

PROVISIONAL COPY

Grant Low-loss header system Installation & User Instructions 70 & 165 kW



Please note these are provisional instructions if you have any queries please contact our Projects Office if you are in any doubt of the suitability of this system for your requirements.

Part No. DOC.00 Rev.02 – June 2013

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1. Introduction

These Installation instructions should be read carefully before installing the Grant Low – loss header system and must be used in conjunction with the Installation & User instructions supplied with the boiler. We recommend before installing the Grant Low – loss header system you attend a Grant Systems Control Installer training course.

The Grant Low – loss header system is a cost effective way of installing multiple heat sources and feeding more than one heating zone which have different temperature requirements. It is designed specifically for use with the Grant heat producing appliances such as our Oil, Spira wood pellet and Air source heat pumps, and should not be used for any other application.

Grant Engineering UK Ltd shall not be liable for any injury or damage arising from the incorrect use of this system. For correct usage, refer to these Installation and User instructions.

Installation of the Grant Low – loss header system, must be installed by a competent person in accordance with all current legislation, codes of practice and local by-laws relating to the installation of heating systems and appliances.

The electrical installation must comply with the requirements of the Electricity at Work Regulations 1989 and BS7671:2008 - IEE Wiring Regulations 17th Edition (including all amendments).

All installations of Grant Vortex Oil and Spira wood pellet boilers must comply with the relevant Building Regulations.

2. Technical Specification – 70kW

2.1 Basic dimensions – 70 kW Header

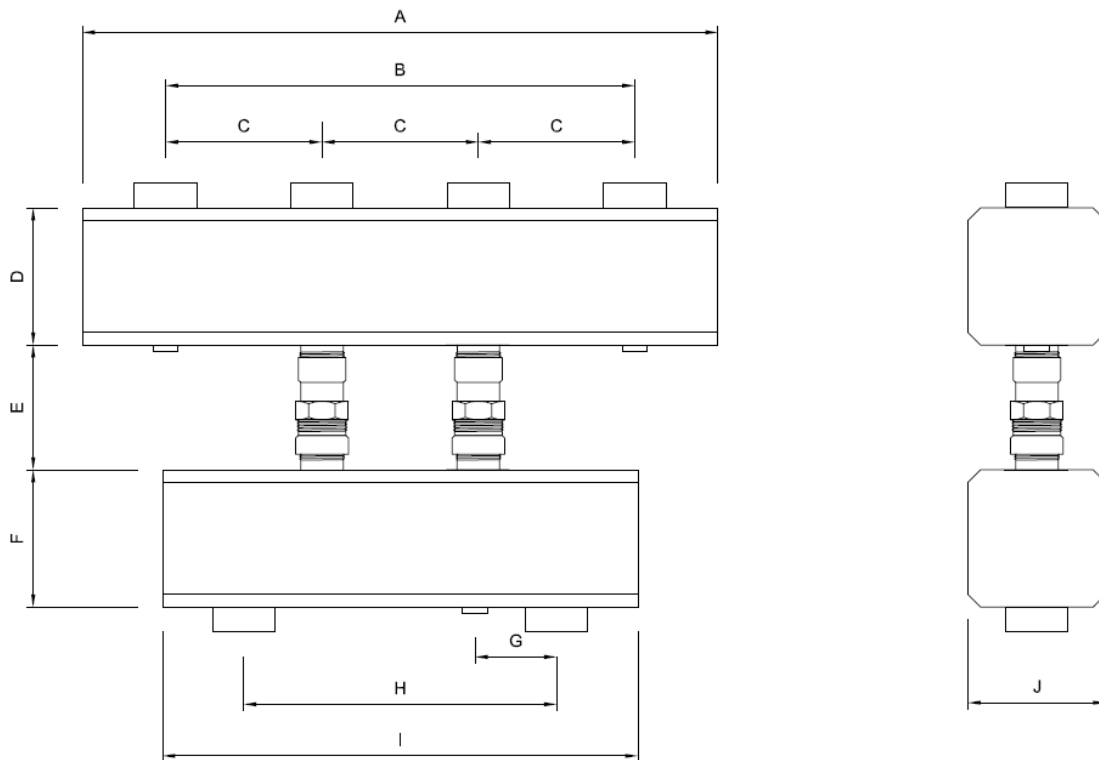


Figure 2.1 Header switcher details 70kW

Item description	Letter	Dimension mm
Overall length of header – 2 zone pumps	A	508
Overall length of header – 3 zone pumps	A	758
Overall length of header – 4 zone pumps	A	1008
Overall length of header – 5 zone pumps	A	1258
Overall length of header – 6 zone pumps	A	1508
Fixing centres for wall brackets for 2 & 3 zone pumps	B	375
Fixing centres for wall brackets for 4 & 5 zone pumps	B	625
Fixing centres for wall brackets for 6 zone pumps	B	875
Zone pump centres	C	125
Header overall height	D	110
Approximate distance between header and switcher	E	110
Switcher overall height	F	110
Sensor pocket from flow	G	65
Flow and return centres	H	250
Overall length of switcher	I	380
Overall width of switcher and header	J	110

N.B. Check dimensions against actual headers before proceeding with installation.

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2. Technical Specification – 70kW

2.2Kit Contents – 70 kW Header

The Grant Low – loss header system is available in 2 different size kits, the 70 & 165kW, the 70kW contains the following:

- 1 x Hydraulic switcher
- 1 x Distribution header
- 1 x Pair of 1¼" Connectors for the above
- 1 x Set of wall fixings
- The required number of System Zone pump kits as required, 6 or 8 m head
- 1" Isolation valves to connect Distribution header to Zone pump kit.
- Installation & User Instructions

Note. All electrical cable and pipe work required to connect the Grant header system to the appliances and heating circuits to be supplied by installer.

Draw No	Part description	Further information	Grant Part number	Qty
1	1¼" Hydraulic Switcher – 70kW	Note: 70 kW @ 20°Δt	GHS60/125	1
1B	Switcher bracket set wrap over 100mm off wall *	Only 1 set per Header Required	GHS/WF100	1
1C	Switcher bracket set wrap over 150mm off wall *		GHS/WF150	1
1D	Distributor bracket set 90° (100 – 150 adjustable)*		GHS/WFHV	1
2	1" F & R Distributor	2 – 6 is the number of pump units (circuits) per installation as required by the installer (see drawings)	GHS70/1252	1
3	1" F & R Distributor		GHS70/1253	1
4	1" F & R Distributor		GHS70/1254	1
5	1" F & R Distributor		GHS70/1255	1
6	1" F & R Distributor		GHS70/1256	1
7	1¼" Connector	2 Connectors per switcher	GHS05629	2
8	1" Valves	2 valves per pump station	GHS/0266M	2
9	Safety set up to 50kW – <u>if 70kW use item 29</u>	Note: 3 Bar PRV & 50 kW	GHS/SG50	1
11	Constant temperature 6m Zone pump kit	Constant temp, variable speed for Heating & Hot Water Primary circuits	GHS/CT01	1
12	Constant temperature 8m Zone pump kit		GHS/CT02	1
13	Variable temperature 6m Zone pump kit	For Heating circuits only. With mixing valve used with GEO 360 W/comp	GHS/VT03	1
14	Variable temperature 8m Zone pump kit		GHS/VT04	1

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2.2 Kit Contents – 70 kW Header – continued

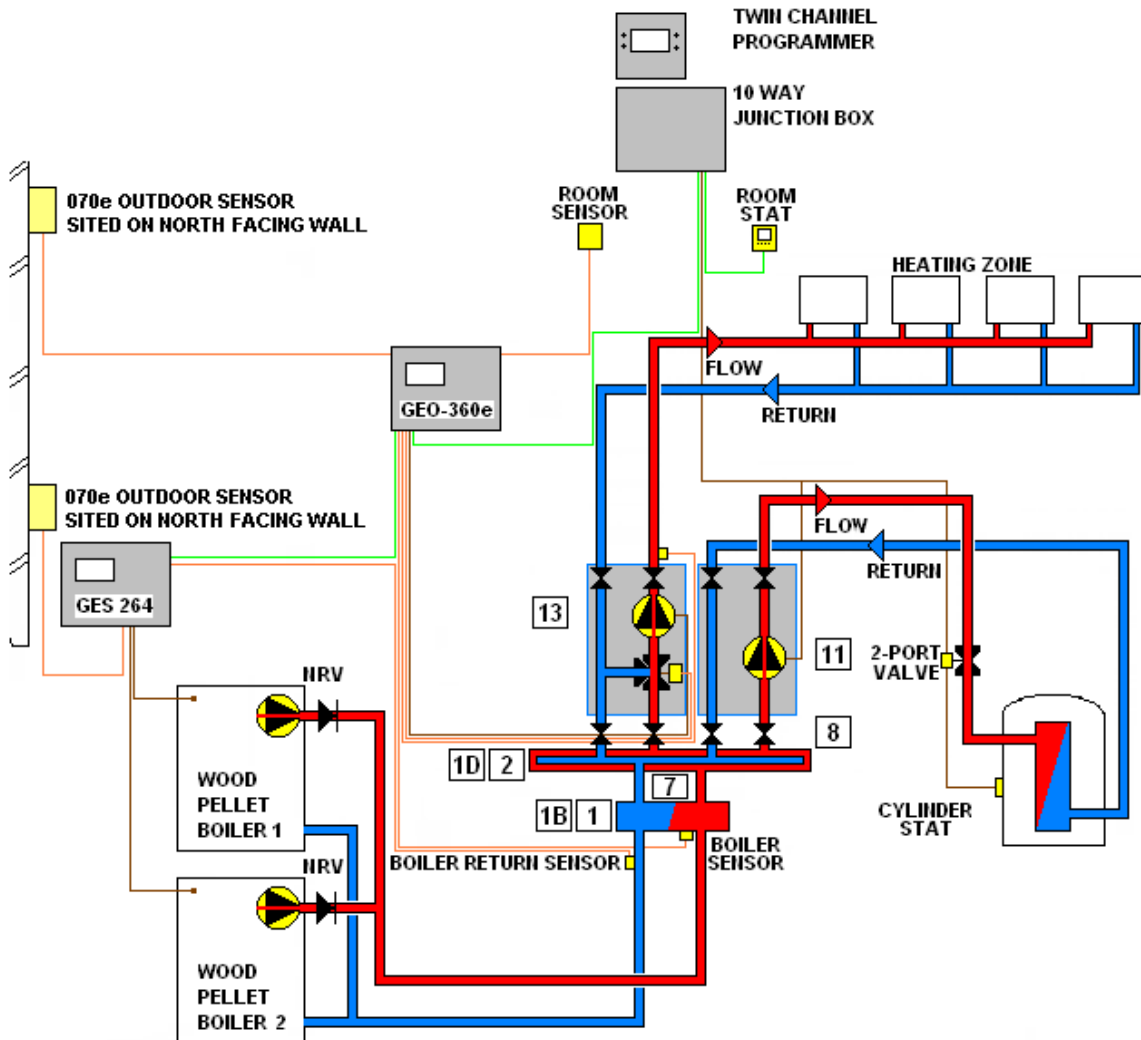


Figure 2 – 2 Typical header system showing the itemised parts (see previous page)

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2.3 Technical Data – 70kW



Figure 2 – 3 Header components

70 kW Hydraulic switcher		Max 6 Bar	
Hydraulic switcher – max flow rate		Up to 3m ³ /h, @ 20° Δ t	
Hydraulic insulated switcher – dimensions		110 x 110 x 380mm	
Hydraulic switcher connection – appliances (Boilers etc)		1¼" Female iron	
Hydraulic switcher connection – insulated distributor		1¼" Male iron	
Hydraulic switcher connection – flow sensor pocket		½" Female iron	
Hydraulic switcher – Wall fixing		110 x 110 – 100 or 150mm wall - centre	
70 kW Distributor			
Distributor max flow rate – distributor per 1" Zone pump connection		Up to 1.53m ³ /h, @ 20° Δ t	
Distributor insulated - dimensions		110 x 110 x 580 – 1508mm max 2 – 6 x 1" connections for Zone pump kits	
Distributor – zone pump connections		2 – 6 x 1" connections for Zone pump kits	
Distributor – side connection for exp vessel		¾" Female iron	
Distributor – Wall fixings		110 x 110 x 100 or 150mm wall – centre	

70 kW Hydraulic switcher – system fluid volume			
Length mm	Cross section mm	Litres	Approximate total header and switcher volume in Litres
380	110 x 110 (less insulation)	0.875	
70 kW Distributors			
508	110 x 110 (less insulation)	1.125	2.000
758		1.750	2.625
1008		2.375	3.250
1258		3.000	3.875
1508		3.625	4.500

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2.4 Technical Data – Constant temperature Zone pump kits 70kW

Zone pump kits for the 70 kW header	See figure 2 - 4
Comprises – pump, isolation ball valves, temperature gauges inc non return valve	Constant temperature variable speed
Connection sizes	1" Female iron top and bottom connections
Dimensions W X H X D	250 x 380 x 190mm
Maximum temperature	110° C
Non return valve – operate at 20mb	Built in to return valve
Application – 6 & 8m head	Hot water and heating circuits'
Flow rate – 6 & 8m head	35kW 1.53m ³ /h, @ 20° Δ t



Figure 2 – 4 Variable temperature



Figure 2 – 3 Constant temperature

2.4 Technical Data – Variable temperature 70kW Zone pump kits

Zone pump kits for the 70 kW header	See figure 2 – 3
Comprises – pump, isolation ball valves, temperature gauges inc non return valve	Variable temperature & variable speed
Connection sizes	1" Female iron top and bottom connections
Dimensions W X H X D	250 x 380 x 190mm
Maximum temperature	110° C
Non return valve – operate at 20mb	Built into return valve + mixer
Application – 6 & 8m head	Weather compensated heating circuits
Flow rate – 6 & 8m head	35kW 1.53m ³ /h, @ 20° Δ t
Additional controls	Built in mixing valve and servomotor for use with Grant GEO 360 weather compensated heating circuits

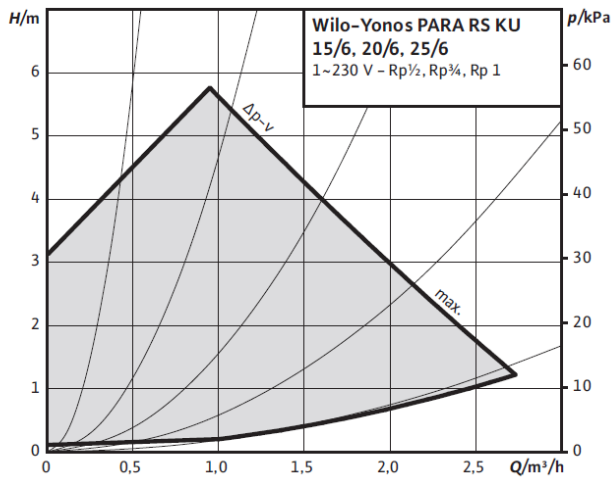
2.4 Technical Data – Constant temperature Zone pump kits 70kW

Zone pump kit		70kW		
Size	Type	6m	7m	8m
1"	Constant temperature	YONOS PARA – RS25/6*	N/A	YONOS PICO – RS25/1-8**
	Variable temperature	YONOS PARA – RS25/6*	N/A	YONOS PICO – RS25/1-8**

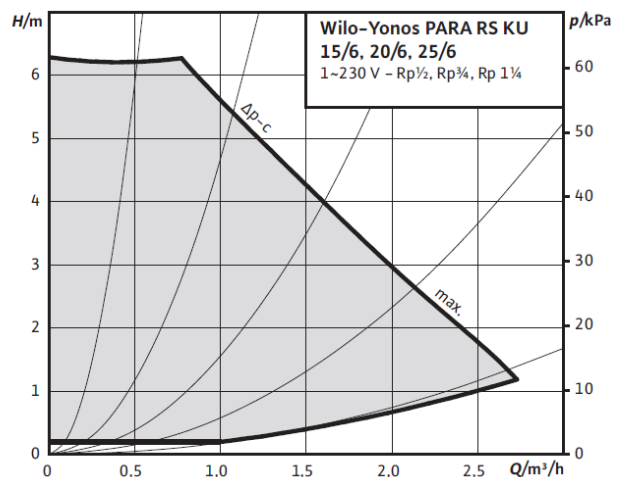
Notes: * Flashing status indicator see page 14/40 ** Digital readout see page 15/40

Constant/variable temperature YONOS PARA RS 25/6

$\Delta p-v$ (variable)

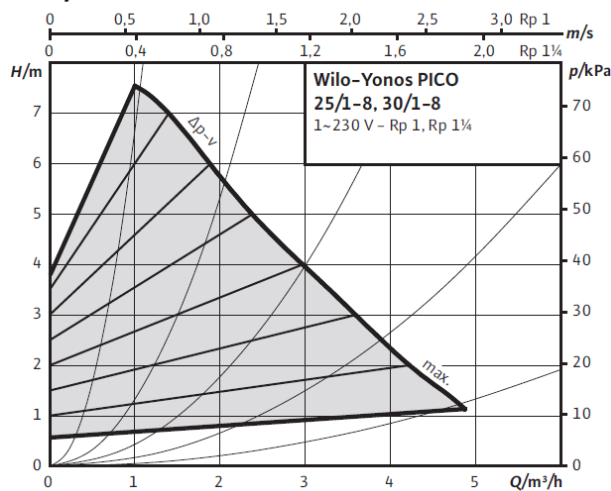


$\Delta p-c$ (const.)

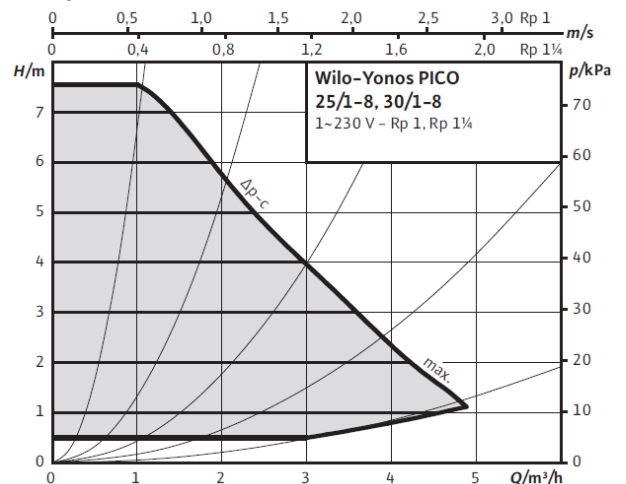


Constant/variable temperature YONOS PICO RS 25/1-8

Pump curves



Pump curves



2.5 Technical Data – Constant temperature Zone pump kits 70kW

Constant/variable temperature YONOS PARA RS 25/6

High – efficiency pumps
Overview

ERP – Energy related products.

Following Kyoto Protocol from December 1997, the EU has set up measures to achieve a 20% reduction on both energy consumption and CO₂ – emissions until 2020, based on the data from 1990. One of these measures is the ErP Directive. Conformity with the derived EU regulations will be governed through mandatory CE Marking

The latest ErP (Energy related Products) directive is ErP 2009/125/EC which also covers products such as windows as well as pumps etc.



Since 1st January 2013, glandless stand alone circulators, with the exception of those specifically designed for primary circuits of thermal solar hot water and of heat pumps, shall have an energy efficiency index (EEI) of not more than 0.27.

From 1st August 2015 stand alone circulators and circulators integrated into products shall have an energy efficiency index (EEI) of not more than 0.23. A product is an appliance that generates heat, boilers, heat pumps, solar hot water, district heating and DHW boiler.

Electronic performance control

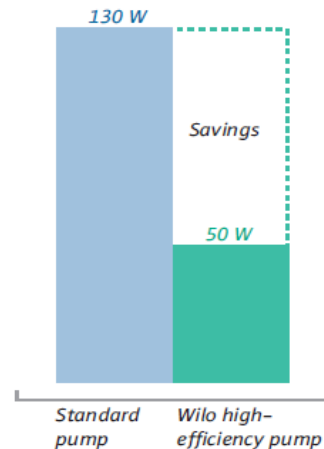
Heating pumps due to their high annual operating hours are among the largest power consuming appliances in buildings. Automatic pump performance control will help drastically reduce power consumption. A further significant effect connected with the prevention of a rise in pump pressure is the avoidance of flow noise in systems.

EC motor

EC stands for electronically controlled motor, a synchronous motor with permanent magnet rotor. The rotating stator magnetic field is generated by electronic communication, meaning that the stator windings are activated specifically for the interaction of the electrical and magnetic poles.

The benefits.

The magnetic field required in the rotor does not need to be generated with any losses. Especially in part load range (up to 98% of the operating time) the difference in efficiency is even greater than it is already in the full load range compared to an asynchronous motor. High speeds are possible, this results in the reduction in size and weight of the unit compared with a traditional circulating pump.

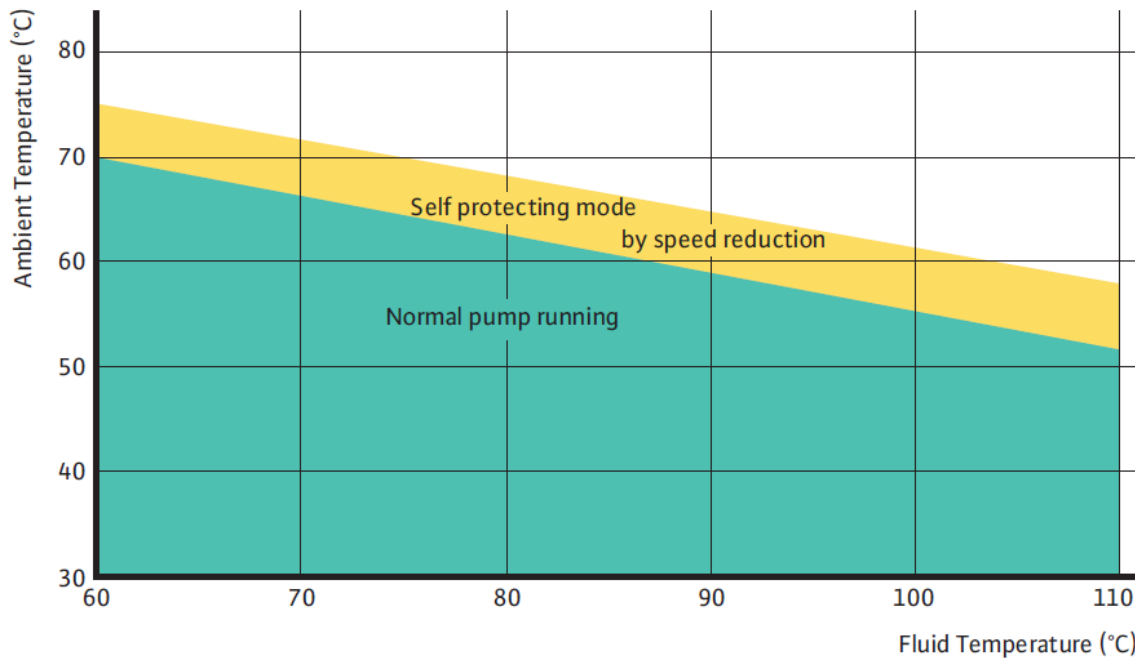


2.5 Technical Data – Constant temperature Zone pump kits 70kW

Constant/variable temperature YONOS PARA RS 25/6

Permissible temperature range

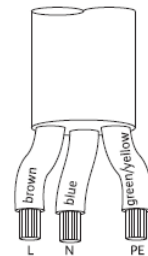
The Wilo – Yonos Para range is equipped with a self protecting mode. In the event of too high a temperature, outside the permissible temperature range, the electronics will automatically reduce the power consumption until normal operating conditions return.



Example: at a fluid temperature of 90 °C and at an ambient temperature of 59 °C, the delivery head can decrease by 0.5m depending on the pressure losses of the system

Electrical connection

To ensure a safe and easy electrical connection, the Wilo – Yonos Para pumps are equipped with a mains 3 core cable with brass end splices.



Optional Wilo connector.

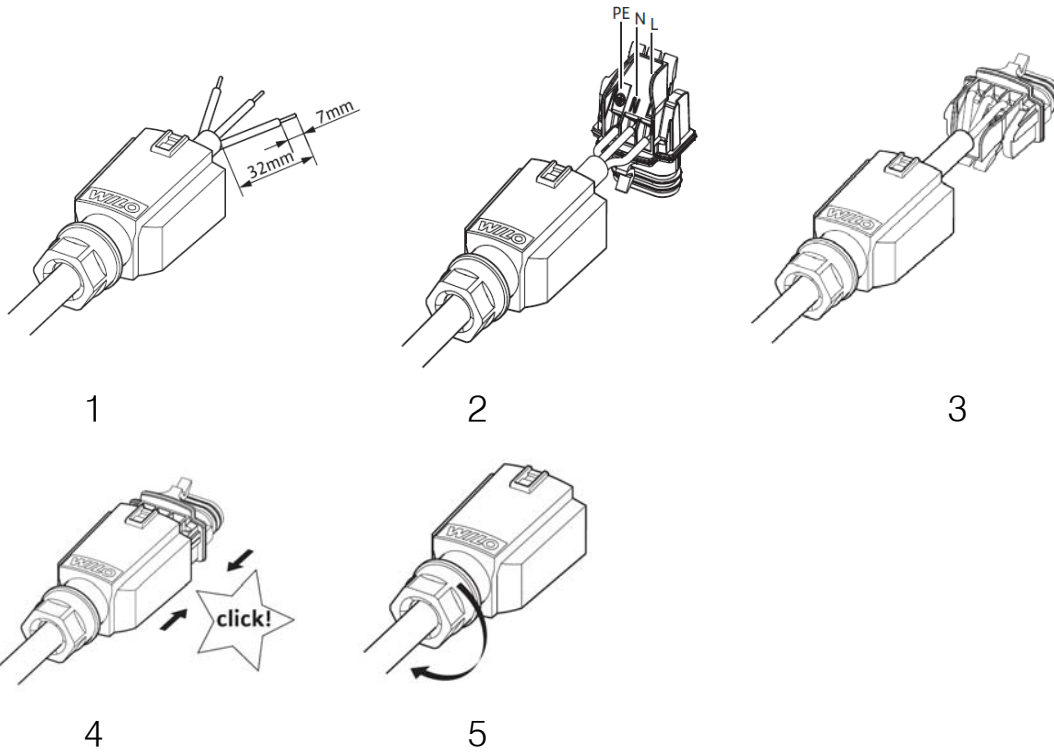
No tools are required to connect the mains cable to the Wilo connector. Strip the heat resisting cable conductor insulation by 7mm and strip the outer cable insulation by 32mm.

See the following illustrations:

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2.5 Technical Data – Constant temperature Zone pump kits 70kW

Electrical connection



2.5 Technical Data – Constant temperature Zone pump kits 70kW

Constant/variable temperature YONOS PARA RS 25/6

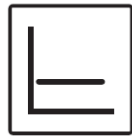
Electronic performance control

The three modes of operation.

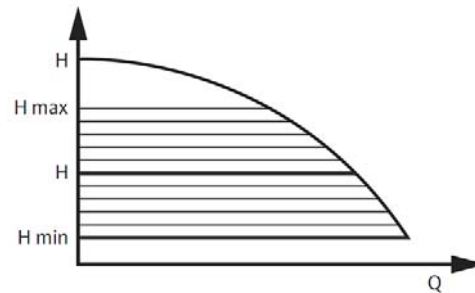
Control mode **Up-c:**

Constant differential pressure

In this setting the pump will operate up to the HS (head setting)



Pump control symbol



Pump graph

Control mode **Up-v:**

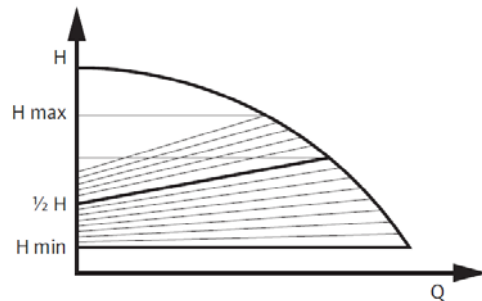
Variable differential pressure

In this setting the pump will change the differential set point to be maintained by the pump in a linear fashion between H_s and $\frac{1}{2} H_s$.

The differential pressure set point value H varies with the volume flow Q



Pump control symbol



Pump graph

Venting routine



Pump control symbol

The integrated venting routine supports a bleeding of the overall heating system. After a manual setting, the routine runs for 10 minutes alternating at low and high speed of the pump every 15 seconds. At the end of the process, the pump will switch automatically to a preset speed. After that, the desired control mode can be set on the red button.

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2.5 Technical Data – Constant temperature Zone pump kits 70kW

Constant/variable temperature YONOS PARA RS 25/6

Control selector with Red LED

Constant Δp and variable Δp working mode and air vent program can be selected by means of the RED knob.

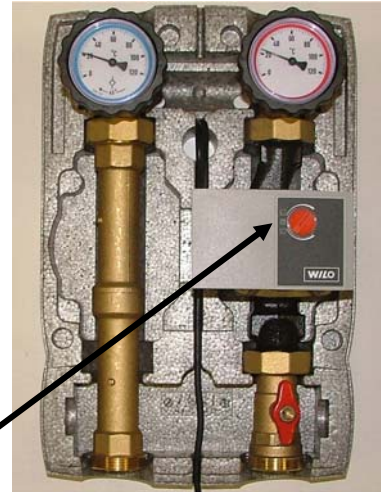
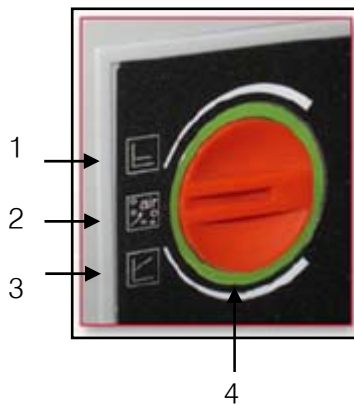
The LED indicator, shown here in GREEN, (placed around the selector knob), indicates the working state of the circulator or the presence of any problems.

1 Constant Δp

2 Air vent mode

3 Variable Δp

4 Green LED



Continuous green LED



Regular working or air vent program ended

Intermittent green LED



Air vent program in progress

Intermittent green and red LED



Irregular working, the circulator will start again as soon as the anomaly is worked out i.e. excessive temperature.

Intermittent red LED



Stopping problem, circulator stopped.

Switched off LED



No power supply or electrical failure.

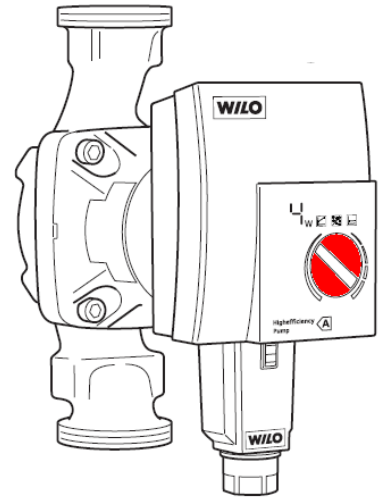
2.5 Technical Data – Constant temperature Zone pump kits 70kW

Constant/variable temperature YONOS PICO RS 25/1-8

Description

The pump consists of a hydraulic system, a glandless pump motor with a permanent magnet rotor, and an electronic control module with an integrated frequency converter.

The control module has a red operating knob together with an LED display for setting all parameters and for displaying the current power consumption in W.



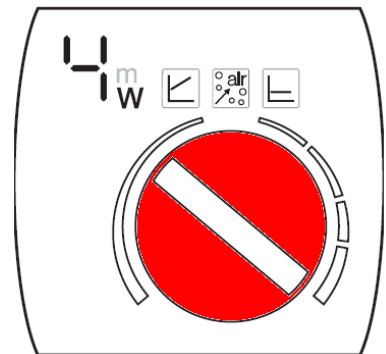
Functions

All functions can be set, activated or deactivated using the red operating knob.

4 W

In operating mode, the current power consumption in W is displayed

4.3 m



When the red knob is turned, the LED display shows the delivery head in m

The three modes of operation.

All as previous page,

Constant differential pressure

Grant recommends this mode of control for underfloor heating circuits or older systems with large pipe sizes as well as for applications with no changeable pipe system curve, boiler primary into a low loss header or thermal store.

Variable differential pressure

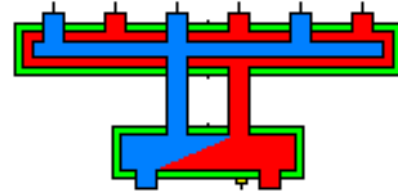
This control mode is especially useful in heating systems with radiators, this will help with issues such as flow noise as associated with thermostatic radiator valves when closing.

3. Description & Operation – 70kW

3.1 Description and operation – 70kW

The Grant header system has two major components the 'Hydraulic switcher' for connecting the heat source, (appliances, boilers air source heat pumps etc) and the 'Distribution header' this is connected to the switcher by two 1¼" unions. The distribution header supports the 'Zone pump kits' which distribute the heat to the system.

Figure 3.1 Header flow path



Why is it called a 'Low loss header'?

If we take the supply pipework from the appliances which for a 70kW input @ 20° Δ t flow and return differential would be say 35mm diameter pipe. The resistance reading from a pipe chart for 0.83kgs/sec (70kW @ 20° Δ t) would be 0.03 m/m, when the water enters the 'Switcher – low loss header) this is 54mm square. If we take a reading for a 54mm copper pipe we would find that the loss of head per metre run for 0.83kgs/sec would only be 0.003 m/m. As can be seen there is 10 times less head loss per metre in our low loss header, hence the expression 'low loss' header.

The zone pump kits then draw their system water off the distribution header to the appropriate circuits. At the same time cooler return water is returned to the 'Hydraulic switcher' and mixed back into the return for the appliances or re – used back into the system flow. It is important that every circuit is correctly balanced to make sure that the system water temperature differentials are set.

For suggested flow rates and differentials see the table below.

Distribution header capacity – 70kW	Δ t	kgs/s*	l/h	m³/h
Maximum input from heat sources				
70,000 watts @	20	0.833	3,000	3.0
35,000 watts @	10	0.833	3,000	3.0
17,500 watts @	5	0.833	3,000	3.0
1" Zone pump kits				
35,000 watts @	20	0.416	1,500	1.5
17,500 watts @	10	0.416	1,500	1.5
8,750 watts @	5	0.416	1,500	1.5

* Based on the formula watts divided by temp differential multiplied by specific heat of water.

As can be seen in the above table it is important to obtain the correct flow rate and temperature differential in order to carry the amount of energy required for the system. As an example, if we used two 36kW Grant Spira wood pellet boilers, with a flow and return temperature differential of 20°K this will produce the rated output of 36 x 2 = 72kW. This would be suitable on this 70kW system, whereas if an Air source heat pump, say rated at 17.5 kW at -3°C set up with a flow and return differential of 5°K would also be suitable for the

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70kW header system. All pipework sizing calculations must be sized by the installer/heating engineer before proceeding with the installation.

4. Installation – 70kW

4.1 Header and switcher Unit – 70kW

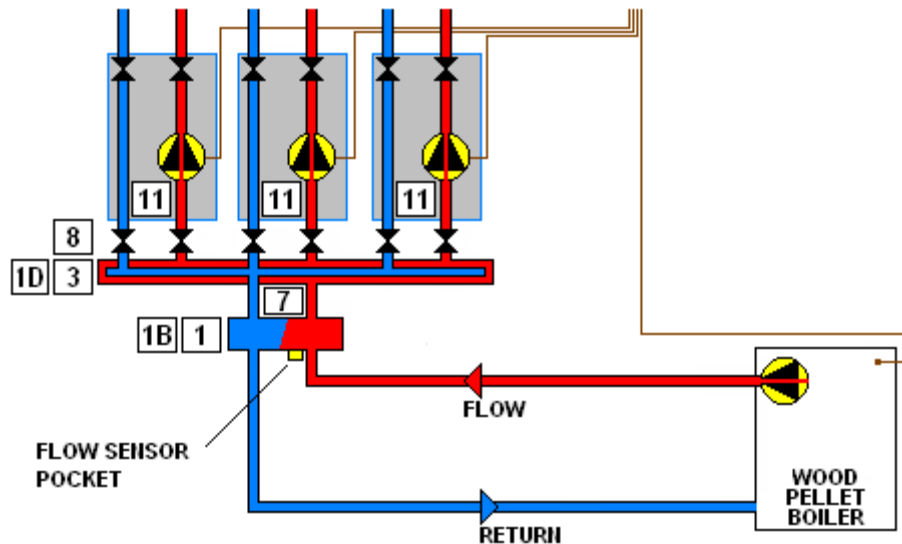


Figure 4 – 1 Flow and return connections

Flow and return connections.

NB: The switcher unit flow connection is always on the RIGHT with the flow sensor POCKET alongside shown above.

It is always preferable to have the header system above the top connection of the appliance (as shown above) to prevent pipe dips and air entrapment, but this is not essential as systems have been installed where the appliance top tapping is higher than the 'Header switcher', but auto air vents may be required, please follow the appliance manufactures installation instructions.

Siting the header.

A suitable solid wall is preferable to minimise the transmission of any vibration or mechanical noise by the Zone pump units when in operation. The structure should be capable of carrying the weight of the installation. In some properties metal frame plasterboard partitions may be used, these may not be suitable.

The header system is attached to the wall using wall fixing brackets for dimensions see the dimensions page (999) for more detail.

The 'Header switcher' is connected to the 'Distribution header' using 1¼" brass unions; threaded joints may be made water tight with a suitable compound or PTFE tape. If a paste is to be used on the union faces this should be used sparingly so as to prevent ingress by the paste into the system. The pump flanges have a composite washer these should be installed without any paste 'dry' to prevent spreading of the composite washer.

4.2 System considerations – 70kW

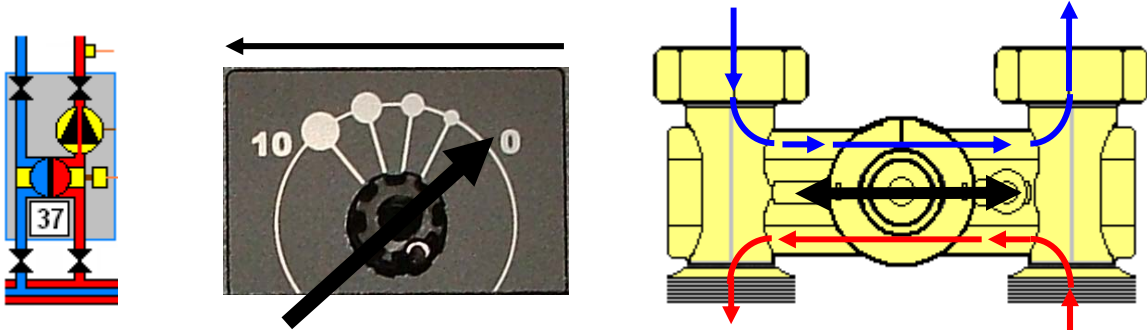
The Grant header system may be used with either a vented or sealed heating system; all installations must comply with relevant standards and Building Regulations as appropriate. (see section 7 of this document)

The Grant header system will not require a by – pass valve between the appliances and the switcher header as the switcher is an open pipe allowing the water to circulate through the appliances without hindrance.

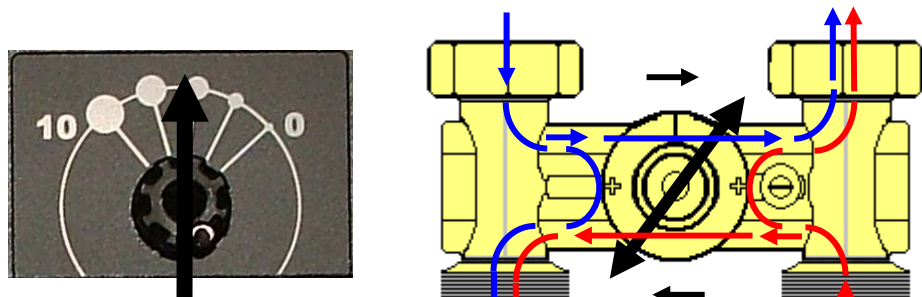
Back end protection would not normally be required if the boilers are commissioned and the flow rates set up for the correct operation of the appliances, under normal working conditions the return would not be expected to rise above 57° C.

4.3 Four way mixing valve – 70kW - operation

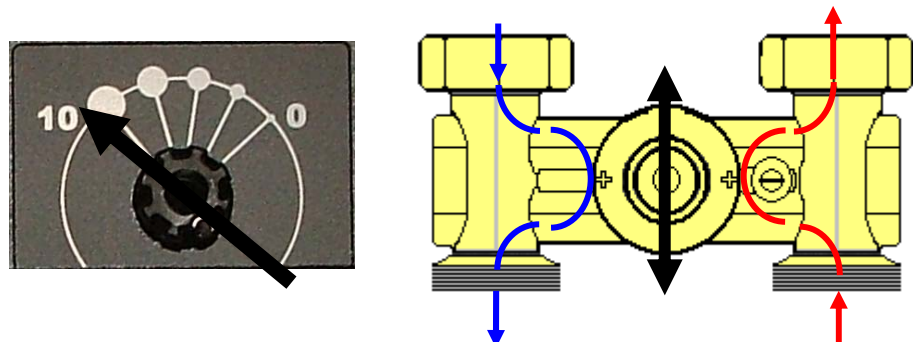
4 Port operation with a 90° movement anti-clockwise from closed to open.



4 port motor lever at '0'. Closed
Flow across valve, heating flow and return recirculate.



4 Port motor lever mid way between '0' and '10'
Mid position – mixing the flow and return 50%



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4 Port motor lever at '10' Open

Heating circuit at appliance temperature.

4.3 Four way mixing valve – 70kW - continued

4.3.1 Fitting of 4-port valve motor

Unscrew retaining screw and remove black knob from valve shaft



Fit anti-rotation stud (supplied with motor) into threaded hole in valve body and tighten



Fit grey adaptor (supplied with motor) onto valve shaft



Rotate shaft to align pointer on grey adaptor with closed position on valve scale (at '3-o-clock' position)



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4.3 Four way mixing valve – 70kW - continued

4.3.1 Fitting of 4-port valve motor

Fit the valve scale (supplied with the motor) over the splined shaft end



IMPORTANT: ensure '0' is to the right

Using a flat bladed screwdriver push in and rotate the motor release to switch from 'auto' to 'manual' operation of the motor/valve



Fit the valve lever (supplied with the motor) onto the splined shaft end

Rotate lever clockwise to point to '0' position on scale



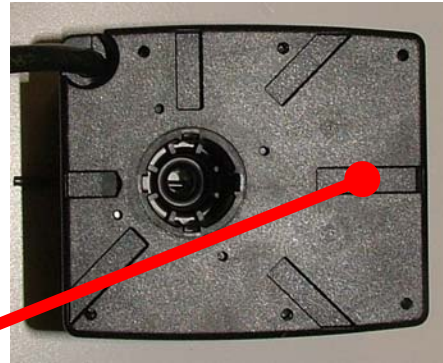
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4.3 Four way mixing valve – 70kW - continued

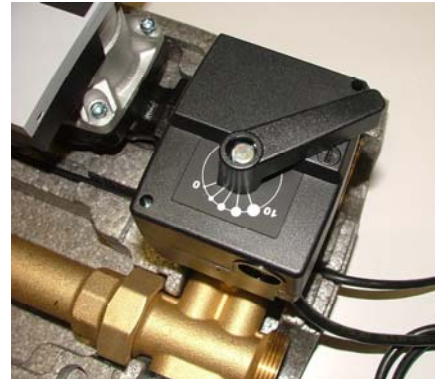
4.3.1 Fitting of 4-port valve motor

Fit the motor onto valve shaft/adaptor with the scale at the left hand end

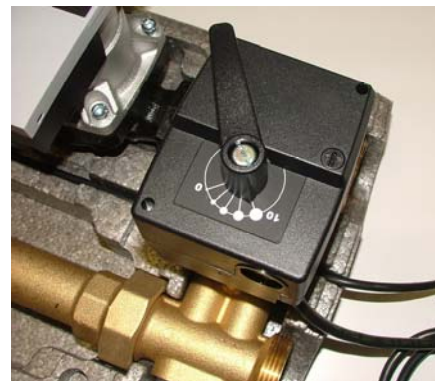
Locate anti-rotation stud into groove in the underside of the motor housing



Fit the long fixing screw (supplied with the motor) and tighten to secure motor/lever to valve shaft



Manually operate valve - move lever anticlockwise to closed '10' position to check operation then reset to '0'
Using screwdriver - re-set motor release to 'auto' (A) position



5. Technical Specification 165kW

5.1 Kit Contents – 165 kW Header

The Grant Low – loss header system 165 kW containing the following:

- 1 x Hydraulic switcher
- 1 x Distribution header
- 1 x 2" Connection kit (including 3 - 2" unions) for the above
- 1 x Set of wall fixings
- The required number of System Zone pump kits as required, 7 or 8 M head
- 1¼" Isolation valves to connect Distribution header to Zone pump kit.
- Installation & User Instructions

Note. All electrical cable and pipe work required to connect the Grant header system to the appliances and heating circuits to be supplied by installer.

Draw No	Part description	Further information	Grant Part number
20	2" Vertical Hydraulic Switcher – 165 kW	Note: 165 kW @ 20°Δt	GHS80/570
20B	Header bracket set wrap over 160mm	Only 1 set per Header Required	GHS/WF160
20C	Header wall fixing set 160mm		GHS/WFHV160
21	2" Connection Kit	Only 1 per header	GHS076929
22	1¼" F & R Distributor	2 – 6 is the number of pump units (circuits) per installation as required by the installer (see drawings)	GHS80/1252
23	1¼" F & R Distributor		GHS80/1253
24	1¼" F & R Distributor		GHS80/1254
25	1¼" F & R Distributor		GHS80/1255
26	1¼" F & R Distributor		GHS80/1256
28	1¼" Isolation Valves	2 valves per pump station	GHS/55AMMS
29	Safety set up to <u>200kW</u>	Note: 3 Bar PRV	GHS/SG200
35	32mm Constant temperature 7m pump station	Constant temp, variable speed for Heating & Hot Water Primary circuits	GHS/CT05
36	32mm Constant temperature 8m pump station		GHS/CT06
37	32mm Variable temperature 7m pump station	For Heating circuits only. With mixing valve used with GEO 360 W/comp	GHS/VT07
38	32mm Variable temperature 8m pump station		GHS/VT08

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5.1 Kit Contents – 165 kW Header – continued

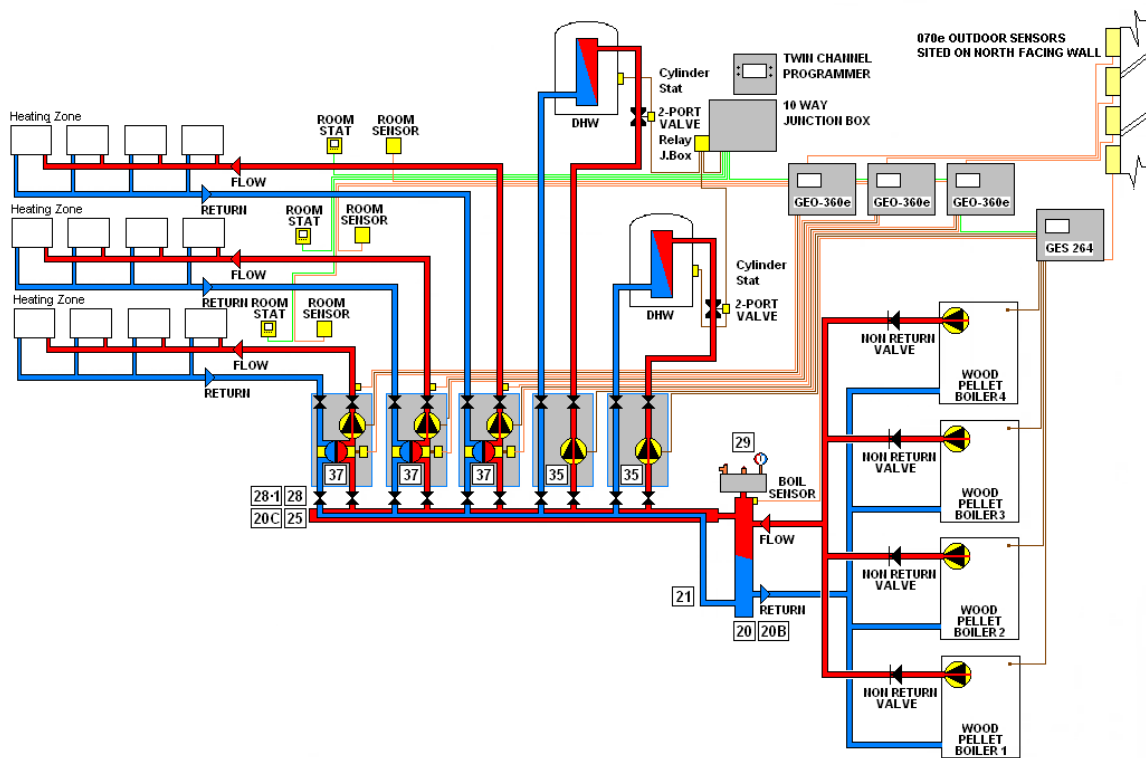


Figure 5 – 1 Typical header system showing the itemised parts

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5.2 Technical Data – 165kW

165 kW Hydraulic switcher	Max 6 Bar
Hydraulic switcher – max flow rate	Up to 7m ³ /h, @ 20° Δ t
Hydraulic switcher – dimensions (including insulation)	152 x 152 x 770mm (high)
Hydraulic switcher connection – appliances (Boilers etc)	2 x 2" Male iron
Hydraulic switcher connection – to insulated distributor	2 x 2" Male iron
Hydraulic switcher connection – flow sensor pocket	½" Female iron
Hydraulic switcher top connection – vent/PRV	1¼" Male iron thread for security unit SG 200
Hydraulic switcher bottom connection - drain	½" Female iron
Hydraulic switcher – Wall fixing	152 x 152 – 160mm wall - centre
165 kW Distributor	
Distributor max flow rate – distributor per 1¼" Zone pump connection	Up to 3m ³ /h, @ 20° Δ t
Distributor insulated - dimensions	150 x 150 x 625 – 1625mm max (length)
Distributor – zone pump connections	2 – 6 x 1¼" connections for Zone pump kits
Distributor – side connections (for left or right hand connection of the hydraulic switcher)	2" Male iron
Distributor – bottom connections (for left or right hand connection of the hydraulic switcher) including 2 x 2" Cap ends to blank unused connections	2" Male iron
Distributor – Wall fixings	150 x 150 x 100 or 150mm wall – centre

165 kW Hydraulic switcher			
Length mm Inc 2" threads	Cross section mm	Litres	Approximate total header and switcher volume in Litres
750	150 x 150 (less insulation)	7.50	
165 kW Distributors			
625	150 x 150 (less insulation)	5.75	13.25
875		8.25	15.75
1125		10.75	18.25
1375		13.25	20.75
1625		15.75	23.25

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5.3 Technical Data - Constant temperature 165kW Zone pump kit

Zone pump kits for the 165 kW header	Figure 5 – 2
Comprises – pump, isolation ball valves, temperature gauges inc non return valve	Constant temperature variable speed
Connection sizes	1¼" Female iron top and bottom connections
Dimensions W X H X D	250 x 380 x 190mm
Maximum temperature	110° C
Non return valve – operate at 20mb	Built in to return valve
Application – 7 & 8m head	Hot water and heating circuits'
Flow rate – 7 & 8m head	70kW 3m³/h, @ 20° Δ t



Figure 5 – 3 Variable temperature



Figure 5 – 2 Constant temperature

5.4 Technical Data – Variable temperature 165 kW Zone pump kit

Zone pump kits for the 165 kW header	Figure 5 – 3
Comprises – pump, isolation ball valves, temperature gauges inc non return valve	Variable temperature & variable speed
Connection sizes	1¼" Female iron top and bottom connections
Dimensions W X H X D	250 x 380 x 190mm
Maximum temperature	110° C
Non return valve – operate at 20mb	Built into return valve + mixer
Application – 7 & 8m head	Weather compensated heating circuits
Flow rate – 7 & 8m head	70kW 3m³/h, @ 20° Δ t
Additional controls	Built in mixing valve and servomotor for use with Grant GEO 360 weather compensated heating circuits

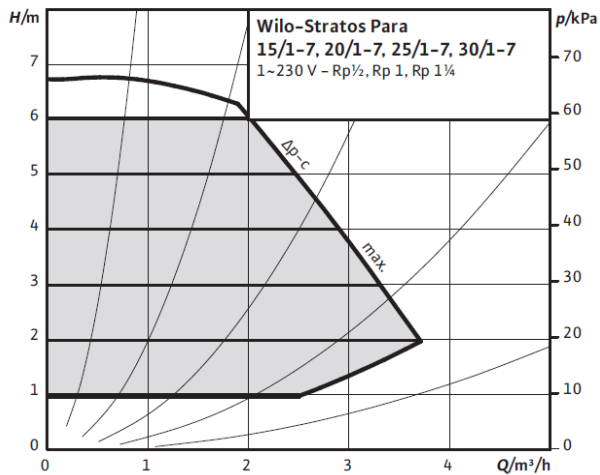
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Zone pump kit	165 kW			
Size	Type	6m	7m	8m
1 1/4"	Constant temperature	N/A	STRATOS PARA – 30/1-7	STRATOS PARA – 30/1-8
	Variable temperature	N/A	STRATOS PARA – 30/1-7	STRATOS PARA – 30/1-8

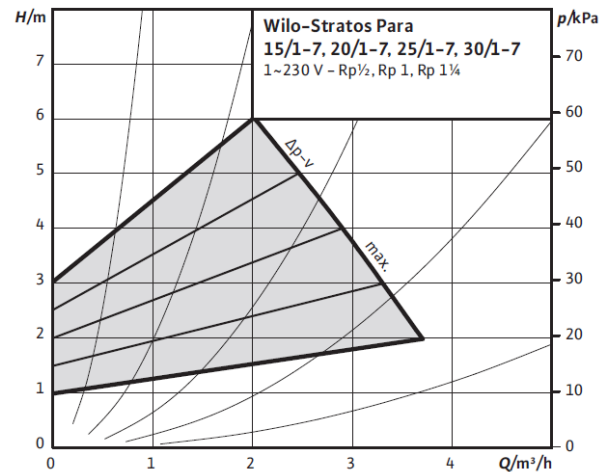
Pump graphs

Constant/variable temperature STRATOS PARA 30/1 – 7

Δp -c (constant)

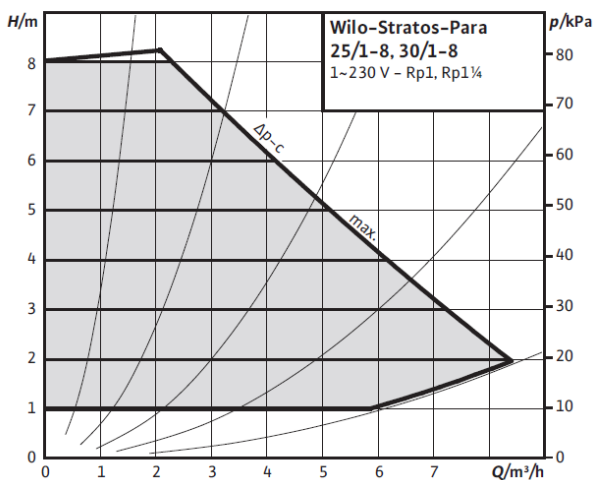


Δp -v (variable)

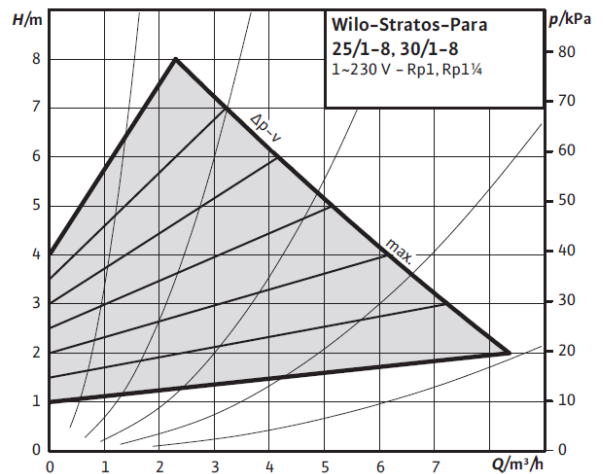


Constant/variable temperature STRATOS PARA 30/1 – 8

Δp -c (constant)



Δp -v (variable)

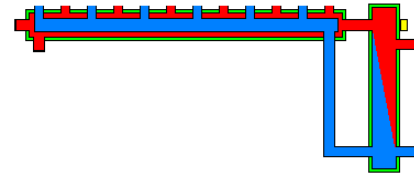


6. Description & Operation – 165kW

6.1 Description and operation – 165kW

The 165kW Grant header system has two major components the 'Vertical Hydraulic switcher' for connecting the heat source, (appliances, boilers air source heat pumps etc) and the 'Distribution header' this is connected to the switcher by two 2" unions. And a 2" pipe bend (pre – insulated). The distribution header supports the 'Zone pump kits' which distribute the heat to the system.

Figure 3.1 Header flow path



Why is it called a 'Low loss header'?

If we take the supply pipework from the appliances which for a 165kW input @ 20° Δ t flow and return differential would be say 54 mm diameter pipe. The resistance reading from a pipe chart for 1.9643 kgs/sec (165kW @ 20° Δ t) would be 0.016 m/m, when the water enters the 'Switcher – low loss header' this is 100mm square. If we take a reading for a 100mm copper pipe we would find that the loss of head per metre run for 1.9643kgs/sec would only be 0.0018 m/m. As can be seen there is 10 times less head loss per metre in our low loss header, hence the expression 'low loss' header.

The zone pump kits then draw their system water off the distribution header to the appropriate circuits. At the same time cooler return water is returned to the 'Hydraulic switcher' and mixed back into the return for the appliances or re – used back into the system flow. It is important that every circuit is correctly balanced to make sure that the system water temperature differentials are set.

For suggested flow rates and differentials see the table below.

Distribution header capacity – 165kW	Δ t	kgs/s*	l/h	m³/h
Maximum input from heat sources				
1650,000 watts @	20	1.9643	7,000	7.0
82,500 watts @	10	1.9643	3,000	7.0
41,250 watts @	5	1.9643	3,000	7.0
1¼" Zone pump kits				
70,000 watts @	20	0.833	3,000	3.0
35,000 watts @	10	0.833	3,000	3.0
17,500 watts @	5	0.833	3,000	3.0

* Based on the formula watts divided by temp differential multiplied by specific heat of water.

As can be seen in the above table it is important to obtain the correct flow rate and temperature differential in order to carry the amount of energy required for the system. As an example, if we used four 36kW Grant Spira wood pellet boilers, with a flow and return temperature differential of 20°K this will produce the rated output of 36 x 4 = 144kW. This would be suitable on this 165kW system, whereas if we used 3 Air source heat pumps, say rated at 14.8 kW at -3°C set up with a Δt of 5°K we would be just over the maximum at 44.4 kW. All pipework sizing calculations must be sized by the installer/heating engineer before proceeding with the installation.

6. Description & Operation – 165kW

6.1 Description and operation – 165kW

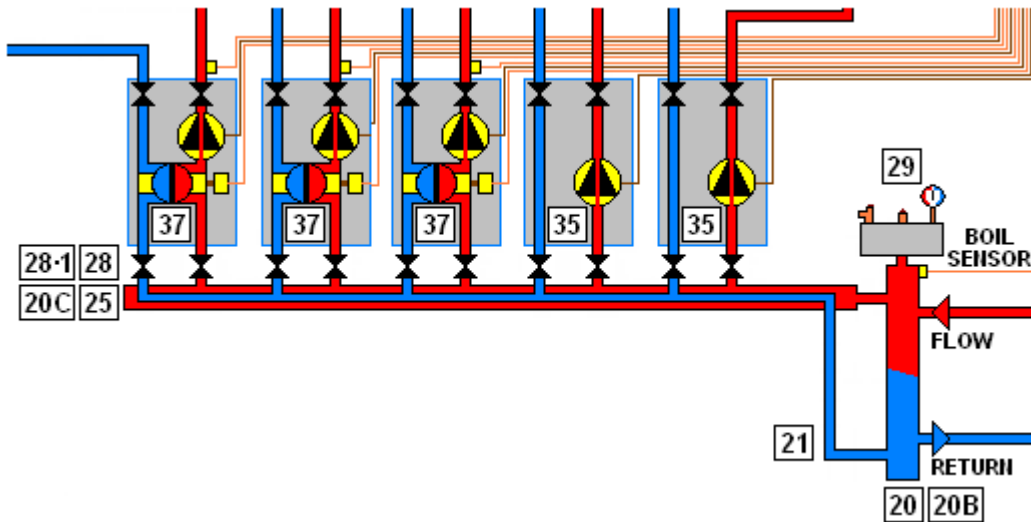


Figure 6 – 1 Flow and return connections

NB: The flow connection is always on the TOP with the flow sensor POCKET above the flow connection as shown.

It is always preferable to have the header system above the top connection of the appliance to prevent pipe dips and air entrapment, but this is not essential as systems have been installed where the appliance top tapping is higher than the 'Header switcher', but auto air vents (use the safety unit as shown which includes an Automatic air vent 3 Bar pressure relief valve and Pressure gauge) may be required, please follow the appliance manufactures installation instructions.

A suitable solid wall is preferable to minimise the transmission of any vibration or mechanical noise transmitted by the Zone pump units and to be able to carry the weight of the installation, some metal frame plasterboard partitions may not be suitable. The header system is attached to the wall using wall fixing brackets for dimensions see the dimensions page (999) for more detail.

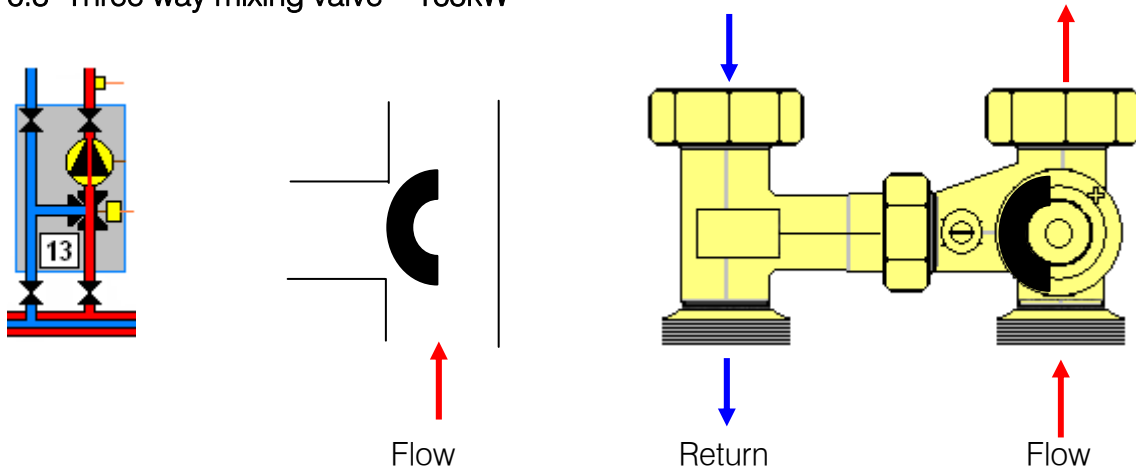
The 'Header switcher' is connected to the 'Distribution header' using 2" Galvanized pipe and unions; threaded joints may be made water tight with a suitable compound or PTFE tape. If a paste is to be used on the union faces this should be used sparingly so as to prevent ingress by the paste into the system. The pump flanges have a rubber washer these should be installed without any paste 'dry' to prevent spreading of the gasket.

6.2 System considerations – 165kW

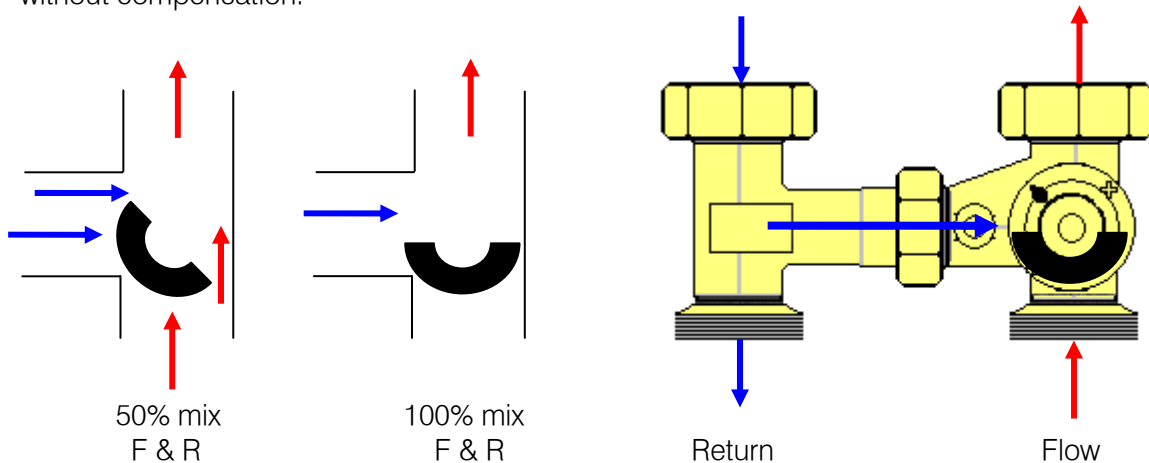
The Grant header system may be used with either a vented or sealed heating layout; all installations must comply with relevant standards and Building Regulations as appropriate. The Grant header system will not require a by pass valve between the appliances and the switcher header as the switcher is an open pipe allowing the water to circulate through the appliances without hindrance.

Back end protection would not normally be required if the boilers are commissioned and the flow rates set up for the correct operation of the appliances, under normal working conditions the return would not be expected to rise above 57° C.

6.3 Three way mixing valve – 165kW



3 Port operation with a 90° movement of the valve shoe from open to closed.
Open – no mix from the return, motor valve scale at '10' heating flow and return operate without compensation.



Fully closed – the return water is re - circulated back into the system, motor scale at '0', the valve shoe is across the flow from the heat source. Weather compensation will be a position between fully open and fully closed.

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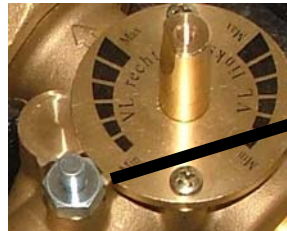
6.3 Three way mixing valve – 165 kW - continued

6.3.1 Fitting of 3-port valve motor

Unscrew retaining screw and remove black knob from valve shaft



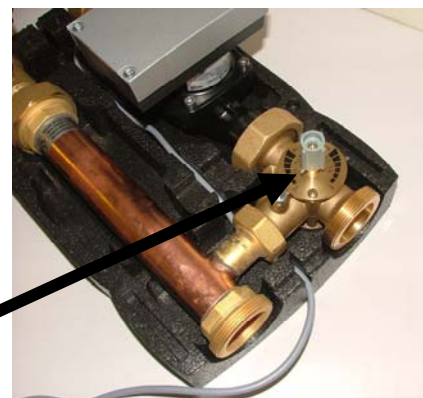
Fit anti-rotation stud (supplied with motor) into threaded hole in valve body and tighten



Fit grey adaptor (supplied with motor) onto valve shaft



Rotate shaft to align pointer on grey adaptor with closed position on valve scale (at '9 – o'clock' position)



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6.3 Three way mixing valve – 165 kW - continued

6.3.1 Fitting of 3-port valve motor

Fit the valve scale (supplied with the motor) over the splined shaft end

IMPORTANT: ensure '0' is to the left



Using a flat bladed screwdriver push in and rotate the motor release to switch from 'auto' to 'manual' operation of the motor/valve



Fit the valve lever (supplied with the motor) onto the splined shaft end
Rotate lever anticlockwise to point to '0' position on scale



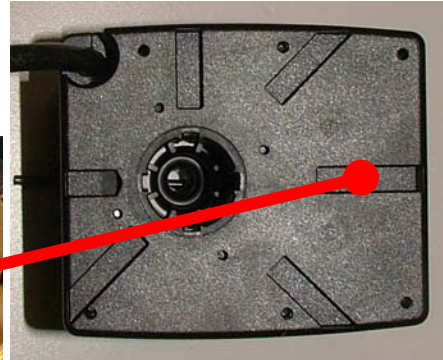
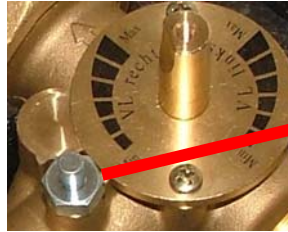
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6.3 Three way mixing valve – 70kW - continued

6.3.1 Fitting of 3-port valve motor

Fit the motor onto valve shaft/adaptor with the scale at the left hand end

Locate anti-rotation stud into groove in the underside of the motor housing



Fit the long fixing screw (supplied with the motor) and tighten to secure motor/lever to valve shaft



Manually operate valve - move lever anticlockwise to closed '10' position to check operation then reset to '0'

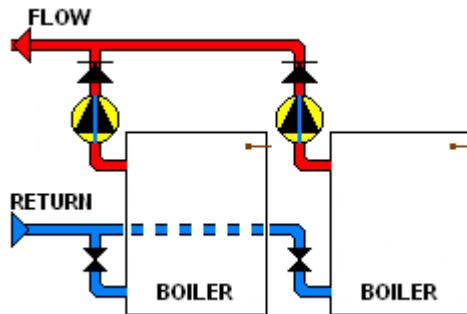
Using screwdriver - re-set motor release to 'auto' (A) position



7. General system information – 70 & 165kW

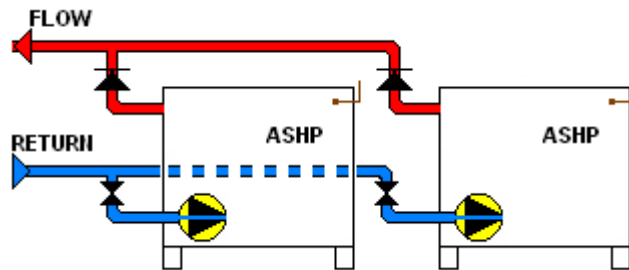
7.1 Multiple appliances

Figure 7 – 1



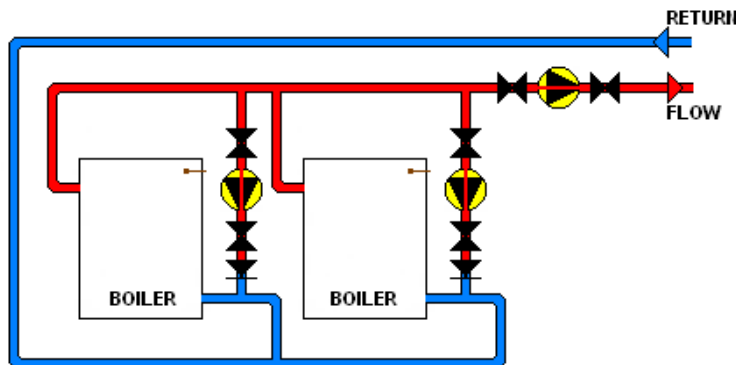
Two appliances with a common return, each appliance will need to be balanced to provide equal flow through both appliances, hence the balance valve on the return to the appliance. Each pump is fitted with a non – return valve to prevent circulation taking place through the second appliance if it is not firing.

Figure 7 – 2



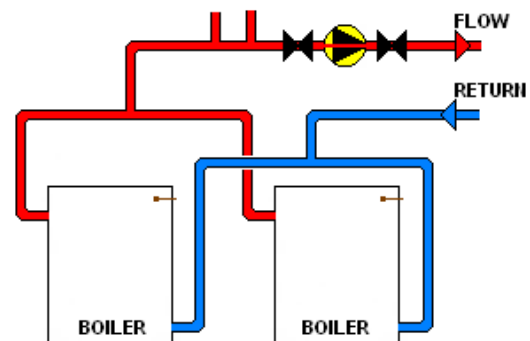
Connecting more than one ASHP is now more common. Similar to the illustration above except the circulating pumps are on the return. Not a non – return valve and balancing valve are included.

Figure 7 – 3



Some appliances will require back end protection. This can be achieved as shown with a common flow and return with a shunt pump normally linked through a pipe thermostat.

Figure 7 – 4



A reverse return layout normally will be used with just two appliances of the same size type and output. Providing the flow and return pipework is of equal length and correctly sized an equal flow should be obtained through both appliances.

7.2 Open vented systems

7.2 Open vented system connection

7.2.1 Open vented systems up to 70kW

Figure 7. – 2 – 1 Single appliance installation

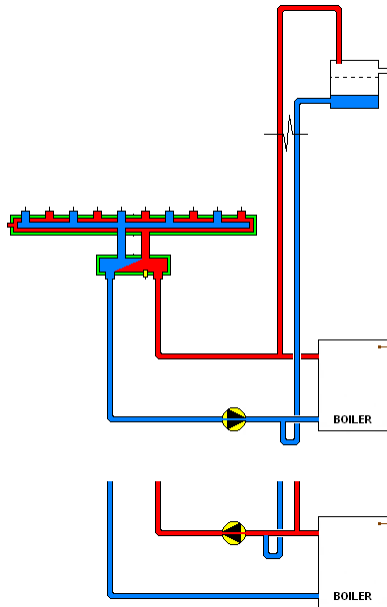
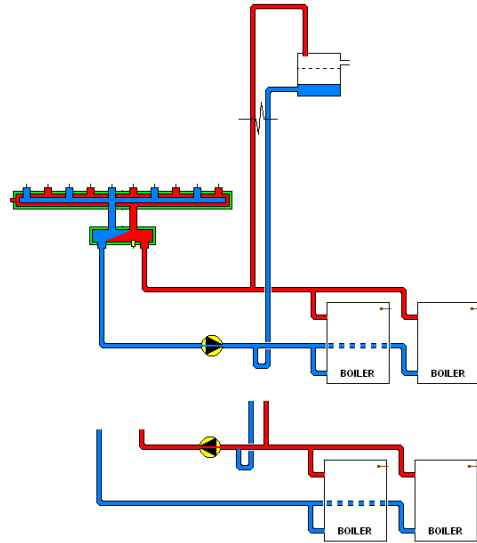


Figure 7 – 2 – 2 Multiple appliance installation



7.2.2 Open vented systems up to 165kW

Figure 7. – 2 – 3 Multiple appliance installation open vent off hydraulic switcher

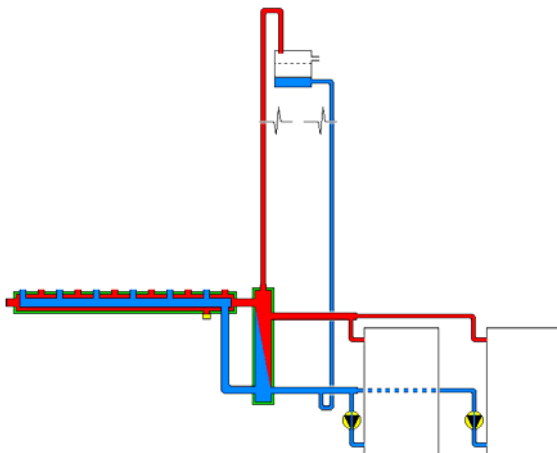
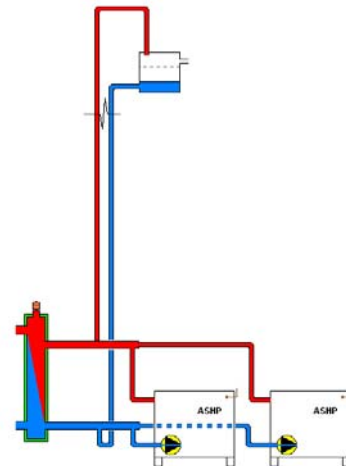


Figure 7 – 2 – 4 Multiple appliance installation open vent off flow to hydraulic switcher.



7.2 Open vented systems

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Safety pipes and feed and expansion pipes

According to the Water supply (Water fittings) regulations 1999 and the Scottish water byelaws 2004, and BS EN 12828 the minimum size for the expansion pipe on a heating system should be no less than 19mm internal diameter. The Domestic heating design guide gives recommended sizes for boilers up to 25kW output 22mm OD and 25 – 60 kW output 28mm OD diameter vent pipe, these are guide lines. BS EN gives a formula which the following table is based.

Safety pipe:

$$d_s = 15 + 1.4 \sqrt{\phi}$$

Feed and expansion

$$d_{fe} = 15 + 1.0 \sqrt{\phi}$$

ϕ is the nominal output of the heat generator in kilo Watts (kW)

Figure 7 – 2 – 4 Suggested open vent and cold feed pipes in copper tube

	70kW		165kW	
	id	OD	id	OD
Vent	32	35	39	42
Cold feed	23	28	28	35

7.2 Sealed systems

Sealed systems expansion vessels and pressure relief valves

BS EN 12828 Annex D (informative) and the Water supply (Water fittings) regulations 1999 and the Scottish water byelaws 2004, also cover the installation of sealed heating systems, guidance can be found in the Domestic heating design guide. The diagrams on the following pages demonstrate basic guidance for the installation of the sealed system and its components, it is the responsibility of the installer to check with the appliance manufactures and current legal requirements when installing such systems.

1. Calculate the total volume of the system to enable the correct size of expansion vessel required.
2. The initial vessel pressure should be at least that of the static pressure, nominally 1 bar, this would represent an approximate static head of 10 metres. The final system pressure should be 0.2 – 0.3 bar greater than the expansion vessel pressure.
3. The position of the expansion vessel in the system determines the neutral point in the system, this is where the system pressure is always constant.
4. The fill position should be between the connection point of the expansion vessel and the inlet of the circulating pump.
5. For vessel sizing refer to the Heating Design guide or Table D.1 in BS EN 12828:2003
6. Sealed systems should be fitted with a non – adjustable safety valve set to lift at a gauge pressure not exceeding 3 bar (300 kPa), fitted close to the appliance with a discharge to a tundish with a suitable metal discharge pipe in accordance with the appliance manufactures and current regulations and standards.

7.3 Sealed system connection

7.2.1 Sealed system up to 70kW

Figure 7. – 2 – 4 Single appliance installation

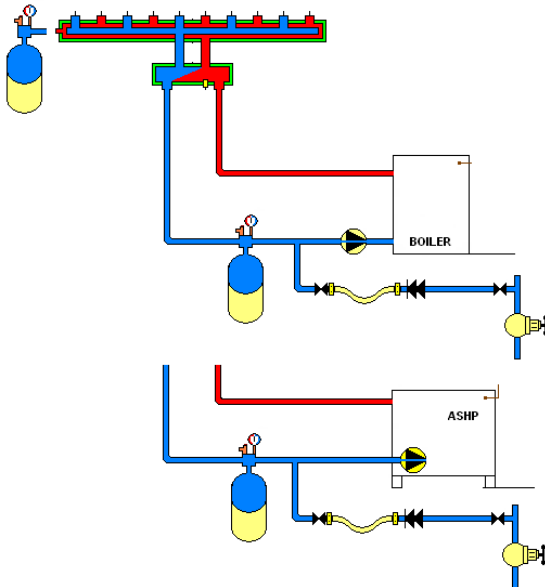


Figure 7 – 2 – 4 Shows a single appliance connected to a sealed system with removable filling loop expansion vessel pressure relief valve and gauge.

Please note the alternative connection into the distributing header. On the 70kW distributor this is a $\frac{3}{4}$ " female iron tapping.

Consideration should be given to the correct sizing of the expansion vessel which should comply with BS 4814

Automatic and manual air vents should be fitted at high points in the system to completely remove all air when commissioning the system

7.2.2 Sealed system up to 165kW

Figure 7. – 2 – 5 Multiple appliance installation

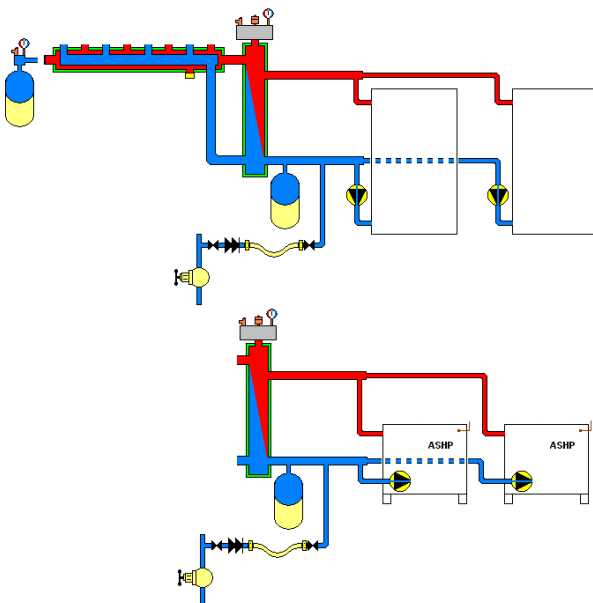


Figure 7 – 2 – 5 shows the installation of the 165kW header system with multiple appliances.

With consideration to the above comments it can be seen that the vertical switcher has the facility to connect the 200kW safety device which includes an automatic air vent, 3 bar pressure relief valve and pressure gauge.



7.4 Pipe sizing

As shown in the previous illustrations there are different ways in which to connect two or more appliances together to feed the header switcher.

Pipe sizing must be adequate to provide the required flow rate through the appliance, never use a pipe size LESS than the tapping size of the appliance. It is acceptable practice to increase the size of the pipework away from the appliance to accommodate the flow of water. For example an appliance with a tapping size of $\frac{3}{4}$ " may require a pipe size of 28mm to accommodate the flow of water.

Always refer to manufacturer's instruction for addition help and requirements.

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8. Filling the system for 70 & 165kW headers

8.1 Filling and flushing the system

Reference should be made to the appropriate standards in regard to filling and flushing of the heating system and circuits. In domestic properties BS 7593:1992 advises the use of a full bore drain valve at the lowest point of the system and also a full bore drain point at the boiler. This is to facilitate the complete draining and flushing of the system. Some chemical manufactures have produced a high powered flushing pump system for this purpose. It is the responsibility of the installer/commissioning engineer to make sure the system has had all foreign matter removed and to ensure it is free of flux residues, metal swarf, solder pieces and if an existing system magnetite deposits removed.

The use of propriety chemical cleaners and agents will help in this process providing the manufacturers instructions are adhered to.

Upon the completed filling and flushing of the system procedure it is also the responsibility of the installer/commissioning engineer to ensure that all the air has been removed from the system and heat emitters and pumps.

9. Commissioning the system for 70 & 165kW headers

9.1 General

The commissioning of a heating system in the words of the CIBSE Guide B states "Commissioning means the advancement of these systems from the state of static completion to working order to the specified requirements of the approved design"

In regard to our header system this will mean that after we have filled and flushed our system and removed all unwanted air. We may put the system into operation with due regard to electrical requirements including the correct earthing arrangements for the system all in accordance with the current regulations and BS7671.

Water flow rate, it is advisable that wherever possible valves should be fitted to all equipment to enable the correct flow rate to be achieved through the equipment. The correct flow and return temperatures also need to be checked to ensure the correct amount of energy is being carried through the system as described in section ????

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9.2 Fault finding

If the correct procedure for the filling and venting of the system is carried out there should be no need for fault finding, but in the event that a system is not functioning as it should then the following method of fault detection may be used.

Always remember the basic method when fault finding, is there power, or fuel and in the case of the header system is there system fluid.

Figure 9. – 1 Fault finding the header installation

Mechanical	Solution	Electrical	Solution
No circulation	Check for water in the system	N/A	Fill system
System not heating up (Luke warm) radiators not heating up	Check flow and return connections into switcher (Flow should be on the right with sensor pocket alongside)	Ditto	Carry out electrical safety checks. Check for power from fused spur. Check for heating/hot water demand from controls. Check for power to pumps at the pump terminals Check for continuity
No circulation through zone pumps	Check valves are fully open, above and below pumps		
Pumps noisy	Check for air in pump, release central bleed screw on pump, also check for pump rotation		
Reverse circulation through pumps	Check non – return valves are fitted into Zone pump kit as per installation instructions	N/A	
Insufficient heat from appliances	Check appliance pumps (see above) Check valves are fully open (see above) Check appliances are of sufficient output for the heat load of the installation	Ditto	See above
Individual circuit not working correctly	Check pump, valves, non return valves and any system valves are open (see above)	Ditto	See above

Servicing 10 : Header systems 70 & 165kW

10.1 Servicing.

Service requirements for the Grant Header systems is minimal but checks must be carried out as part of the appliance annual service.

The basic checks should include;

1. Isolate the power supply and remove insulation to the Zone pumps, check for mechanical damage to the covers, if required contact Grant Engineering UK Ltd for replacement insulating covers.
2. With the zone pumps exposed check all connections for water tightness and make good any leaks from joints. If required replace gaskets and jointing to threads, refit and test. Check pump for air via the large screw on the front of the pump, do this without the pump being energised.
3. Visually check the condition of any electrical flex/wiring to the zone pumps, if there is any sign of deterioration of the insulation, replace the flex with a suitable new flex/wiring to the correct specification for the zone pump.
4. If there is a weather compensator mixing valve fitted to the heating zone pump remove the actuating motor and check the drive shaft for leaks. Check the condition of the actuating motor if damaged replace. Refit actuating motor and before recommissioning the system carry out a 'Test' using the 'Test' button on the GEO360 control.
5. Testing the control , see GEO360 control and press the 'Test' button, this will carry out a built in test routine which will test the main control functions and continually monitor the fitted sensors and relays, if there is a problem an error message will be displayed on the control screen. (see GEO360 instructions for a list of error codes) During the test the valve will rotate. This will take approximately 130 seconds, (see adjust menu).
6. Check pump and system operation when recommissioning. Check flow and return differentials to maintain system maximum efficiency.
7. Hand over to customer and explain the operation of the system and the benefits of having regular annual servicing to keep the system operating at its maximum efficiency.