107500
	200	685.6			003Z107600
	250	952.3			003Z107700
	300	1380.2			003Z107800
	350	2046.1			003Z109700
	400	2584.6			003Z109800

Accessories

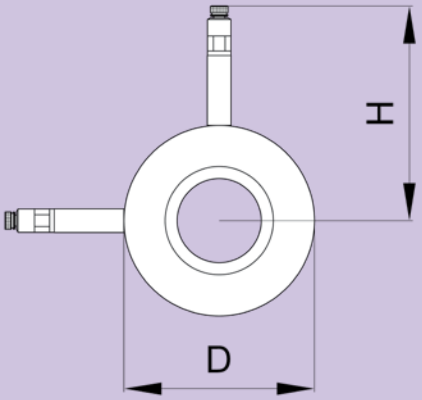
Type	Code No.
Needle nipple, 2 pcs.	003Z010400
Extension of measuring nipple 45mm, 2 pcs.	003Z010300
Extension of measuring nipple 80mm, 2 pcs	003Z010500

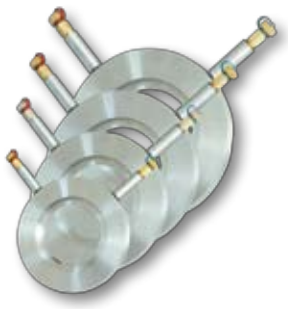
Type		Code No.
Hand-wheel	DN 15-50	003Z017900
	DN 65-150	003Z018000
	DN 200	003Z018100
	DN 250-300	003Z018200
	DN 350 - 400	003Z018300

Flow Measurement
Orifice

- ***Suitable for heating or cooling applications***
- ***Orifice - stainless steel construction***
- ***Measuring points – dezincification free brass***
- ***PN16, 25, 40***

Flow measurement orifices allow easy determination of flow in heating, cooling and potable water based systems. The measuring orifice should be installed between two counter flanges. All that is needed is to measure the differential pressure across the orifice which has a known Kv value.





Orifices

PN16					
DN	**D (mm)**	**H (mm)**	**Flange thickness (mm)**	**Kvs* (m³/h)**	**Code No.**
50	108	149	18	70.5	003Z226600**
65	127	159	18	104.5	003Z226100**
80	142	166	18	120.0	003Z226200**
100	162	176	18	266.3	003Z226300
125	192	191	18	330.3	003Z226400
150	218	204	18	527.6	003Z226500
200	273	232	18	746.0	003Z226600
250	329	260	18	1118.3	003Z226700
300	384	287	18	1765.2	003Z226800
350	444	317	20	1966.8	003Z226900
400	496	343	23	2482.6	003Z227000
450	556	373	28	3299.4	003Z227100
500	618	404	28	4052.9	003Z227200
600	735	463	29	6240.0	003Z227300***

* Flow is measured at Δp=0.2 - 0.3 bar and recalculated to Δp=1 bar over orifice
** Orifices rated PN40 (fit also to PN16 and/or PN25 flanges) *** Available on request

PN25					
DN	**D (mm)**	**H (mm)**	**Flange thickness (mm)**	**Kvs* (m³/h)**	**Code No.**
50	108	149	18	70.5	003Z226000**
65	127	159	18	104.5	003Z226100**
80	142	166	18	120.0	003Z226200**
100	168	179	18	266.3	003Z227700**
125	194	192	18	330.3	003Z227800**
150	224	207	18	527.6	003Z227900**
200	284	237	18	746.0	003Z228000
250	341	266	18	1118.3	003Z228100
300	401	296	18	1765.2	003Z228200
350	458	324	20	1966.8	003Z228300
400	515	353	23	2482.6	003Z228400
450	565	378	28	3299.4	003Z228500
500	625	408	28	4052.9	003Z228600
600	732	461	29	6240.0	003Z228700***

* Flow is measured at Δp=0.2 - 0.3 bar and recalculated to Δp=1 bar over orifice
** Orifices rated PN40 (fit also to PN16 and/or PN25 flanges) *** Available on request

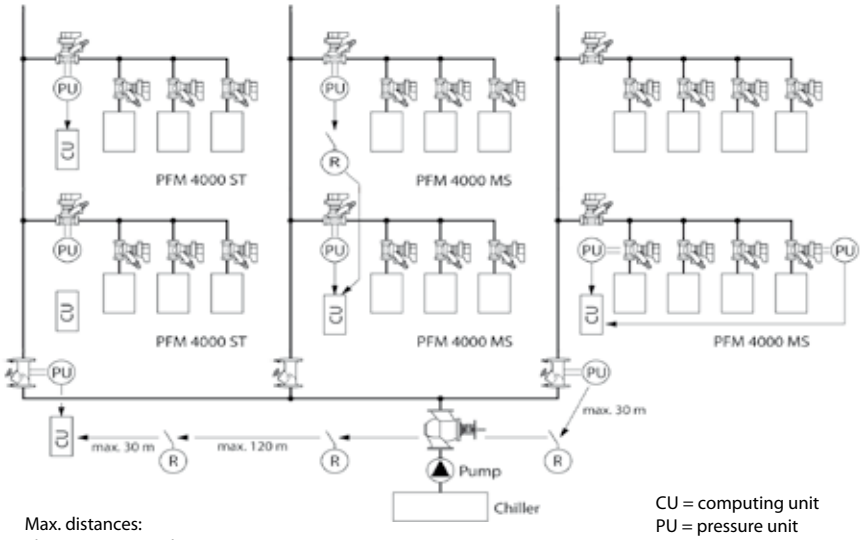
PN40					
DN	**D (mm)**	**H (mm)**	**Flange thickness (mm)**	**K_{vs}* (m³/h)**	**Code No.**
50	108	149	18	70.5	003Z226000
65	127	159	18	104.5	003Z226100
80	142	166	18	120.0	003Z226200
100	168	179	18	266.3	003Z227700
125	194	192	18	330.3	003Z227800
150	224	207	18	527.6	003Z227900
200	291	241	18	746.0	003Z229200
250	353	272	18	1118.3	003Z229300
300	418	304	18	1765.2	003Z229400
350	475	333	20	1966.8	003Z229500
400	547	369	23	2482.6	003Z229600
450	572	381	28	3299.4	003Z229700
500	629	410	28	4052.9	003Z229800
600	735	469	29	6240.0	003Z229900***

* Flow is measured at Δp=0.2 - 0.3 bar and recalculated to Δp=1 bar over orifice *** Available on request

Hydronic Measurement Instrument
PFM4000

PFM4000 Standard

PFM4000 Multi-source Suitcase



Max. distances:
- between PFM and router . max. 30 m
- between 2 routers . max. 120 m
- between pressure unit and router . . max. 30 m

CU = computing unit
PU = pressure unit
ST = standard
MS = Multi-source
R = Router

PFM4000 Standard Suitcase	Main Pressure Unit	Code No.
HP iPAQ 214 computing unit including multi-language software (SD card), AC adapter, sync/charge cable, HP software CD Main pressure unit with Bluetooth transmission, including AC adapter Polyamide measuring hoses (1.5 m), red and blue, with quick coupler for Rectus nipples (2 pcs.) 3.0 mm measuring needles with Rectus nipple, for measuring hoses (2 pcs.) Adapter hoses for old TA valves (2 pcs.) TA adaptors with Rectus nipple, for measuring hoses, (2 pcs.) Measuring adaptor for drain cock ¾" x Rectus nipple, for measuring hoses (2 pcs.) Measuring adaptor for drain cock ¾" x 3 mm measuring needles (2 pcs.) Reduction nipples ¾" x ½" (2 pcs.) Plastic bracket for mounting two measuring needle simultaneously User Guide	10 bar	003L820000
	20 bar	003L820100

PFM4000 Multi-source Suitcase	Main Pressure Unit	Code No.
SoMo 650 computing unit with radio card, including multi-language software (SD card), AC adapter, sync/charge cable, Somo software CD Main pressure unit with radio connection (2 pcs.), including 3,6 V power supply (1 pc.) Polyamide measuring hoses (1.5 m), red and blue, with quick coupler for Rectus nipples (4 pcs.) 3.0 mm measuring needles with Rectus nipple, for measuring hoses (4 pcs.) TA adaptors with Rectus nipple, for measuring hoses (2 pcs.) Adapter hoses for old TA valves (2 pcs.) Measuring adaptor for drain cock ¾" x Rectus nipple, for measuring hoses (2 pcs.) Measuring adaptor for drain cock ¾" x 3 mm measuring needles (2 pcs.) Reduction nipple ¾" x ½" (2 pcs.) Plastic bracket for mounting two measuring needle simultaneously User Guide	10 bar	003L820200
	20 bar	003L820300

- ***A complete system for flow calculation and pressure measurement***
- ***Separate computing unit and main pressure unit***
- ***For manual and automatic balancing valve measurement***
- ***Computing unit enable editing and back-up of data on PC***
- ***Export results to Excel***
- ***Print facility***
- ***Comes as a complete kit with all accessories required***
- ***Multi-language***
- ***Includes software***
- ***Complete with moulded case***

PFM 4000 is a system for measuring flow and performing hydronic balancing in heating, cooling and domestic hot water systems. PFM 4000 can also be used for measuring pressure and temperature.

The PFM 4000 system includes a main pressure unit, which is connected to the valve, and a computing unit. The main pressure unit is measuring flow, pressure and temperature and transmitting the collected data to the computing unit.

PFM 4000 comes in two versions:
- PFM 4000 Standard, with wireless Bluetooth connection (up to 20m transmission range)
- PFM 4000 Multi-source, with wireless radio transmission (up to 30m transmission range, expandable to 300m with routers)

PFM 4000 contains data for all Danfoss balancing valves as well as for valves from Cimberio, Comap, Esbe, Heimeier, Herz, Honeywell, Oras, Oventrop, Quitus, TA Hydronics and others.

Multifunctional Thermostatic Circulation Valve MTCV

- ***Saves energy by limiting hot water circulation***
- ***Provides water instantly at the right temperature***
- ***Automatic disinfection process***
- ***Electronic disinfection process***
- ***Modular upgrading of the MTCV valve during operation, under pressurised conditions, is possible when using ½ or ¾ fittings with shut-off ball valves.***
- ***Replaceable calibrated thermo-element***

The MTCV is a thermostatic self acting proportional valve, operating primarily through the use of a thermo-element to limit circulation flow in cases of high temperature. The setting scale allows the hot water temperature to be limited within a range of 35–60ºC.

There are 3 versions of the MTCV available:

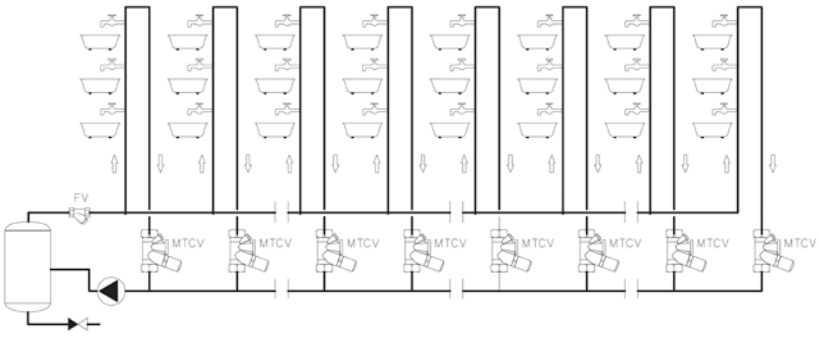
- Version 'A' – provides thermostatic balancing of the HW system within a set temperature range.
- Version 'B' – provides automatic thermal disinfection at temperatures above 68ºC, with a safety feature to prevent temperatures in excess of 75ºC.

Max. working pressure		10 bar
Test pressure		16 bar
Max. flow temperature		100°C
Kvs at 20°C	- DN 20	1.8 m3/h
	- DN 15	1.5 m3/h
Hysteresis		1.5 K

Material of parts in contact with water	
Valve body	Rg5
O-rings	EPDM
Spring, cones	Stainless steel

MTCV Version A

MTCV Version B with Thermometer



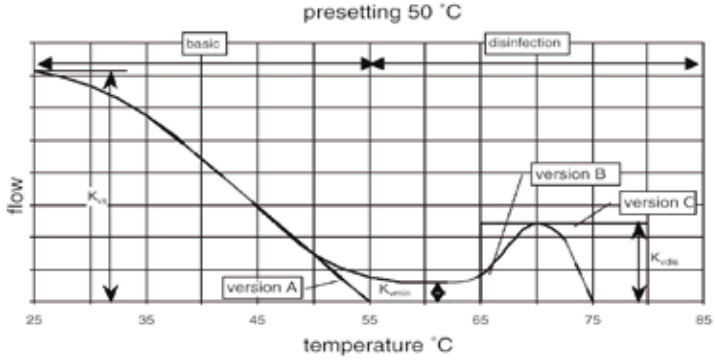
Example of MTCV / basic version / placement in domestic hot water system

Valve - Basic version A	Code No.
DN 15	003Z051500
DN 20	003Z052000

Valve - Basic version B	Code No.
DN 15	003Z051100
DN 20	003Z055700

Accessories	Comments	Code No.
Thermostatic disinfection module - B	DN 15 / DN 20	003Z102100
Fittings with shut-off ball valve (for allen-key 5mm), DN 15	G ½ x Rp ½	003Z102700
	G ¾ x Rp ¾	003Z102800
Thermometer with adapter	DN 15 / DN 20	003Z102300
Adapter for thermo-actuator	DN 15 / DN 20	003Z102200
Temperature sensor ESMB Universal		087B118400
Temperature sensor ESMC contact		087N001100
Fittings for soldering Cu 15mm	DN 15 int. R ½"	003Z103400
Fittings for soldering Cu 18mm		003Z103500
Fittings for soldering Cu 22mm	DN 20 int. R ¾"	003Z103900
Fittings for soldering Cu 28mm		003Z104000
Thermoactuator TWA-A NC, 230 V		088H311200
Thermoactuator TWA-A NC, 24V		088H311000

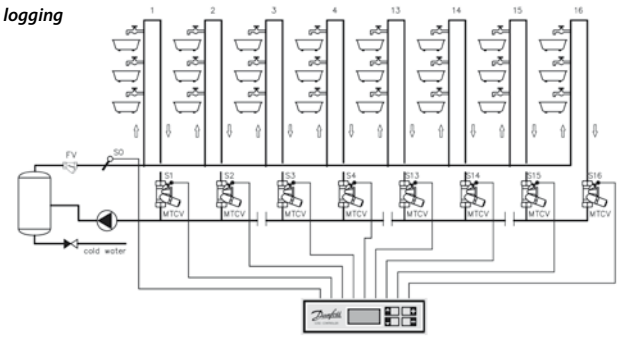
MTCV Regulating Characteristics



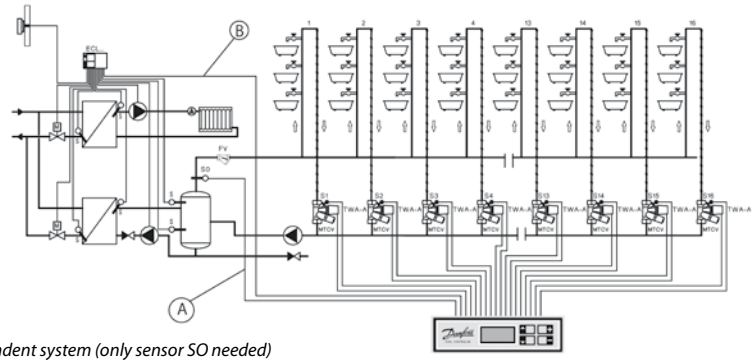
Disinfection Process Control & Temperature Logging
CCR2

CCR2

Scheme for temperature logging



Scheme for disinfection and registration temperature



A - independent system (only sensor SO needed)
B - dependent system (sensor SO and connection to weather or another control needed)

Type	Designation	Supply Voltage	Actuator type	Code No.
CCR2 Control	Disinfection Process Control and temperature registration	24 Vac	NC/16	003Z385000

Accessory				
Type	**Designation**	**Voltage**	**Comments**	**Code No.**
TWA-A	Thermal actuators	24 Vac		008H311000
TWA-A/ESMB	Thermal actuators with temperature sensors ESMB	24 Vac		003Z104300
Adapter	Adapter for TWA-A actuators for MTCV		For valve DN15/DN20	003Z102200
ESMB	Universal temperature sensor, PT1000		With 2.5m cable	087B118400
ESMB + pocket	Universal temperature sensor, PT1000		With 2.5m cable	003Z104500
ESMC	Surface Sensor, PT1000		With 2m cable	087N001100

- ***Fully automatic control of disinfection***
- ***Easy to read LCD display***
- ***Temperature register and log (SD Card)***
- ***Saves energy by shortening disinfection time of whole system***
- ***Reduction of limescale and associated costs***
- ***BMS connection possible***
- ***Alarm function***

The CCR2 system is used in conjunction with MTCV valves to provide fully automatic, optimised disinfection and/or temperature logging for large hot water systems. By optimising this process electronically, energy savings can be made by reducing the overall disinfection time, and disinfecting systems riser by riser.

Fully adjustable temperature logging is available using standard Secure Digital memory cards (SD). A 512mb SD card, when fitted to the CCR2 (set to log temps every 1 minute) will store over 2,000,000 records, or just over 1.5 years of data. Recording intervals are programmable and data can be read on any PC as data files are saved in a common *.txt format for easy integration into Excel or other spreadsheet software.

One CCR2 can control 16 risers, this can be expanded over a larger system by connecting other units up in serial or parallel.

Additional functions of the CCR2:

- Indication of alarm state
- Pump protection function
- Visual indication of the progress of disinfection process.

Automatic Bypass Valves
AVDO

- ***Self acting flow controller***
- ***Opens on rising differential pressure***
- ***DN15, DN20, DN25***
- ***Setting range of 0.05 to 0.5 bar***
- ***Internal/External thread variants***

The AVDO range of automatic bypass valves can be used as either differential pressure controls or to provide a minimum flow through a system.

Many boiler manufacturers are now insisting that a bypass be fitted in all installations to ensure that the volume of water circulating through the boiler does not fall to below a predefined minimum, regardless of the load on the system. Recognising the energy efficiency advantage of such controls the Building Regulations now require in both new-build and boiler replacement contexts, where a bypass is specified by the boiler manufacturer, that an automatic bypass is fitted. Automatic bypass valves improve system efficiency by opening only when there is a need to bypass water, this usually occurs at times of part load when radiator thermostats in the system are partly closed and water flow around the boiler is restricted. In addition to ensuring adequate flow around the boiler, automatic bypass valves also prevent pump pressure from climbing significantly above design levels, thus reducing the risk of noise in the system.

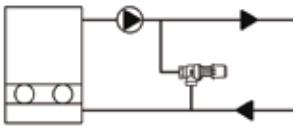
Available in a variety of sizes, the capacity of this range of valves is very high with large but linear changes in water throughput for relatively small increases in differential pressure. This allows a 15mm valve to be used in situations where 22mm valves are normally required.

Setting Range	0.05 - 0.5 bar
Max. differential pressure	0.5 bar
Operation pressure	PN 10
Max. flow temperature	120°C
Max. leakage at closed valve	50 l/h

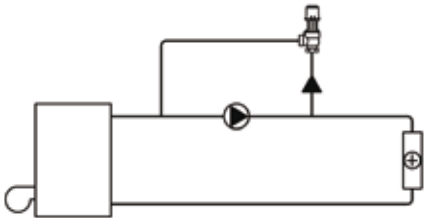
AVDO 15

AVDO 25

AVDO 20



Low capacity gas boiler where maintenance of a minimum flow is required



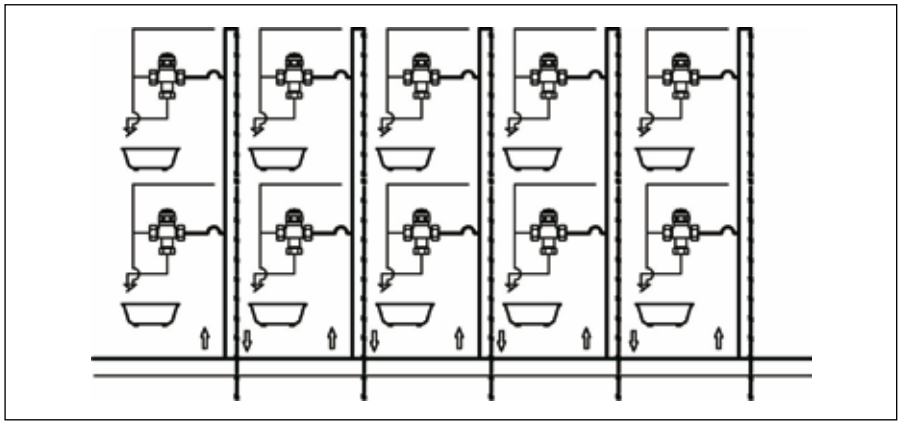
Differential pressure control

Code Number	Type	Setting Range (Bar)	Inlet Connection	Outlet Connection	Design
003L601800	AVDO 15	0.05 - 0.5	Rp ½"	Rp ½"	Straight
003L602300	AVDO 20	0.05 - 0.5	Rp ¾"	Rp ¾"	Straight
003L602800	AVDO 25	0.05 - 0.5	Rp 1"	Rp 1"	Straight
003L611500	AVDO	0.05 - 0.5	15mm	15mm	Straight
003L612200	AVDO	0.05 - 0.5	22mm	22mm	Straight
003L612800	AVDO	0.05 - 0.5	28mm	28mm	Straight

Thermostatic Mixing Valves
TVM-H and TVM-W

TVM-H

TVM-W



- ***Provides constant temperature at the outlet***
- ***Adjustable between 30°C and 70°C***
- ***Locking function***
- ***DN 20 (TVM-W)***
  DN20 & DN25 (TVM-H)
- ***Replaceable thermostatic element***
- ***Reduced risk of Legionella buildup***

The TVM range of thermostatic mixing valves is designed for use in hot water and heating systems (heating systems: TVM-H only) to regulate the outlet temperature to provide a constant and safe temperature.

By mixing the hot and cold supply water the TVM valve effectively provides a greater volume of hot water from any given tank size.

The TVM-W is suitable for single outlets i.e. baths, basins, showers and bidets.

The TWM-H is suitable for:

Without return valves	With return valves
3 Showers	2 Showers
4 Sinks	3 Sinks
2 kitchen/cleaning sinks	1 kitchen/cleaning sink

A replaceable thermostatic insert is available as a spare part which can be easily replaced if performance decreases due to normal wear and tear.

TVM-W							
Type	**Size**	**Connection**	**Temperature Range**	**E (l/min)**	**Kvs 1**	**Kvs 2**	**Code No.**
TVM-W	DN20	G 1/1	30 - 70°C	39	1.9	1.65	003Z112500
E = extracted (outlet) quantity at Δp = 1.5 bar Kvs 1 = without check valve Kvs 2 = with check valve							

Accessories and Spare Parts			
Type	**Maximum Pressure**	**Maximum Temperature**	**Code No.**
Non-return valve DN20	10 bar	95°C	003Z113000
Thermostatic element			003Z113200

TVM-H						
DN	**G**	**Temperature Range**	**E (l/min)**	**Kvs 1**	**Kvs 2**	**Code No.**
TVM-H 20	1″	30 - 70°C	39	1.9	1.65	003Z112000
TVM-H 25	1¾″	30 - 70°C	61	3.0	2.6	003Z112700
E = extracted (outlet) quantity at Δp = 1.5 bar Kvs 1 = without check valve Kvs 2 = with check valve						

Type	**Maximum Pressure**	**Maximum Temperature**	**Code No.**
Check valve DN 20	10 bar	95°C	003Z113000
Check valve DN 25	10 bar	95°C	003Z113100
Thermostatic element			003Z113200

Flush and Bypass Assembly
MiniFlush 100

- *Easy to fit*
- *Speeds up installation*
- *Suitable for heating and cooling applications*
- *100mm centres for easy insulation*
- *Multiple options available (upon request)*

Suitable for use in heating and cooling fancoil applications, small air handling units and heat interface units.

Technical Data
Bronze Cast Body
Integral full bore 3-way ball valves
Handles indicate flow direction
Available in ½" and ¾" end connections
Available complete with:
strainer and commissioning set or pressure independent control valve
Rated to PN16
Temperature rating -10°C to 120°C
Threaded BS21
Individually factory tested

Flush and Bypass Assembly
Connect Series

- *Easy to fit*
- *Speeds up installation*
- *Suitable for heating and cooling applications*
- *Includes flow straightener*
- *Combined drain and strainer*
- *Range of centres to suit application*
- *Bespoke designs available on request*

Suitable for use in heating and cooling fancoil applications, small air handling units and heat interface units.

Technical Data
Handles indicate flow direction
Available in $^{3}/_{8}$" and 1¼" end connections
Available complete with:
strainer and commissioning set or pressure independent control valve
Rated to PN16
Temperature rating -10°C to 120°C
Threaded BS21
Individually factory tested

District and Community Heating
For Heating and Cooling Applications

Danfoss offers a range of state-of-the-art technology control equipment especially developed for district and community heating systems.

Ultrasonic Heat Meters
The Danfoss SONOMETER™1000 Heat Meter is a compact ultrasonic heat meter suitable for district and community heating, chilled water, HVAC as well as combined applications. This range of meters enables optimum measurement of energy consumption, minimum maintenance and long-term stability.

Weather Compensators
The ECL Comfort range of electronic controllers offers optimum control of the heating system. The ECL Comfort weather compensators control the flow temperature, dependant on the outdoor temperature, in district and community heating systems, local block heating networks, boiler based heating and hot water systems.

Ball Valves
Ball valves from Danfoss are specially designed for district heating plants, distribution and transmission networks, pump and substations. The range of valves offers complete shut-off and longevity even at high and changing temperatures. The low operating torque is achieved through a sophisticated spring construction.

Few Products for Endless Number of Applications
ECL Electronic Controllers

- ***Optimiser and boost function***
- ***Return temperature limitation based on outdoor temperature***
- ***Frost protection***
- ***Heating cut-out function***
- ***Year clock and automatic changeover between summer and winter time***
- ***Copy function to/from the intelligent ECL card***
- ***Anti-bacteria function (DHW circuit)***
- ***Communication via the standardised LonTalk Protocol, RS 232, M0bus and MODBUS options***
- ***Motor protection***
- ***Automatic setback***

The ECL Comfort product ranges consist of electronic controllers for temperature control in heating and domestic hot water (DHW) systems. The controllers ensure a high comfort level and optimum energy utilisation.

The Components of ECL Comfort
The ECL Comfort range consists of ECL 110, 200 and 300 - each in an elegant and timeless design.

ECL Comfort 110 is the choice for simple heating systems, for which the installer or user prefer a traditional operation.

ECL Comfort 200 appeals to users who prefer an increased number of options. The series offers many functional options and can be used for commercial installations.

ECL Comfort 300 is the advanced controller with a large number of functions, such as: two control circuits plus thermostatic function, optimiser function, 3 point control, LON communication etc. The intelligent card concept ensures optimum user-friendliness of this advanced controller.

The range also comprises an elegantly designed remote control in two versions, which is connected to the controller via a two-wire cable.

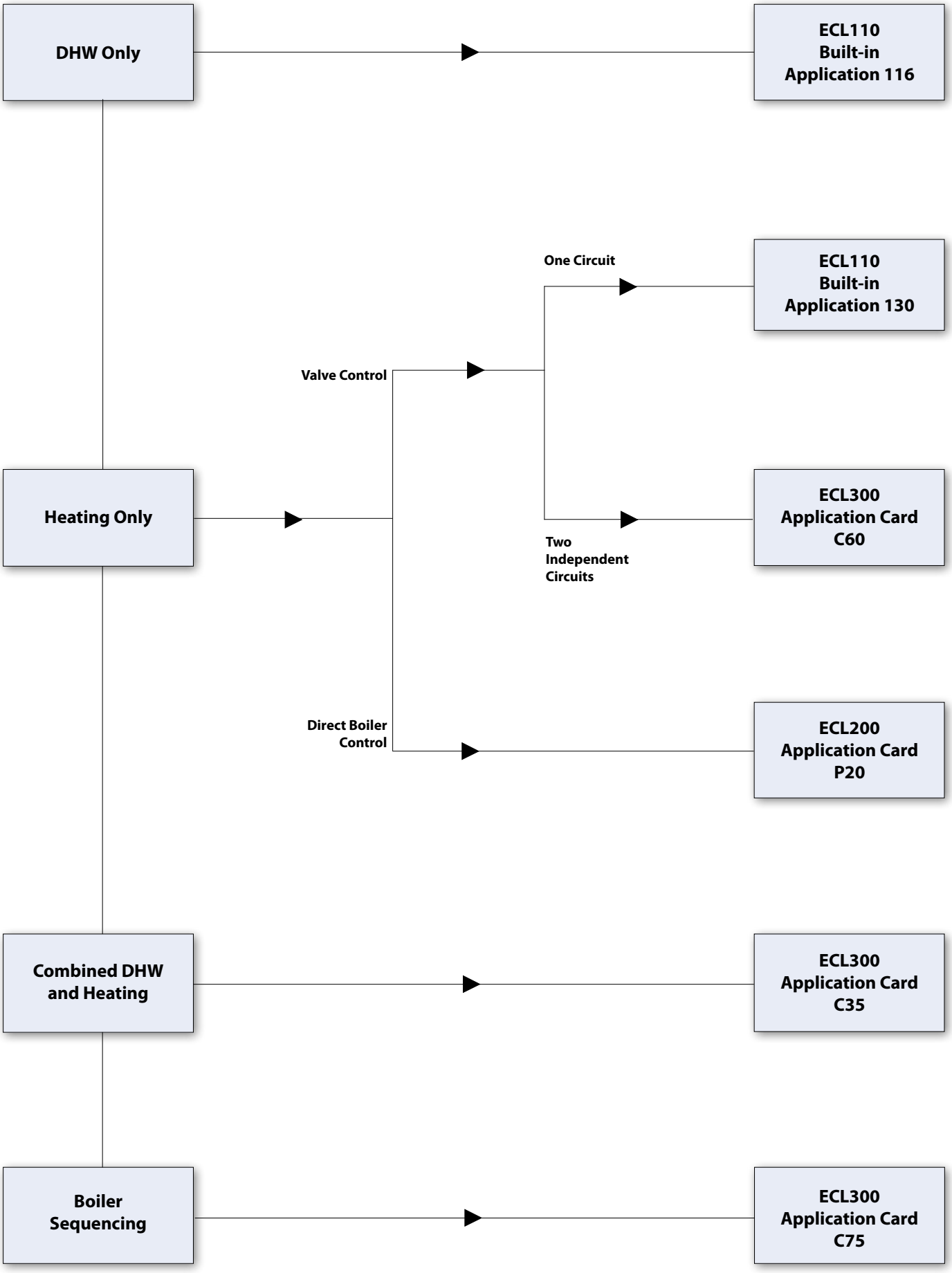
ECL Comfort
The Future is in the Cards
The ECL Comfort range and its advanced chip card not only meet your present demands but also the future requirements you might have for heating control.

With ECL Comfort 300 new demands are covered by new cards with new settings. The few basic models and the large variety of ECL cards give you a considerably better and quicker overview of the unique application opportunities offered by the ECL Comfort range.

By means of the chosen card, it is easy to set the controller and simple to change the factory setting precisely to the relevant type of system and required settings.

The schedule in the ECL Comfort can be programmed for each day in the week. The building will be heated in the comfort periods you request. This is environmentally sound and saves money.

Easy Application System
Quick Selection Guide for Common Applications



Electronic Temperature Controllers
ECL110 Compensator with Optimiser Function

- ***Commercial compensator for mixing valve or DHW control***
- ***Applications are built into the controller so no application cards are required***
- ***Easy to use user interface***
- ***Up to 4 temperature sensors can be connected***
- ***Can be used as a stand alone or slave controller***
- ***Built-in optimiser***
- ***Use with VRB/VF 3-port motorised valves and AMV 435 actuators***

The ECL Comfort 110 is a universal 1-circuit controller for use in district heating substations and district heating systems as well as boiler based systems.

This electronic controller is for:
- weather compensated flow temperature control (heating)
- constant temperature control (e.g. domestic hot water) and prepared for new applications by means of chip card and communication interface.

The controller is designed for easy installation: one cable, one connector and has a custom-designed display with backlight. For a quick overview, the display readouts are based on graphic symbols as well as text.

The controller has triac outputs for motorised control valve and relay outputs for pump control.

It is possible to connect up to 4 temperature sensors and it has 1 input for override. Room panel or remote control (ECA 60/61) can be connected.

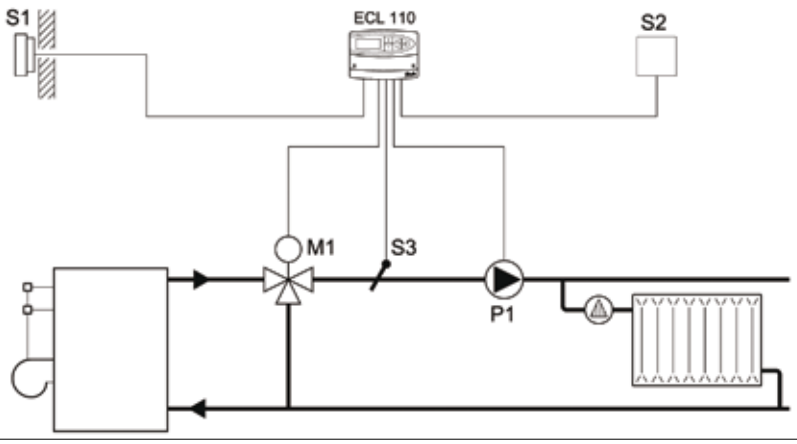
The ECL Comfort 110 controller can be used as master or slave in controller systems.

ECL 110

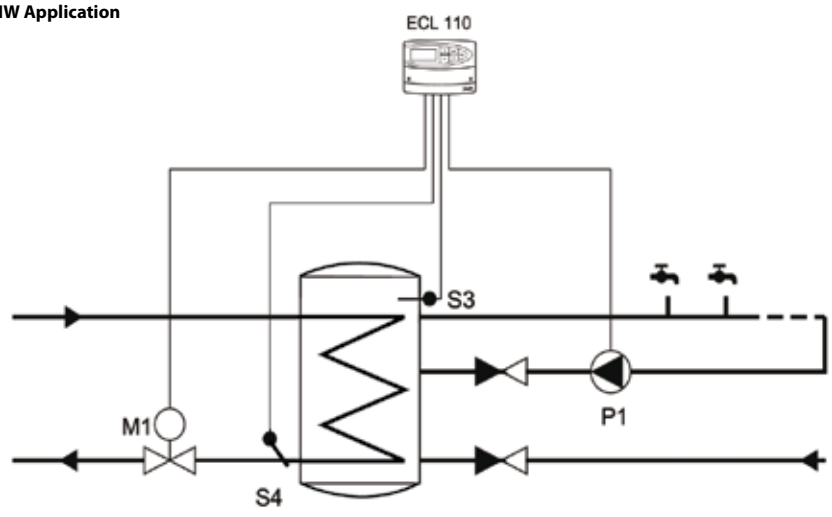
Type	Designation	Code No.
ECL Comfort 110	Universal hardware - 230 V a.c.	087B126100
ECL Comfort 110	Universal hardware - 24 V a.c.	087B125100
ECL Comfort 110 with timer programme	Universal hardware - 230 V a.c.	087B126200
ECL Comfort 110 with timer programme	Universal hardware - 24 V a.c.	087B125200
Panel Mounting Kit	For ECL Comfort 110	087B124900
Instructions appl. 116	User guide and quick guide	087B815100
Instructions appl. 130	User guide and quick guide	087B815200

For sensor options see page 67.

Boiler Application



DHW Application



Electronic Temperature Controllers
ECL200 Compensator with Optimiser Function

ECL 200

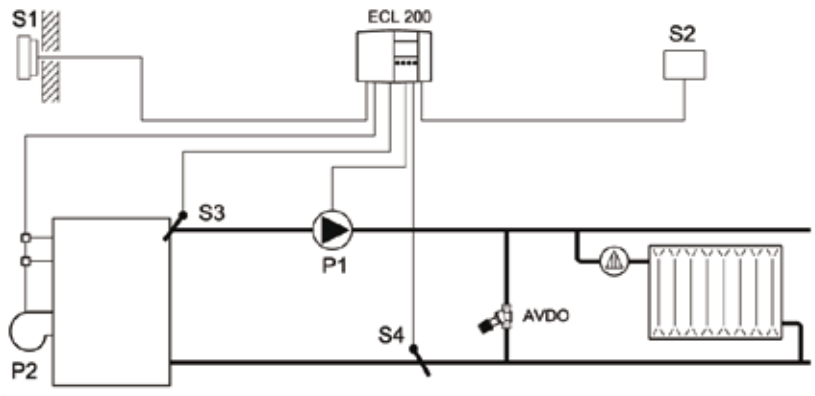
Type	Designation	Code No.
ECL Comfort 200	Universal hardware - 230 V a.c.	087B112000
ECL Comfort 200	Universal hardware - 24 V a.c.	087B112400
ECL Comfort 200	Base part for wall mounting or DIN rail	087B114900
ECL Comfort	Connector set for panel mounting	087B114800
ECL Comfort	Mounting kit for DIN rail	087B114500

For sensor options see page 67.

Following applications can be realised together with ECL Comfort 200:

Card	Code No.	Application Type Description	Controller Outputs (Without accessories)
P16	087B466300	Constant temperature control of hot-water circuits with flow system or storage tank built-in heating coil	1 x 3-point 1 x 2-point
P17	087B466400	Constant temperature control of hot-water circuits with storage charging system	1 x 3-point 2 x 2-point
P20	087B466000	Weather compensated flow temperature control of boiler systems	2 x 2-point
P30	087B465300	Weather compensated flow temperature control of heating systems with fixed return temperature limitation	1 x 3-point 1 x 2-point

Example Application - Direct Boiler Control



- ***Commercial compensator with lockable user interface***
- ***4 application cards are available***
- ***Can be used with P20 card to directly control a boiler***
- ***Easy to use user interface***
- ***Up to 4 temperature sensors can be connected***
- ***Can be used as a stand alone or master/slave controller***
- ***Built-in optimiser***
- ***Use with VRB/VF 3-port motorised valves and AMV 435 actuators***

The ECL Comfort 200 electronic controller is pre-programmed for a variety of different applications. Each application has its own card with an overview of the end-user and installer settings.

The ECL Comfort 200 controller has triac outputs for motorised valve control and 2 relay outputs for pump/valve control.

It is possible to connect up to 4 Pt 1000 temperature sensors and communication modules.

The enclosure is designed for wall and panel mounting as well as mounting on a DIN rail.

Electronic Temperature Controllers
ECL300 Compensator with Optimiser Function

- ***Commercial compensator with lockable user interface***
- ***A wide variety of application cards are available***
- ***Can be used with C75 application card to sequence up to 8 boilers***
- ***Easy to use user interface***
- ***Up to 6 temperature sensors can be connected***
- ***Can be used as a stand alone or master/slave controller***
- ***Built-in optimiser***
- ***Use with VRB/VF 3-port motorised valves and AMV435 actuator***

The ECL Comfort 300 is an electronic temperature controller which can be loaded with selected applications by means of an ECL card.

The ECL Comfort 300 controller has triac outputs for motorised valve control and relay outputs for burner/pump/changeover valve control.

It is possible to connect up to 6 Pt 1000 temperature sensors and optional plug-in modules.

The enclosure is designed for wall and panel mounting as well as for mounting on a DIN rail.

The ECL card contains information about application and factory settings. Each application has its own card with corresponding settings.

Special applications and/or settings are possible on request.

ECL 300

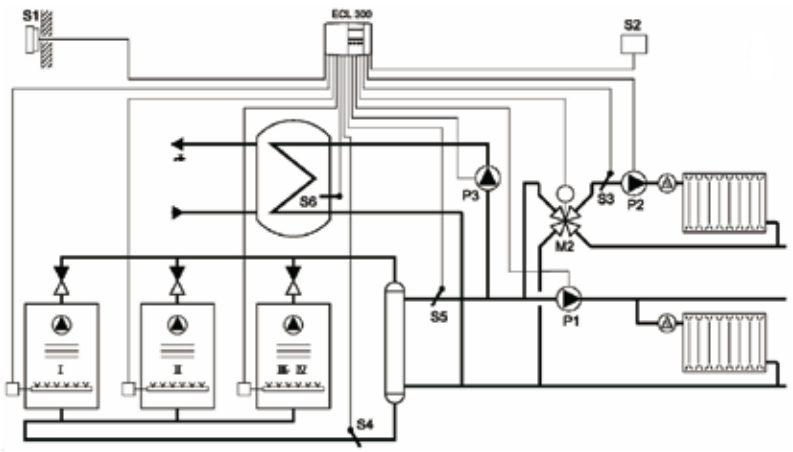
Type	Designation	Code No.
ECL Comfort 300	Universal hardware - 230 V a.c.	087B113000
ECL Comfort 300	Universal hardware - 24 V a.c.	087B113400
ECL Comfort 300 with ECA 83	Universal hardware - 230 V a.c. with 2 additional analog inputs (0-10 V) and 2 analog outputs (0-10 V)	087B183900
ECL Comfort 300 with ECA 88	Universal hardware - 230 V a.c. with2 additional pulse connectors for heat meter	087B113100
ECL Comfort 200/300/301	Base part for wall mounting or DIN rail	087B114900
ECL Comfort	Connector set for panel mounting	087B114800
ECL Comfort	Mounting kit for DIN rail	087B114500

For sensor options see page 67.

Following applications can be realised together with ECL Comfort 300:

Card	Code No.	Application Type Description	Controller Outputs (Without accessories)
C35	087B476100	Weather compensated flow temperature control of systems with fixed temperature limitation. Constant temperature control of secondarily connected DHW circuits with storage tank with built-in heating coil. Optional ON/OFF control of the DHW circuit in connection with primarily connected storage tank with built-in heating coil.	1 x 3-point 2 x 2-point
C60	087B475600	Weather compensated flow temperature control of heating systems with sliding return temperature limitation for two independent heating circuits	2 x 3-point 2 x 2-point
C62	087B480800	Weather compensated flow temperature control of heating systems with sliding return temperature limitation for two independent heating circuits	2 x 3-point 2 x 2-point
C75	087B482500	Multi-stage boiler controller (up to 8 boiler steps) with constant temperature control of DHW circuits and weather compensated flow temperature control of a mixed and an unmixed heating circuit	1 x 3-point 4 x 2-point*

Example Application - C75 Card-Boiler sequencing and mixing valve control



Electronic Temperature Controllers
Additional Items and Sensors

Application Cards

ESMT

ECA60

Type	Code	Description
ECL 200 Application Cards		
P16	087B466300	Hot Water Temperature Control
P17	087B466400	Hot Water Tank Temperature Control
P20	087N466000	Boiler Control
P30	087B465300	Mixing Control
ECL 300 Application Cards		
C12	087B490000	District Cooling Control
C14	087B482400	Ventilation Control
C17	087B473000	Hot Water Tank Temperature Control
C25	087B477000	Boiler and Hot Water Tank Control
C30	087B488900	Mixing and Hot Water Tank Control and Wind Compensation
C35	087B476100	Mixing and Hot Water Tank Control
C37	087B475800	Mixing and Hot Water Tank Control
C47	087B482100	Mixing and Hot Water Control
C55	087B478300	Boiler, Mixing and Hot Water Control
C60	087B475600	2 Circuit Mixing Control
C62	087B480800	2 Circuit Mixing Control
C66	087B475700	Mixing and Hot Water Control
C67	087B482000	2 Circuit Mixing and Hot Water Tank Control
C75	087B482500	Boiler Sequence, Mixing and Hot Water Control
ECA 80	087B115000	Relay Module
Room Panels		
ECA 60	087B114000	Room Panel with Room Temperature Sensor
ECA 61	087B114100	Remote Control with Room Temperature Sensor
ECA 62	087B116900	Room Panel with Room Temperature and Humidity Sensor
ECA 63	087B114300	Remote Control with Room Temperature and Humidity Sensor
Sensors		
ESM-10	087B116400	Pt 1000 Room Temperature Sensor
ESM-11	087B116500	Pt 1000 Surface Sensor
ESMB-12	087B118400	Pt 1000 Universal Sensor
ESMC	087B001100	Pt 1000 Surface Sensor
ESMT	087B101200	Pt 1000 Outdoor Sensor
ESMU-100	087B118000	Pt 1000 Immersion Sensor, 100 mm, Copper
ESMU-100	087B118200	Pt 1000 Immersion Sensor, 100 mm, Stainless Steel
ESMU-250	087B118100	Pt 1000 Immersion Sensor, 250 mm, Copper
ESMU-250	087B118300	Pt 1000 Immersion Sensor, 250 mm, Stainless Steel

Danfoss

Ultrasonic Compact Heat Meter
SONOMETER™ 1000

- ***No wear and tear due to static metering with no moving parts***
- ***1st approval in Europe for ultrasonic heat meter with dynamic range of qi/qp 1:250 in class 2***
- ***EN 1434 class 2 approval***
- ***Replacing of the measuring insert without dismantling the transducers***
- ***Power supply: battery, mains 230V ac or 24 V ac***
- ***Remote reading via M-bus, radio, RS232 or optical interface***
- ***Optional pulse input and pulse output module***
- ***Radio module for easy data transfer***
- ***Battery lifetime up to 16 years***
- ***MID examination certificate***

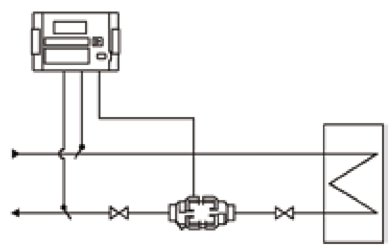
The SONOMETER™1000 is an ultrasonic static compact heat meter especially designed for heating, cooling or combined heating/cooling application in local and district heating systems.

The SONOMETER™1000 as a compact heat meter consists of the following components:
- Ultrasonic flow sensor;
- Calculator with integral hardware and software for measuring flow rate, temperature and energy consumption;
- Temperature sensors.

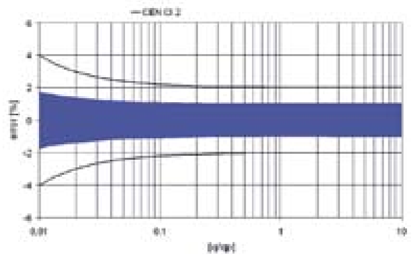
These heat meters give a precise and easy measure of your system's performance using a patented ultrasonic technology that guarantees high accuracy and reliable long-term stability.

SONOMETER™ 1000

Application



Measuring Accuracy to EN 1434 Class 2



Type	Medium	Size	Qp m³/hr	Code
SONOHEAT 1000/15/0.6	LTHW	DN15	0.6	1HE1A-CAR100-AN101-GB3
SONOHEAT 1000/15/1.0	LTHW	DN15	1	1HE1D-CAR100-AN101-GB3
SONOHEAT 1000/20/1.5	LTHW	DN20	1.5	1HE1H-CAR100-AN102-GB3
SONOHEAT 1000/20/2.5	LTHW	DN20	2.5	1HE1J-CAR100-AN101-GB3
SONOHEAT 1000/25/3.5	LTHW	DN25	3.5	1HE1L-CAR100-AN1F3-GB3
SONOHEAT 1000/25/6.0	LTHW	DN25	6	1HE1M-CAR100-AN1F3-GB3
SONOHEAT 1000/40/10.0	LTHW	DN40	10	1HE1N-CAR100-AN1G4-GB3
SONOHEAT 1000/50/15.0	LTHW	DN50	15	1HE2J-CAR100-BN1G0-GB3
SONOHEAT 1000/65/25.0	LTHW	DN65	25	1HE2K-CAR100-BN1G0-GB3
SONOHEAT 1000/80/40.0	LTHW	DN80	40	1HE2L-CAR100-BN1H0-GB3
SONOHEAT 1000/100/60.0	LTHW	DN100	60	1HE2M-CAR100-BN1H0-GB3
SONOCOOL 1000/15/0.6	CHW	DN15	0.6	1CO1A-CAR100-AN101-GB3
SONOCOOL 1000/15/1.0	CHW	DN15	1	1CO1D-CAR100-AN101-GB3
SONOCOOL 1000/20/1.5	CHW	DN20	1.5	1CO1H-CAR100-AN102-GB3
SONOCOOL 1000/20/2.5	CHW	DN20	2.5	1CO1J-CAR100-AN102-GB3
SONOCOOL 1000/25/3.5	CHW	DN25	3.5	1CO1L-CAR100-AN1F3-GB3
SONOCOOL 1000/25/6.0	CHW	DN25	6	1CO1M-CAR100-AN1F3-GB3
SONOCOOL 1000/40/10.0	CHW	DN40	10	1CO1N-CAR100-AN1G4-GB3
SONOCOOL 1000/50/15.0	CHW	DN50	15	1CO2J-CAR100-BN1G0-GB3
SONOCOOL 1000/65/25.0	CHW	DN65	25	1CO2K-CAR100-BN1G0-GB3
SONOCOOL 1000/80/40.0	CHW	DN80	40	1CO2L-CAR100-BN1H0-GB3
SONOCOOL 1000/100/60.0	CHW	DN100	60	1CO2M-CAR100-BN1H0-GB3

<table>
<tr><th colspan="21">Technical Data</th></tr>
<tr><td rowspan="4">Flow Rate Ranges</td><td>Nominal</td><td>q_p m³/h</td><td colspan="3">0.6</td><td colspan="3">1.0/1.5</td><td colspan="2">2.5</td><td colspan="2">3.5</td><td colspan="2">6</td><td colspan="2">10</td><td>15</td><td>25</td><td>40</td><td>60</td></tr>
<tr><td>Maximum</td><td>q_s m³/h</td><td colspan="3">1.2</td><td colspan="3">2/3</td><td colspan="2">5</td><td colspan="2">7</td><td colspan="2">12</td><td colspan="2">20</td><td>30</td><td>50</td><td>80</td><td>120</td></tr>
<tr><td>Minimum</td><td>q_i l/h</td><td colspan="3">6</td><td colspan="3">10/6</td><td colspan="2">10</td><td colspan="2">35</td><td colspan="2">24</td><td colspan="2">40/100</td><td>60/150</td><td>250</td><td>160</td><td>1200</td></tr>
<tr><td>Starting</td><td>l/h</td><td colspan="3">1</td><td colspan="3">2.5</td><td colspan="2">4</td><td colspan="2">7</td><td colspan="2">7</td><td colspan="2">20</td><td>40</td><td>50</td><td>80</td><td>120</td></tr>
<tr><td rowspan="3">Diameter</td><td>Nominal</td><td>DM mm</td><td>15</td><td colspan="2">20</td><td>15</td><td colspan="2">20</td><td colspan="2">20</td><td>25</td><td>32</td><td>25</td><td>32</td><td colspan="2">40</td><td>50</td><td>65</td><td>80</td><td>100</td></tr>
<tr><td>Connection</td><td>AGZ</td><td>G¾B</td><td>G1B</td><td>FL</td><td>G¾B</td><td>G1B</td><td>FL</td><td>G1B</td><td>FL</td><td>G1¼B</td><td>FL</td><td>G1¼B</td><td>FL</td><td>G2B</td><td>FL</td><td>FL</td><td>FL</td><td>FL</td><td>FL</td></tr>
<tr><td>Tailpiece</td><td>AGZ</td><td>R½</td><td>R¾</td><td>-</td><td>R½</td><td>R¾</td><td>-</td><td>R¾</td><td>-</td><td>R1</td><td>-</td><td>R1</td><td>-</td><td>R1</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Operating Pressure</td><td>Maximum</td><td>PN bar</td><td colspan="2">16/25</td><td>25</td><td colspan="2">16/25</td><td>25</td><td>16/25</td><td>25</td><td>16/25</td><td>25</td><td>16/25</td><td>25</td><td colspan="2">25</td><td>25</td><td>25</td><td>25</td><td>25</td></tr>
</table>

Ball Valves
JIP-II Screwed and JIP-FF Flanged

JIP-II

JIP-FF

- ***PTFE/carbon steel stem packing box designed without deteriorating rubber materials***
- ***Complete tightness and unlimited life***
- ***For use in high and low temperature applications***
- ***100% final inspection with leak and shell test performed on every valve***
- ***Tested to standard (EN 12266 part 1 and 2)***

Danfoss ball valves have been specially designed for district heating systems and other hot water systems, in which water has been treated in order to avoid corrosion.

Having fully welded bodies, the valves meet the requirements for valves used in hot water systems thus offering a high degree of security.

Furthermore, the Danfoss ball valves are suitable for district cooling systems.

Nominal Diameter **DN 15-100**
Temperature **0-180°C**
Nominal Pressure **PN 16 / 25 / 40**

JIP-II PN40 Internal Thread Valves

DN mm	Code No. II PN 40 L-handle High stem
15	065N080000
20	065N080500
25	065N081000
32	065N081500
40	065N082000
50	065N082500

DN	Kv (m³/h)
15	12
20	14
25	26
32	41
40	68
50	112
65	200
80	380
100	620
125	1025
150	1700
200	2300

JIP-FF Flanged Valves with Handles

DN mm	Code No. FF PN 16	Code No. FF PN 25	Code No. FF PN 40
15			065N030000
20			065N030500
25			065N031000
32			065N031500
40			065N032000
50			065N032500
65	065N428200	065N428100	
80	065N428700	065N428600	
100	065N024000	065N034000	
125	065N084500	065N094500	
150	065N085000	065N095000	
200	065N085500	065N095500	

Floor Heating Manifold
FHF-F

Easy mounting and installation

Ultra compact size

Energy Saving

Individual shut-off of each circuit

Individual flowmeter per circuit

The FHF-F Manifold is used for controlling water flow in underfloor heating systems. Each pipe in the floor heating system is connected to the manifold, thus making it possible to control water flow or heat supply to each room in the building individually.

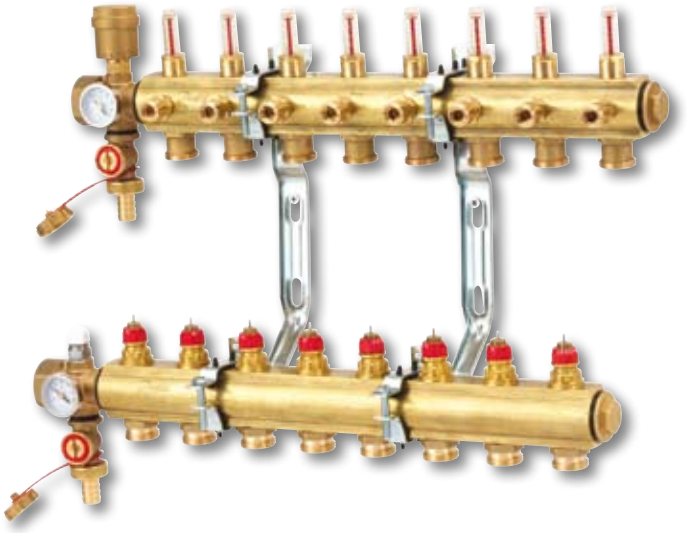
The manifold comprises of a supply and return manifold. The supply manifold includes individual shut-off of each circuit as well as an individual flowmeter per circuit. The return manifold is equipped with integrated Danfoss pre-setting valves securing optimal hydraulic balance in the system.

The valves can be controlled electronically by thermal actuators or act as self-acting units by means of remote temperature adjusters.

The manifold is supplied in modules of up to 12 outlets. Ball valves are available as an option for positive shut-off between the manifold and the system.

The end pieces FHF-EM and FHF-EA are supplied with manual airvents or alternatively with automatic airvents.

For fittings see page 20.



FHF-F

Description	Type	Code No.
Manifold set 2+2, with flowmeter	FHF-2F	088U052200
Manifold set 3+3, with flowmeter	FHF-3F	088U052300
Manifold set 4+4, with flowmeter	FHF-4F	088U052400
Manifold set 5+5, with flowmeter	FHF-5F	088U052500
Manifold set 6+6, with flowmeter	FHF-6F	088U052600
Manifold set 7+7, with flowmeter	FHF-7F	088U052700
Manifold set 8+8, with flowmeter	FHF-8F	088U052800
Manifold set 9+9, with flowmeter	FHF-9F	088U052900
Manifold set 10+10, with flowmeter	FHF-10F	088U053000
Manifold set 11+11, with flowmeter	FHF-11F	088U053100
Manifold set 12+12, with flowmeter	FHF-12F	088U053200

Accessories	Type	Code No.
End section - automatic airvent and purge valve	FHF-EA	088U058000
End section - manual airvent and purge valve	FHF-EM	088U058100
End caps - set	FHF-E	088U058200
Connection pieces - set	FHF-C	088U058300
Reduction bushes/pieces - set - 1" - ¾"	FHF-R	088U058400
Mounting brackets - set	FHF-MB	088U058500
2 x ball valve 1" with tail piece - for connection to manifold and for blocking of floor heating system	FHF-BV	058U058600
1 x thermometer 0-60°C Ø35mm - for flow/return temperature measurement	FHD-T	088U002900
Thermal actuator, 24V, NC, Danfoss RA connection to valve	TWA-A	088H311000
Thermal actuator, 230V, NC, Danfoss RA connection to valve	TWA-A	088H311200
Thermal actuator, 24V, NC, with end switch, Danfoss RA connection to valve	TWA-A	088H311400

Other variants of the TWA-A actuators are available.

Electronic Thermostats and Controllers
For Heating and Cooling Applications

For those seeking a simple, accurate and cost effective method of maintaining desired comfort temperatures in premises equipped with fan-coil units or with chilled beam ceilings and radiator heating systems, the Danfoss range of On/Off and 0-10v proportional electronic room controls is the answer. This range includes models ideally suited to 4-pipe or 2-pipe heating/cooling systems including fan-coil units, split packaged systems and chilled ceiling systems as well as traditional radiator based heating systems.

Using advanced chrono-proportional control the RET range of on/off thermostats provides accurate energy efficient control of heating systems whilst maintaining traditional use of on/off control for cooling modes if required. As the name suggests, chrono-proportional control is based upon regulating the amount of time for which the valve opens instead of the temperature-event based On/Off cycling of a traditional room thermostat. In operation, each hour is split into sections (either 3 or 6) and the controller calculates the proportion of these periods for which the valve opens to maintain desired comfort level.

The REP range of 24Vac/dc electronic controls allow for 0-10v proportional control with or without selectable fan speeds. Use of 0-10V control thermostats paired with an appropriate Danfoss actuator and valve allow for highly accurate valve positioning with the output voltage from the thermostat to the actuator proportional to the room temperature deviation from setpoint. This allows a high level of control ensuring optimal comfort conditions.

Through the introduction of the RET and REP room thermostats, Danfoss aims to show that improved system efficiency can be obtained without compromise on comfort and in fact improved comfort and improved system efficiency can be provided simultaneously if advanced controllers running chrono-proportional or 0-10V proportional control are used in combination with complimentary valves and actuators.

www.danfoss-randall.co.uk

Room Thermostats with Function Switches
RET

- ***Stylish, modern design***
- ***Large easy to read setting dial***
- ***Wide range - covers most applications***
- ***Locking and limiting as standard***

Suitable for the commercial heating and air conditioning market.

All models in the range feature up to two supplementary switches, the functions of which vary between models. Most models incorporate a separate fan output terminal making them ideal for use in fan coil unit systems.

RET230 C02: for use in 2-pipe or 4-pipe systems. One switch provides manual Heat/Cool selection; a second switch provides system Auto/Off selection.

RET230 C03: for use in 2-pipe changeover systems. One switch provides manual Heat/Off/Cool selection; a second switch provides 3-speed fan selection.

RET230 C3: for use in cooling systems. One switch provides Fan Auto/Continuous and system off selection; a second switch provides 3-speed fan selection.

RET230 LS: for use in heating or cooling systems. A manual switch is provided for Off/Auto selection. A version with voltage free manual switch is also available.

RET230-CO3

RET230-C3

RET230-LS

	RET230-C02	RET230-C03
Code No.	087N702200	087N703200
Thermostat with manual heat/cool selection	•	•
System Off/Auto Selector	•	
Heat/Cool/Off (Winter/Off/Summer) selector		•
Heat/Cool (Winter/Summer) selector	•	
3-speed fan switch		•
Single speed fan output	•	
	RET230-C3	**RET230-LS**
Code No.	087N702300	087N700700
Cooling thermostat	•	
Heating or cooling thermostat		•
Fan Auto/Continuous switch with system off selector	•	
System Off/Auto selector		•
Power on and thermostat calling LEDs	•	•
3-speed fan switch	•	
Specification		
Switching differential	<1°C	
Operating voltage	230 Vac, ±15%, 50/60 Hz	
Switch rating	2 (1) A	
Temperature range	5-30°C	
Dimensions (mm)	85 wide x 86 high x 42 deep	

Heat/Cool Room Thermostats
RET230 HC-3 and RET230 HCW-3

RET230HCW-3

RET230HC-3

- ***Stylish modern design***
- ***For use in 2-pipe or 4-pipe fan-coil systems.***
- ***Large setting dial with LCD temperature display***
- ***230 volt operation***
- ***On/off or chrono-proportional regulation***

The RET230 HC-3 and HCW-3 are heat/cool room thermostats designed for 2-pipe or 4-pipe fan-coil systems. These thermostats feature an analogue setting dial, scaled 1 to 5, a small LCD display which normally displays actual room temperature, but changes momentarily to show the set temperature when the setting dial is moved.

In addition to the heating and cooling outputs, the thermostats incorporate a fan relay to control the operation of a single phase 3-speed fan motor. A manual switch on the right of the thermostat allows the user to manually select the required fan speed. An additional manual switch on the left allows the user to turn off the thermostat and to select whether the fan is switched on or off with the heating/cooling output or runs continuously. LED indicators provide clear indication of output status.

In addition to providing conventional on/off control, the thermostat can be set up at time of installation to provide chrono-proportional output. This type of control mode provides closer control accuracy compared to on/off control.

RET230 HC-3 and RET230 HCA-3
Designed for use in 4-pipe fan-coil unit systems, split packaged systems and in air to air heat-pump systems.

RET230 HCW-3
Designed for use in 2-pipe fan coil unit systems with central changeover between heating and cooling.

		RET230 HC-3	RET230 HCA-3	RET230 HCW-3
Code No.		087N780500	087N780600	087N780800
Built-in sensor		•		•
Remote sensor			•	
Temperature Range - Heating		5-30°C		
Temperature Range - Cooling		7-32°C at dead-band of 2K		
Temperature Range - Cooling		9-34°C at dead-band of 4K		
Selectable dead-band		2 or 4K		
Changeover Temperature	Cool to heat Heat to cool			Pipe temperature >30°C Pipe temperature <16°C
Thermal differential in on/off mode		<1°C		
Temperature Accuracy		±1°C		
Pipe sensor for heat/cool changeover				•
Manual fan 3-speed selector		•		
Thermostat off/auto & fan on selector		•		
LCD display of set/room temperature		•		
Heat/cool output status LED		•		
Power on/fan output status LED		•		
On/Off or Chrono-proportional control		•		
Optional compressor delay timer		•		
Fan-coil or heat-pump configuration		•		
Reversing valve heat or cool selection [1]		•		
Selectable Celsius or Fahrenheit scaling		•		
Maximum ambient temperature		45°C		
Power supply		230 Vac, ±15%, 50/60 Hz		
Relay outputs, heat, cool & fan		3 x SPST, 3(1)A, 10-230 Vac		2 x SPST, 3(1)A, 10-230 Vac
Dimensions (mm)		110 wide x 90 high x 40 deep		

Note
1) Reversing valve function is only available if set up for heat-pump operation.

Heat/Cool Thermostats
0-10v Proportional Control

The REP range offers 0-10v output proportional control designed for use controlling fan coil or chilled ceiling units or any other system that requires 0-10v proportional control. Available with various options for manual or auto fan speed control as well as options for using motorised or wax filled actuators, these thermostats provide a solution for most heat/cool manual changeover requirements.

The slower response of wax filled actuators compared to the relative speed of motorised actuators means that different control algorithms are needed within a thermostat to ensure accurate temperature control. A simple DIL switch selection for motorised or wax at time of installation ensures accurate and stable control for the minimum of fuss.

On all models, range and limit locking are available allowing the installer to limit or lock the temperature range of the thermostat (e.g. 18-22ºC), ideal in public buildings or office environments.

Frost protection mode is available in heating mode. If the dial is turned down below the 10ºC mark on the dial, frost protection is activated (indicated by the right LED turning orange) meaning that if the temperature drops below 8ºC the output will engage.

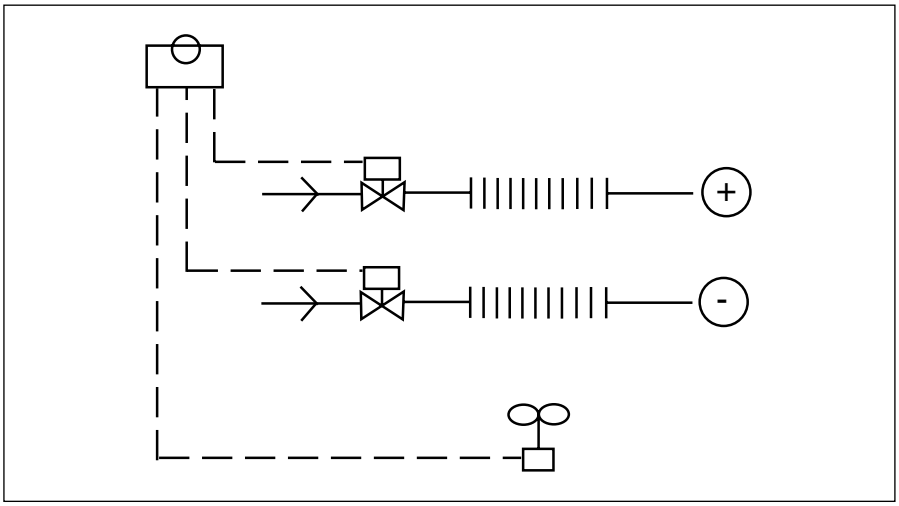
Frost protection is not available in cooling mode, however, if the dial is turned below 10ºC in cooling mode the unit enters standby mode and the unit is inactive until the dial is turned above 10ºC again.

Overall the REP range provides a versatile and efficient solution for almost all installations requiring 24v input 0-10v output manual heat/cool changeover with or without fan control.

REP24

REP24 CO

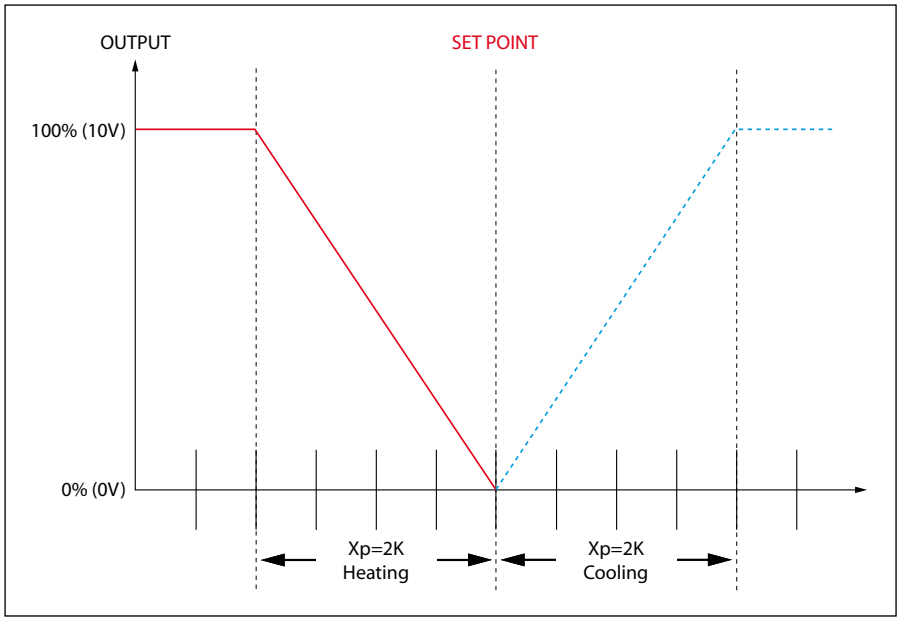
Application Example



	REP24	REP24CO	REP24CO1	REP24CO3
Code No.	087N775000	087N775200	087N775400	087N775600
Temperature Range	10-30°C			
Power Output	0-10 Vdc			
Power Supply	24 Vac/Vdc +/- 15%			
Switching Differential	<1°C			
Control Method	P + I			
Proportional Band	2°K			
Internal Heat/Cool Selection	•			
Front mounted Heat/Cool Switch		•	•	•
Fan Speeds	0	0	1	3
Manual fan speed selector	N/A	N/A	No	Yes
Auto/Manual Fan	N/A	N/A	•	•
Frost Protection	•			
Standby (Cooling)	•			
Motorised or Wax Actuator Selection	•			
Power LED	Yes	Yes	Yes	Yes
Output LED	Yes	Yes	Yes	Yes
Ambient Operating Temperature	-10 to +45°C			
Dimensions (mm)	85 w x 86 h x 42 d	110w x 90 h x 40 d	110 w x 90 h x 40 d	110 w x 90 h x 40 d

REP24 CO1

REP24 CO3



- ***Stylish design***
- ***Large setting dial***
- ***0-10V proportional output***
- ***Fan output***
- ***Frost protection***
- ***Standby mode***

REP24

The REP24 is ideal for chilled ceiling applications, with no fan outputs, a simple selection of MOT/WAX actuator at time of installation is all that is needed to set up this heat/cool thermostat at time of installation.

REP24 CO

Like the REP24, the REP 24 CO is a temperature only proportional thermostat with a manual heat cool changeover switch present on the front of the unit.

REP24 CO1

The REP24 CO1 has a front mounted heat/cool changeover switch, as well as a single speed fan output. The fan works in either manual (constant on) or automatic (on/off dependant of output state).

REP24 CO3

The REP24 CO3 offers all the features of the REP24 CO with the addition of a manually selectable 3 speed fan with front mounted switch. Fan operation mode is selected at time of installation via DIL switches within the case.

Danfoss/Trend Cross Reference
Plant and Steam Valves

Trend Code	Danfoss Product Type	Danfoss Part Number	Trend code	Danfoss Product Type	Danfoss Part Number
Plant Valves - Screwed Internal Short Stroke			***Plant Valves - Flanged***		
SVG2N/20/6.3	VRBZ2 20/6.3 internal short stroke	065Z722001	VC2/15/0.63	VF2 15/0.63 (2)	065Z027100
SVG2N/25/10	VRBZ2 25/10 internal short stroke	065Z722501	VC2/15/1.0	VF2 15/1.0 (2)	065Z027200
SVG2N/32/13	VRBZ2 32/13 internal short stroke	065Z723201	VC2/15/1.6	VF2 15/1.6 (2)	065Z027300
SVG2N/40/16	VRBZ2 40/16 internal short stroke	065Z724001	VC2/15/2.5	VF2 15/2.5 (2)	065Z027400
SVG3N/20/6.3	VRBZ3 20/6.3 internal short stroke	065Z722000	VC2/15/4.0	VF2 15/4.0 (2)	065Z027500
SVG3N/25/10	VRBZ3 25/10 internal short stroke	065Z722500	VC2/20/6.3	VF2 20/6.3 (2)	065Z027600
SVG3N/32/13	VRBZ3 32/13 internal short stroke	065Z723200	VC2/25/10	VF2 25/10 (2)	065Z027700
SVG3N/40/16	VRBZ3 40/16 internal short stroke	065Z724000	VC2/32/16	VF2 32/16 (2)	065Z027800
Plant Valves - Screwed External Short Stroke			VC2/40/25	VF2 40/25 (2)	065Z027900
SVG2X/20/6.3	VRBZ2 20/6.3 external short stroke	065Z742002	VC2/50/40	VF2 50/40 (2)	065Z028000
SVG2X/25/10	VRBZ2 25/10 external short stroke	065Z742502	VC2/65/63	VF2 65/63 (3)	065Z028100
SVG2X/32/13	VRBZ2 32/13 external short stroke	065Z743202	VC2/80/100	VF2 80/100 (3)	065Z028200
SVG2X/40/16	VRBZ2 40/16 external short stroke	065Z744002	VC2/100/145	VF2 100/145	065B320500
SVG3X/20/6.3	VRBZ3 20/6.3 external short stroke	065Z742001	VC2/125/220	VF2 125/220	065B323000
SVG3X/25/10	VRBZ3 25/10 external short stroke	065Z742501	VC2/150/320	VF2 150/320	065B325500
SVG3X/32/13	VRBZ3 32/13 external short stroke	065Z743201	VC3/15/0.63	VF3 15/0.63 (2)	065Z025100
SVG3X/40/16	VRBZ3 40/16 external short stroke	065Z744001	VC3/15/1.0	VF3 15/1.0 (2)	065Z025200
Plant Valves - Screwed Internal Brass			VC3/15/1.6	VF3 15/1.6 (2)	065Z025300
VG2N/15/0.6	VRB2 15/0.63 internal (2)	065Z023100	VC3/15/2.5	VF3 15/2.5 (2)	065Z025400
VG2N/15/1.0	VRB2 15/1.0 internal (2)	065Z023200	VC3/15/4.0	VF3 15/4.0 (2)	065Z025500
VG2N/15/1.6	VRB2 15/1.6 internal (2)	065Z023300	VC3/20/6.3	VF3 20/6.3 (2)	065Z025600
VG2N/15/2.5	VRB2 15/2.5 internal (2)	065Z023400	VC3/25/10	VF3 25/10 (2)	065Z025700
VG2N/15/4.0	VRB2 15/4.0 internal (2)	065Z023500	VC3/32/16	VF3 32/16 (2)	065Z025800
VG2N/20/6.3	VRB2 20/6.3 internal (2)	065Z023600	VC3/40/25	VF3 40/25 (2)	065Z025900
VG2N/25/10	VRB2 25/10 internal (2)	065Z023700	VC3/50/40	VF3 50/40 (2)	065Z026000
VG2N/32/16	VRB2 32/16 internal (2)	065Z023800	VC3/65/63	VF3 65/63 (3)	065Z026100
VG2N/40/25	VRB2 40/25 internal (2)	065Z023900	VC3/80/100	VF3 80/100 (3)	065Z026200
VG2N/50/40	VRB2 50/40 internal (2)	065Z024000	VC3/100/145	VF3 100/145	065B168500
VG3N/15/0.6	VRB3 15/0.63 internal (2)	065Z021100	VC3/125/220	VF3 125/220	065B312500
VG3N/15/1.0	VRB3 15/1.0 internal (2)	065Z021200	VC3/150/320	VF3 150/320	065B315000
VG3N/15/1.6	VRB3 15/1.6 internal (2)	065Z021300	*(2) Requires 065Z031100 adapter to fit to old style actuators, types AMV/E 15, 16, 25 and 35*		
VG3N/15/2.5	VRB3 15/2.5 internal (2)	065Z021400	*(3) Requires 065Z031200 adapter to fit to old style actuators, types AMV/E 55 and 56*		
VG3N/15/4.0	VRB3 15/4.0 internal (2)	065Z021500			
VG3N/20/6.3	VRB3 20/6.3 internal (2)	065Z021600	***Plant Valves - Flanged Steam***		
VG3N/25/10	VRB3 25/10 internal (2)	065Z021700	VC2H/15/0.4 LOG	VFS2 15/0.4	065B151000
VG3N/32/16	VRB3 32/16 internal (2)	065Z021800	VC2H/15/0.63 LOG	VFS2 15/0.63	065B151100
VG3N/40/25	VRB3 40/25 internal (2)	065Z021900	VC2H/15/1.0 LOG	VFS2 15/1.0	065B151200
VG3N/50/40	VRB3 50/40 internal (2)	065Z022000	VC2H/15/1.6 LOG	VFS2 15/1.6	065B151300
(2) Requires 065Z031100 adapter to fit to old style actuators, types AMV/E 15, 16, 25 and 35			VC2H/15/2.5 LOG	VFS2 15/2.5	065B151400
			VC2H/15/4.0 LOG	VFS2 15/4.0	065B151500
Plant Valves - Screwed External Brass			VC2H/20/6.3 LOG	VFS2 20/6.3	065B152000
VG2X/15/0.6	VRB2 15/0.63 external (2)	065Z017101	VC2H/25/10 LOG	VFS2 25/10	065B152500
VG2X/15/1.0	VRB2 15/1.0 external (2)	065Z017201	VC2H/32/16 LOG	VFS2 32/16	065B153200
VG2X/15/1.6	VRB2 15/1.6 external (2)	065Z017301	VC2H/40/25 LOG	VFS2 40/25	065B154000
VG2X/15/2.5	VRB2 15/2.5 external (2)	065Z017401	VC2H/50/40 LOG	VFS2 50/40	065B155000
VG2X/15/4.0	VRB2 15/4.0 external (2)	065Z017501	VC2H/65/63 LOG	VFS2 65/63	065B336500
VG2X/20/6.3	VRB2 20/6.3 external (2)	065Z017601	VC2H/80/100 LOG	VFS2 80/100	065B338000
VG2X/25/10	VRB2 25/10 external (2)	065Z017701	VC2H/100/145 LOG	VFS2 100/145	065B340000
VG2X/32/16	VRB2 32/16 external (2)	065Z017801	VS2H/25/10 LIN	VEFS2 25/10	065Z751700
VG2X/40/25	VRB2 40/25 external (2)	065Z017901	VS2H/32/16 LIN	VEFS2 32/16	065Z751800
VG2X/50/40	VRB2 50/40 external (2)	065Z018001	VS2H/40/20 LIN	VEFS2 40/20	065Z751900
VG3X/15/0.6	VRB3 15/0.63 external (2)	065Z015101	VS2H/50/25 LIN	VEFS2 50/25	065Z752000
VG3X/15/1.0	VRB3 15/1.0 external (2)	065Z015201			
VG3X/15/1.6	VRB3 15/1.6 external (2)	065Z015301			
VG3X/15/2.5	VRB3 15/2.5 external (2)	065Z015401			
VG3X/15/4.0	VRB3 15/4.0 external (2)	065Z015501			
VG3X/20/6.3	VRB3 20/6.3 external (2)	065Z015601			
VG3X/25/10	VRB3 25/10 external (2)	065Z015701			
VG3X/32/16	VRB3 32/16 external (2)	065Z015801			
VG3X/40/25	VRB3 40/25 external (2)	065Z015901			
VG3X/50/40	VRB3 50/40 external (2)	065Z016001			
(2) Requires 065Z031100 adapter to fit to old style actuators, types AMV/E 15, 16, 25 and 35					

Danfoss/Trend Cross Reference
Actuators and Fan Coil Valves

Trend Code	Danfoss Product Type	Danfoss Part Number	Trend Code	Danfoss Product Type	Danfoss Part Number
Actuators			***Fan Coil Valves - Compression Standard Stroke***		
AT103/24	TWA-Z	082F122200	VB2/15/0.25	VZ2 DN 15/0.25	065Z501000
ATR103/24-NC	TWA-A 24V AC/DC NC	088H311100	VB2/15/0.4	VZ2 DN 15/0.4	065Z501100
ATR103/24-NO	TWA-A 24V AC/DC NO	088H311000	VB2/15/0.6	VZ2 DN 15/0.6	065Z501200
A203/230	AMV 130 230V	082H803700	VB2/15/1.0	VZ2 DN 15/1.0	065Z501300
A203/230/K	AMV 130-H 230V	082H804100	VB2/15/1.6	VZ2 DN 15/1.6	065Z501400
A203/24	AMV 130 24V	082H803600	VB2/15/2.5	VZ2 DN 15/2.5	065Z501500
A203/24/K	AMV 130-H 24V	082H804000	VB2/20/2.5	VZ2 DN 20/2.5	065Z502000
A203/P	AME 130 24V	082H804400	VB2/20/4.0	VZ2 DN 20/4.0	065Z502100
A203/P/K	AME 130-H 24V	082H804600	VB3/15/0.25	VZ3 DN 15/0.25	065Z511000
A204/230	AMV 140 230V	082H803900	VB3/15/0.4	VZ3 DN 15/0.4	065Z511100
A204/230/K	AMV 140-H 230V	082H804300	VB3/15/0.6	VZ3 DN 15/0.6	065Z511200
A204/24	AMV 140 24V	082H803800	VB3/15/1.0	VZ3 DN 15/1.0	065Z511300
A204/24/K	AMV 140-H 24V	082H804200	VB3/15/1.6	VZ3 DN 15/1.6	065Z511400
A204/P	AME 140 24V	082H804700	VB3/15/2.5	VZ3 DN 15/2.5	065Z511500
A204/P/K	AME 140-H 24V	082H804500	VB3/20/2.5	VZ3 DN 20/2.5	065Z512000
A301/230	AMV 435 230V (1)	082H016300	VB3/20/4.0	VZ3 DN 20/4.0	065Z512100
A301/24	AMV 435 24V (1)	082H016200	VB4/15/0.25	VZ4 DN 15/0.25	065Z521000
A301/P	AME 435 24V (1)	082H016100	VB4/15/0.4	VZ4 DN 15/0.4	065Z521100
A302/230	AMV 435 230V (1)	082H016300	VB4/15/0.6	VZ4 DN 15/0.6	065Z521200
A302/24	AMV 435- 24V (1)	082H016200	VB4/15/1.0	VZ4 DN 15/1.0	065Z521300
A302/P	AME 435 24V (1)	082H016100	VB4/15/1.6	VZ4 DN 15/1.6	065Z521400
A401/230	AMV 435 230V (1)	082H016300	VB4/15/2.5	VZ4 DN 15/2.5	065Z521500
A401/24	AMV 435 24V (1)	082H016200	VB4/20/2.5	VZ4 DN 20/2.5	065Z522000
A401/P	AME 435 24V (1)	082H016100	VB4/20/4.0	VZ4 DN 20/4.0	065Z522100
A402/230	AMV 435 230V (1)	082H016300	***Fan Coil Valves - Flat Short Stroke***		
A402/24	AMV 435 24V (1)	082H016200	SVB2/15/0.25/F	VZL2 DN 15/0.25	065Z207000
A402/P	AME 435 24V (1)	082H016100	SVB2/15/0.4/F	VZL2 DN 15/0.4	065Z207100
A501/230	AMV 55 230V	082H302100	SVB2/15/0.6/F	VZL2 DN 15/0.6	065Z207200
A501/24	AMV 55 24V	082H302000	SVB2/15/1.0/F	VZL2 DN 15/1.0	065Z207300
A501/P	AME 55 24V	082H302200	SVB2/15/1.6/F	VZL2 DN 15/1.6	065Z207400
A502/230	AMV 56 230V	082H302400	SVB2/20/2.5/F	VZL2 DN 20/2.5	065Z207500
A502/24	AMV 56 24V	082H302300	SVB2/20/3.5/F	VZL2 DN 20/3.5	065Z207600
A502/P	AME 56 24V	082H302500	SVB3/15/0.25/F	VZL3 DN 15/0.25	065Z209000
A601/230	AMV 85 230V	082G145100	SVB3/15/0.4/F	VZL3 DN 15/0.4	065Z209100
A601/24	AMV 85 24V	082G145000	SVB3/15/0.6/F	VZL3 DN 15/0.6	065Z209200
A601/P	AME 85 24V	082G145200	SVB3/15/1.0/F	VZL3 DN 15/1.0	065Z209300
A602/230	AMV 86 230V	082G146100	SVB3/15/1.6/F	VZL3 DN 15/1.6	065Z209400
A602/24	AMV 86 24V	082G146000	SVB3/20/2.5/F	VZL3 DN 20/2.5	065Z209500
A602/P	AME 86 24V	082G146200	SVB3/20/3.5/F	VZL3 DN 20/3.5	065Z209600
(1) Requires 065Z031300 adapter to fit to old style valves, types VRB, VRG, VF and VL			SVB4/15/0.25/F	VZL4 DN 15/0.25	065Z209000
Actuators - Spring Return			SVB4/15/0.4/F	VZL4 DN 15/0.4	065Z209100
A353/2/230	AMV 13 230V SU	082H304200	SVB4/15/0.6/F	VZL4 DN 15/0.6	065Z209200
A353/2/24	AMV 13 24V SU	082H304300	SVB4/15/1.0/F	VZL4 DN 15/1.0	065Z209300
A353/2/P	AME 13 24V SU	082H304400	SVB4/15/1.6/F	VZL4 DN 15/1.6	065Z209400
A451/1/230	AMV 25SD 230V	082H303700	SVB4/20/2.5/F	VZL4 DN 20/2.5	065Z209500
A451/1/24	AMV 25SD 24V	082H303600	SVB4/20/3.5/F	VZL4 DN 20/3.5	065Z209600
A451/1/P	AME 25SD	082H303800	***Fan coil valves - Flat standard stroke***		
A451/2/230	AMV 438SU 230V	082H012300	VB2/15/0.25/F	VZ2 DN 15/0.25	065Z531000
A451/2/24	AMV 438SU 24V	082H012200	VB2/15/0.4/F	VZ2 DN 15/0.4	065Z531100
A451/2/P	AME 438SU	082H012100	VB2/15/0.6/F	VZ2 DN 15/0.6	065Z531200
Fan Coil Valves - Compression Short Stroke			VB2/15/1.0/F	VZ2 DN 15/1.0	065Z531300
SVB2/15/0.25	VZL2 DN 15/0.25	065Z204000	VB2/15/1.6/F	VZ2 DN 15/1.6	065Z531400
SVB2/15/0.4	VZL2 DN 15/0.4	065Z204100	VB2/15/2.5/F	VZ2 DN 15/2.5	065Z531500
SVB2/15/0.6	VZL2 DN 15/0.6	065Z204200	VB2/20/2.5/F	VZ2 DN 20/2.5	065Z532000
SVB2/15/1.0	VZL2 DN 15/1.0	065Z204300	VB2/20/4.0/F	VZ2 DN 20/4.0	065Z532100
SVB2/15/1.6	VZL2 DN 15/1.6	065Z204400	VB3/15/0.25/F	VZ3 DN 15/0.25	065Z541000
SVB2/20/2.5	VZL2 DN 20/2.5	065Z204500	VB3/15/0.4/F	VZ3 DN 15/0.4	065Z541100
SVB2/20/3.5	VZL2 DN 20/3.5	065Z204600	VB3/15/0.6/F	VZ3 DN 15/0.6	065Z541200
SVB4/15/0.25	VZL4 DN 15/0.25	065Z206000	VB3/15/1.0/F	VZ3 DN 15/1.0	065Z541300
SVB4/15/0.4	VZL4 DN 15/0.4	065Z206100	VB3/15/1.6/F	VZ3 DN 15/1.6	065Z541400
SVB4/15/0.6	VZL4 DN 15/0.6	065Z206200	VB3/15/2.5/F	VZ3 DN 15/2.5	065Z541500
SVB4/15/1.0	VZL4 DN 15/1.0	065Z206300	VB3/20/2.5/F	VZ3 DN 20/2.5	065Z542000
SVB4/15/1.6	VZL4 DN 15/1.6	065Z206400	VB3/20/4.0/F	VZ3 DN 20/4.0	065Z542100
SVB4/20/2.5	VZL4 DN 20/2.5	065Z206500	VB4/15/0.25/F	VZ4 DN 15/0.25	065Z551000
SVB4/20/3.5	VZL4 DN 20/3.5	065Z206600	VB4/15/0.4/F	VZ4 DN 15/0.4	065Z551100
			VB4/15/0.6/F	VZ4 DN 15/0.6	065Z551200
			VB4/15/1.0/F	VZ4 DN 15/1.0	065Z551300
			VB4/15/1.6/F	VZ4 DN 15/1.6	065Z551400
			VB4/15/2.5/F	VZ4 DN 15/2.5	065Z551500
			VB4/20/2.5/F	VZ4 DN 20/2.5	065Z552000
			VB4/20/4.0/F	VZ4 DN 20/4.0	065Z552100

Danfoss Cross Reference Chart
For 1st and 2nd Generation of VRB/VF Plant Valves

	Old Code	Trend Code	Description		New Code	Description
VRB 2-Port Valves with an Internal Threaded Connection						
	065B141101	VG2N/15/0.63	VRB2 15/0.63 int.		065Z023100	VRB2 DN15 PN16 kvs 0.63 int.
	065B141201	VG2N/15/1.0	VRB2 15/1.0 int.		065Z023200	VRB2 DN16 PN16 kvs 1.0 int.
	065B141301	VG2N/15/1.6	VRB2 15/1.6 int.		065Z023300	VRB2 DN15 PN16 kvs 1.6 int.
	065B141401	VG2N/15/2.5	VRB2 15/2.5 int.		065Z023400	VRB2 DN15 PN16 kvs 2.5 int.
	065B141501	VG2N/15/4.0	VRB2 15/4.0 int.		065Z023500	VRB2 DN15 PN16 kvs 4.0 int.
	065B142001	VG2N/20/6.3	VRB2 20/6.3 int.		065Z023600	VRB2 DN20 PN16 kvs 6.3 int.
	065B145201	VG2N/25/10	VRB2 25/10 int.		065Z023700	VRB2 DN25 PN16 kvs 10 int.
	065B143201	VG2N/32/16	VRB2 32/16 int.		065Z023800	VRB2 DN32 PN16 kvs 16 int.
	065B144001	VG2N/40/25	VRB2 40/25 int.		065Z023900	VRB2 DN40 PN16 kvs 25 int.
	065B145001	VG2N/50/40	VRB2 50/40 int.		065Z024000	VRB2 DN50 PN16 kvs 40 int.
VRB 3-Port Valves with an Internal Threaded Connection						
	065B141100	VG3N/15/0.63	VRB3 15/0.63 int.		065Z021100	VRB3 DN15 PN16 kvs 0.63 int.
	065B141200	VG3N/15/1.0	VRB3 15/1.0 int.		065Z021200	VRB3 DN15 PN16 kvs 1.0 int.
	065B141300	VG3N/15/1.6	VRB3 15/1.6 int.		065Z021300	VRB3 DN15 PN16 kvs 1.6 int.
	065B141400	VG3N/15/2.5	VRB3 15/2.5 int.		065Z021400	VRB3 DN15 PN16 kvs 2.5 int.
	065B141500	VG3N/15/4.0	VRB3 15/4.0 int.		065Z021500	VRB3 DN15 PN16 kvs 4.0 int.
	065B142000	VG3N/20/6.3	VRB3 20/6.3 int.		065Z021600	VRB3 DN20 PN16 kvs 6.3 int.
	065B145200	VG3N/25/10	VRB3 25/10 int.		065Z021700	VRB3 DN25 PN16 kvs 10 int.
	065B143200	VG3N/32/16	VRB3 32/16 int.		065Z021800	VRB3 DN32 PN16 kvs 16 int.
	065B144000	VG3N/40/25	VRB3 40/25 int.		065Z021900	VRB3 DN40 PN16 kvs 25 int.
	065B145000	VG3N/50/40	VRB3 50/40 int.		065Z022000	VRB3 DN50 PN16 kvs 40 int.
VRB 2-Port Valves with an External Threaded Connection						
	065B131102	VG2X/15/0.63	VRB2 15/0.63		065Z017101	VRB2 DN15 PN16 kvs 0.63 ext.
	065B131202	VG2X/15/1.0	VRB2 15/1.0		065Z017201	VRB2 DN16 PN16 kvs 1.0 ext.
	065B131302	VG2X/15/1.6	VRB2 15/1.6		065Z017301	VRB2 DN15 PN16 kvs 1.6 ext.
	065B131402	VG2X/15/2.5	VRB2 15/2.5		065Z017401	VRB2 DN15 PN16 kvs 2.5 ext.
	065B131502	VG2X/15/4.0	VRB2 15/4.0		065Z017501	VRB2 DN15 PN16 kvs 4.0 ext.
	065B132002	VG2X/20/6.3	VRB2 20/6.3		065Z017601	VRB2 DN20 PN16 kvs 6.3 ext.
	065B132502	VG2X/25/10	VRB2 25/10		065Z017701	VRB2 DN25 PN16 kvs 10 ext.
	065B133202	VG2X/32/16	VRB2 32/16		065Z017801	VRB2 DN32 PN16 kvs 16 ext.
	065B134002	VG2X/40/25	VRB2 40/25		065Z017901	VRB2 DN40 PN16 kvs 25 ext.
	065B135002	VG2X/50/40	VRB2 50/40		065Z018001	VRB2 DN50 PN16 kvs 40 ext.
VRB 3-Port Valves with an External Threaded Connection						
	065B131101	VG3X/15/0.63	VRB3 15/0.63 int.		065Z151001	VRB3 DN15 PN16 kvs 0.63 ext.
	065B131201	VG3X/15/1.0	VRB3 15/1.0 int.		065Z015201	VRB3 DN15 PN16 kvs 1.0 ext.
	065B131301	VG3X/15/1.6	VRB3 15/1.6 int.		065Z015301	VRB3 DN15 PN16 kvs 1.6 ext.
	065B131401	VG3X/15/2.5	VRB3 15/2.5 int.		065Z015401	VRB3 DN15 PN16 kvs 2.5 ext.
	065B131501	VG3X/15/4.0	VRB3 15/4.0 int.		065Z015501	VRB3 DN15 PN16 kvs 4.0 ext.
	065B132001	VG3X/20/6.3	VRB3 20/6.3 int.		065Z015601	VRB3 DN20 PN16 kvs 6.3 ext.
	065B132501	VG3X/25/10	VRB3 25/10 int.		065Z015701	VRB3 DN25 PN16 kvs 10 ext.
	065B133201	VG3X/32/16	VRB3 32/16 int.		065Z015801	VRB3 DN32 PN16 kvs 16 ext.
	065B134001	VG3X/40/25	VRB3 40/25 int.		065Z015901	VRB3 DN40 PN16 kvs 25 ext.
	065B135001	VG3X/50/40	VRB3 50/40 int.		065Z016001	VRB3 DN50 PN16 kvs 40 ext.
VF 3-Port Valves Flanged						
	065B161100	VC3/15/0.63	VF3 DN15 PN16 kvs 0.63		065Z025100	VF3 15 kvs 0.63
	065B161200	VC3/15/1.0	VF3 DN15 PN16 kvs 1.0		065Z025200	VF3 15 kvs 1.0
	065B161300	VC3/15/1.6	VF3 DN15 PN16 kvs 1.6		065Z025300	VF3 15 kvs 1.6
	065B161400	VC3/15/2.5	VF3 DN15 PN16 kvs 2.5		065Z025400	VF3 15 kvs 2.5
	065B161500	VC3/15/4.0	VF3 DN15 PN16 kvs 4.0		065Z025500	VF3 15 kvs 4.0
	065B162000	VC3/20/6.3	VF3 DN15 PN16 kvs 6.3		065Z025600	VF3 20 kvs 6.3
	065B162500	VC3/25/10	VF3 DN15 PN16 kvs 10		065Z025700	VF3 25 kvs 10
	065B163200	VC3/32/16	VF3 DN15 PN16 kvs 16		065Z025800	VF3 32 kvs 16
	065B164000	VC3/40/25	VF3 DN15 PN16 kvs 25		065Z025900	VF3 40 kvs 25
	065B165000	VC3/50/40	VF3 DN15 PN16 kvs 40		065Z026000	VF3 50 kvs 40
	065B166500	VC3/65/63	VF3 DN15 PN16 kvs 63		065Z026100	VF3 65 kvs 63
	065B168000	VC3/80/100	VF3 DN15 PN16 kvs 100		065Z026200	VF3 80 kvs 100
VF 2-Port Valves Flanged						
	065B171100	VC2/15/0.63	VF2 DN15 PN16 kvs 0.63		065Z027100	VF2 15 kvs 0.63
	065B171200	VC2/15/1.0	VF2 DN15 PN16 kvs 1.0		065Z027200	VF2 15 kvs 1.0
	065B171300	VC2/15/1.6	VF2 DN15 PN16 kvs 1.6		065Z027300	VF2 15 kvs 1.6
	065B171400	VC2/15/2.5	VF2 DN15 PN16 kvs 2.5		065Z027400	VF2 15 kvs 2.5
	065B171500	VC2/15/4.0	VF2 DN15 PN16 kvs 4.0		065Z027500	VF2 15 kvs 4.0
	065B172000	VC2/20/6.3	VF2 DN15 PN16 kvs 6.3		065Z027600	VF2 20 kvs 6.3
	065B172500	VC2/25/10	VF2 DN15 PN16 kvs 10		065Z027700	VF2 25 kvs 10
	065B173200	VC2/32/16	VF2 DN15 PN16 kvs 16		065Z027800	VF2 32 kvs 16
	065B174000	VC2/40/25	VF2 DN15 PN16 kvs 25		065Z027900	VF2 40 kvs 25
	065B175000	VC2/50/40	VF2 DN15 PN16 kvs 40		065Z028000	VF2 50 kvs 40
	065B317000	VC2/65/63	VF2 DN15 PN16 kvs 63		065Z028100	VF2 65 kvs 63
	065B318500	VC2/80/100	VF2 DN15 PN16 kvs 100		065Z028200	VF2 80 kvs 100

Danfoss Cross Reference Chart
For 1st and 2nd Generation of VRB/VF Plant Valves

	Old Code	Trend Code	Description		New Code	Description
Actuators						
	082G302800	A301/P	AME 15 Modulating Standard Speed 500N		082H016100	AME 435 Modulating Selectable Speed 400N
	082G303100	A302/P	AME 16 Modulating Fast Speed 500N		082H016100	AME 435 Modulating Selectable Speed 400N
	082G302700	A301/24	AMV 15 24V 3-Point Standard Speed 500N		082H016200	AMV 435 24V 3-Point Selectable Speed 400N
	082G302900	A302/24	AMV 16 24V 3-Point Fast Speed 500N		082H016200	AMV 435 24V 3-Point Selectable Speed 400N
	082G302600	A301/230	AMV 15 230V 3-Point Standard Speed 500N		082H016300	AMV 435 230V 3-Point Selectable Speed 400N
	082G303000	A302/230	AMV 16 230V 3-Point Fast Speed 500N		082H016300	AMV 435 230V 3-Point Selectable Speed 400N
	082G302500	A401/P	AME 25 Modulating Standard Speed 1000N		082H016100	AME 435 Modulating Selectable Speed 400N
	082G302200	A402/P	AME 35 Modulating Fast Speed 1000N		082H016100	AME 435 Modulating Selectable Speed 400N
	082G302300	A401/24	AMV 25 24V 3-Point Standard Speed 1000N		082H016200	AMV 435 24V 3-Point Selectable Speed 400N
	082G302000	A402/24	AMV 35 24V 3-Point Fast Speed 1000N		082H016200	AMV 435 24V 3-Point Selectable Speed 400N
	082G302400	A401/230	AMV 25 230V 3-Point Standard Speed 1000N		082H016300	AMV 435 230V 3-Point Selectable Speed 400N
	082G302100	A402/230	AMV 35 230V 3-Point Fast Speed 1000N		082H016300	AMV 435 230V 3-Point Selectable Speed 400N
Adapters						
	065Z031300		Adapter to enable the new actuator to fit on to old style valves		065Z031200	Adapter to enable the old actuator types to fit onto new style valves in DN65-80
	065Z031100		Adapter to enable the old actuator types to fit on to new style valves in DN15-50			

Identifying whether you have and old or new valve

Both the old valve types and the new types share the same reference of either VRB, VF or VL. You can identify whether you have an old or new valve from its collar type. The old VRBs have a solid cylindrical collar. The new valves have a grooved collar.

Old Valve Collar

New Valve Collar

Danfoss Randall Ltd
Ampthill Road, Bedford, MK42 9ER
Tel: 0845 1217 400
Fax: 0845 1217 515
Email: danfossrandall@danfoss.com
Website: www.danfoss-randall.co.uk

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