

Amicus LTS454B low temperature air source heat pump installation planning guide.



Article	Language	Version	Modified by
Amicus LTS454b Installation and Planning guide	English	V1.0 January 2024	S Addis

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Introduction

This document includes all the basic information required for the Design team from stage 2 to stage 5 of the project.

The Lochinvar Amicus Low temperature air source heat pump range has been designed to provide heating and DHW only and can work at temperatures up to 59°C (at +5°C external air) and can maintain 45°C in external air temperatures as low as -10°C. There are 20 models in the range with outputs ranging from **22 to just over 463kW at standard rating** conditions External air+7C 30/35 flow. The individual technical product submittal for each heat pump supplies detailed data on outputs ranging from 35 to 59°C flow with external air temperatures of +20 to -10°C. All units can also be supplied as RV two pipe heating and/or cooling units.

Each heat pump has the following standard features:

R454B Scroll compressors utilising a low GWP refrigerant.

Source heat exchanger made from copper with low air resistance to allow slower rotating fans and thus reduce noise.

Direct drive fans with low speed of only 600rpm.

User heat exchanger made from 316 stainless steel.

Condensate drip tray with antifreeze heater, collects condensation from the source heat exchanger which can then be piped to drain.

Antifreeze kit which prevents internal pipework from freezing whilst the unit is non-operational.

Control panel which can be removed from the heat pump and mounted within the plantroom up to 50 metres away.

General

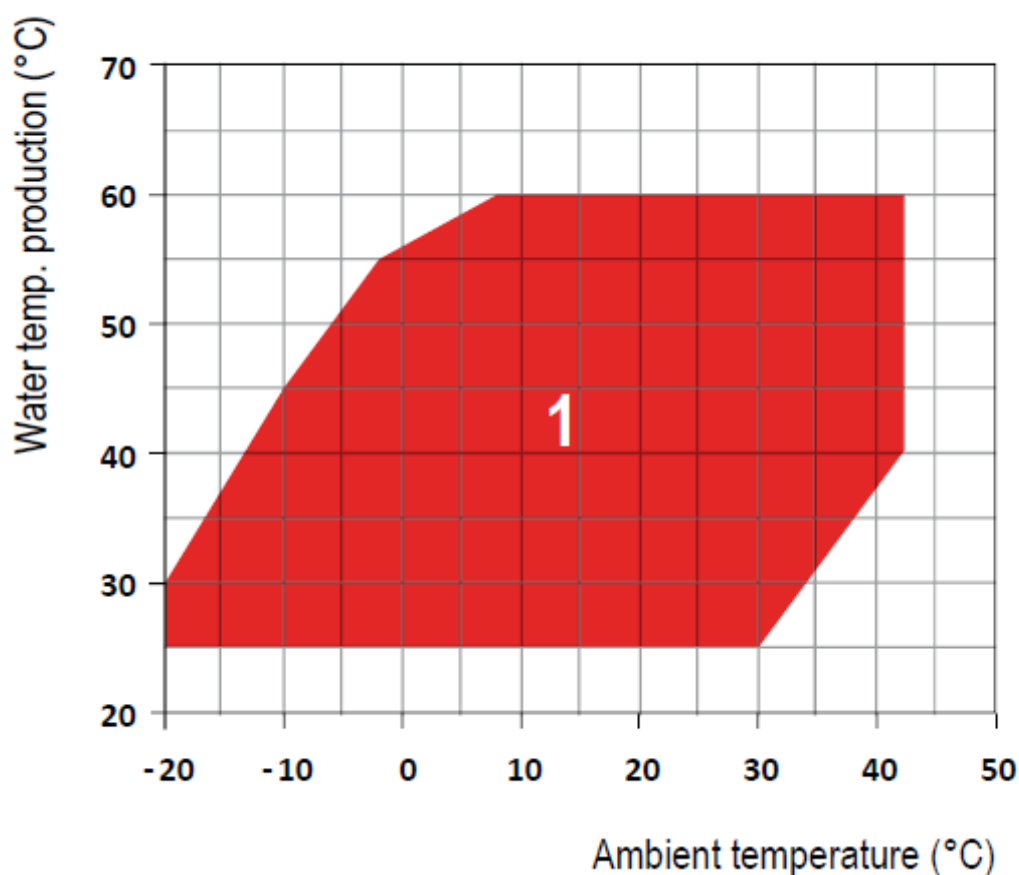
The Amicus air source heat pump should be sited in an area which:

- Can bear the Weight of the unit.
- Has enough space around the unit to allow the correct airflow across the source heat exchanger, see table 2.
- Is not too windy.
- Does not present a noise nuisance to users of the building and neighbours.

Operational limits

Amicus low temperature heat pumps can provide heating and/or domestic hot water at temperatures up to 59°C, and can operate in external temperatures down to as low as -20°C. The diagram below shows the general working limits and should be crossed reference with the data shown in the individual model Technical Product Submittal as each is slightly different.

(Standard versions)



Sizing

When sizing the air source heat pump careful consideration needs to be taken of design outside air temperatures as the output from the heat pump will be much lower at -5°C than shown in the standard rated conditions. Lochinvar can help with sizing your project, contact your local area sales manager or email sales@lochinvar.ltd.uk

Technical details

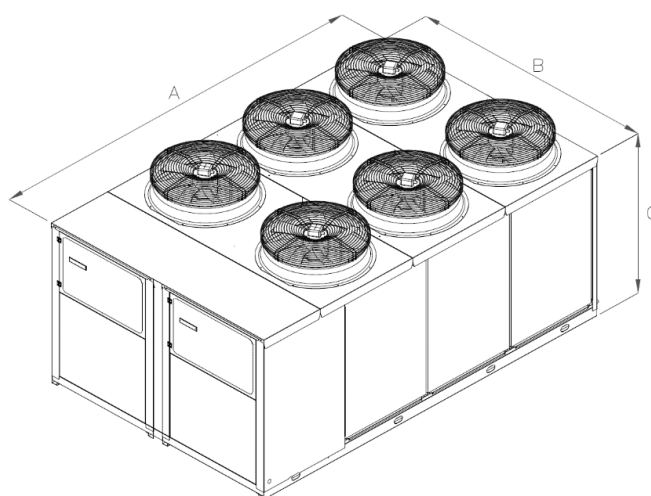
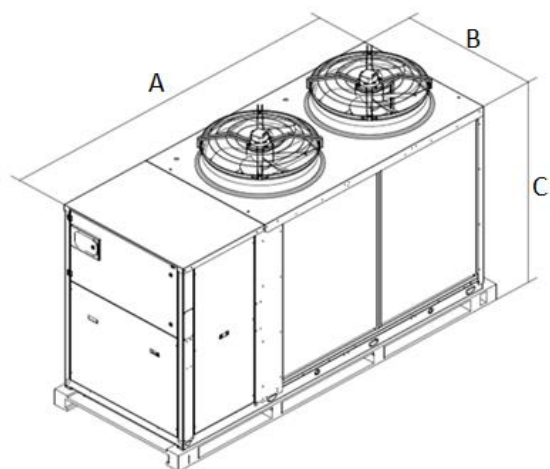
Dimensions			LAHP-452LTS-454	LAHP-512LTS-454	LAHP-682LTS-454	LAHP-752LTS-454	LAHP-912LTS-454
Height	A	mm	1673	1673	1839	1839	1918
Length	B	mm	2400	2400	3000	3000	3000
Width	C	mm	1265	1265	1265	1265	1265
Shipping Weight		Kg	650	658	884	890	1100

Dimensions			LAHP-1102LTS-454	LAHP-1152LTS-454	LAHP-1352LTS-454	LAHP-1502LTS-454	LAHP-1612LTS-454
Height	A	mm	1918	1918	1918	1918	1918
Length	B	mm	3000	3000	4295	4295	4295
Width	C	mm	1265	1265	1265	1265	1265
Shipping Weight		Kg	1108	1110	1668	1714	1722

Dimensions			LAHP-1792LTS-454	LAHP-2012LTS-454	LAHP-2304LTS-454	LAHP-2312LTS-454	LAHP-2654LTS-454
Height	A	mm	1918	2287	2378	2287	2378
Length	B	mm	4295	4296	4515	4296	4515
Width	C	mm	1265	1265	2310	1265	2310
Shipping Weight		Kg	1776	1762	3262	1778	3348

Dimensions			LAHP-2954LTS-454	LAHP-3214LTS-454	LAHP-3514LTS-454	LAHP-3954LTS-454	LAHP-4454LTS-454
Height	A	mm	2378	2378	2378	2378	2378
Length	B	mm	4515	4515	4515	5557	5557
Width	C	mm	2310	2310	2310	2310	2310
Shipping Weight		Kg	3438	3480	3508	3658	3686

Table 1 Dimensions and Weights



Drawing 1 Dimensions

Full technical details including detailed performance data for each model can be found on the technical product submittal at: [LTStps://lochinvar.LTSd.uk/amicus-air-source-heat-pumps/](https://lochinvar.LTSd.uk/amicus-air-source-heat-pumps/)

Position on site

Amicus air source heat pumps require minimum clearances around them to enable the fan which is fitted on top of the unit to draw sufficient air through the source heat exchanger (evaporator) which is fitted to the Right-hand side on models LAHP-452LTS to LAHP-752LTS when viewed from the front and on both sides on models LAHP-912LTS to LAHP-4454LTS. Clearances also prevent exhaust air recirculation which can create operational problems for the units.



Drawing 2 Airflow across the unit

The type of model used will impact the required clearances and how multiple units can be laid out.



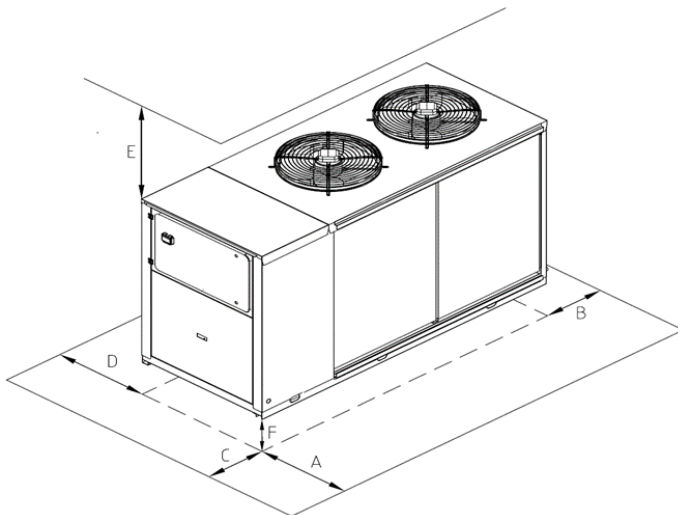
*All Amicus Air Source Heat Pumps, during defrost mode, produce condensate at the base of the source heat exchanger. If the ambient temperature is below 0°C, the water may freeze, creating a thick layer of ice within the appliance. This layer of ice, in specific conditions, may damage the heat exchanger and therefore, to guarantee correct operation of the unit it is highly recommended to raise the Amicus ASHP by a minimum amount as shown in table 2 using either a bigfoot type system as shown or by making the plinth the same dimensions as the heat pump

Table 2 Airflow clearances required for a single unit (see table 4 for multiple units).

Legend	Unit	Model						
		LAHP-452LTS-454	LAHP-512LTS-454	LAHP-682LTS-454	LAHP-752LTS-454	LAHP-912LTS-454	LAHP-1102LTS-454	LAHP-1152LTS-454
A	mm	1000	1000	1500	1500	1500	1500	2000
B	mm	800	800	1000	1000	1000	1000	1000
C	mm	800	800	1000	1000	1000	1000	1000
D	mm	800	800	1000	1000	1000	1000	1000
E	mm	3000	3000	3000	3000	3000	3000	3000
F	mm	350	350	350	350	350	350	350

Legend	Unit	Model						
		LAHP-1352LTS-454	LAHP-1502LTS-454	LAHP-1612LTS-454	LAHP-1792LTS-454	LAHP-2012LTS-454	LAHP-2304LTS-454	LAHP-2312LTS-454
A	mm	2000	2000	2000	1000	1000	1500	1500
B	mm	1000	1000	1000	800	800	100	1000
C	mm	1000	1000	100	800	800	100	1000
D	mm	1000	2000	2000	800	800	100	1000
E	mm	3000	3000	3000	3000	3000	3000	3000
F	mm	350	350	350	350	350	350	350

Legend	Unit	Model					
		LAHP-2654LTS-454	LAHP-2954LTS-454	LAHP-3214LTS-454	LAHP-3514LTS-454	LAHP-3954LTS-454	LAHP-4454LTS-454
A	mm	1500	1500	2000	2000	2000	2000
	mm	1000	1000	1000	1000	1000	1000
C	mm	1000	1000	1000	1000	1000	1000
D	mm	1000	1000	1000	1000	2000	2000
E	mm	3000	3000	3000	3000	3000	3000
F	mm	350	350	350	350	350	350

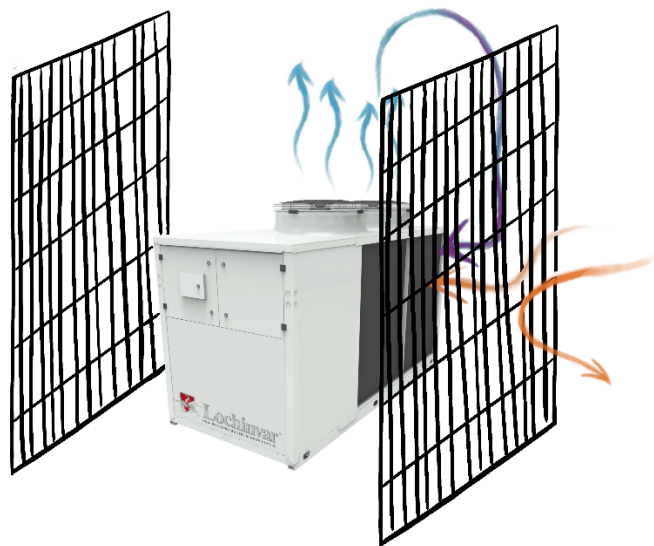


Drawing 3 Airflow clearances required, see table 2

Fencing or an acoustic shroud can be fitted around Amicus units, these must comply with the minimum service clearances shown in table 3 or must be removable for service access. The fence must allow enough airflow as required for the unit to be installed and can be found in the technical submittal for the unit.



Drawing 4 Airflow across the unit when sited within a correctly constructed screen



Drawing 5 Short cycling caused by an incorrectly constructed screen

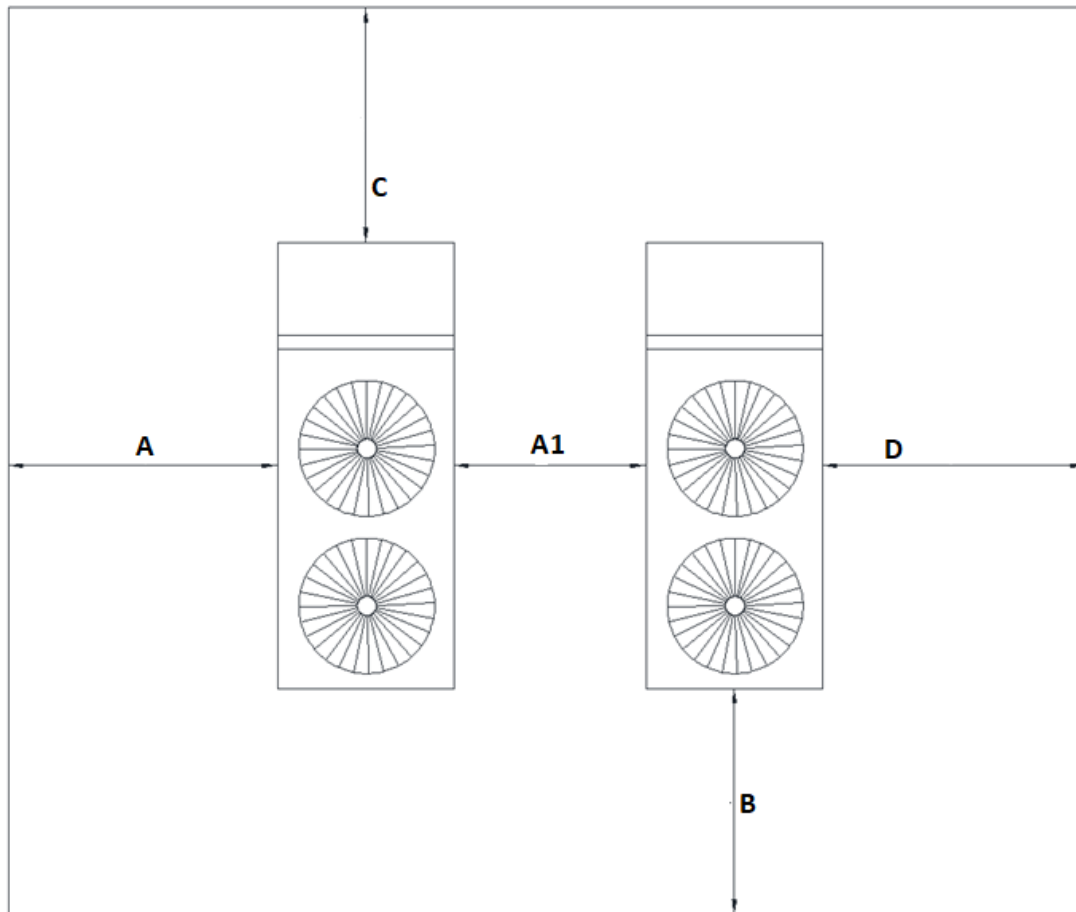
Locations near the coast

If the heat pumps are to be located within one mile of the coast or tidal water, then the unit should be ordered with the source heat exchanger treated to ensure premature saltwater corrosion does not occur.

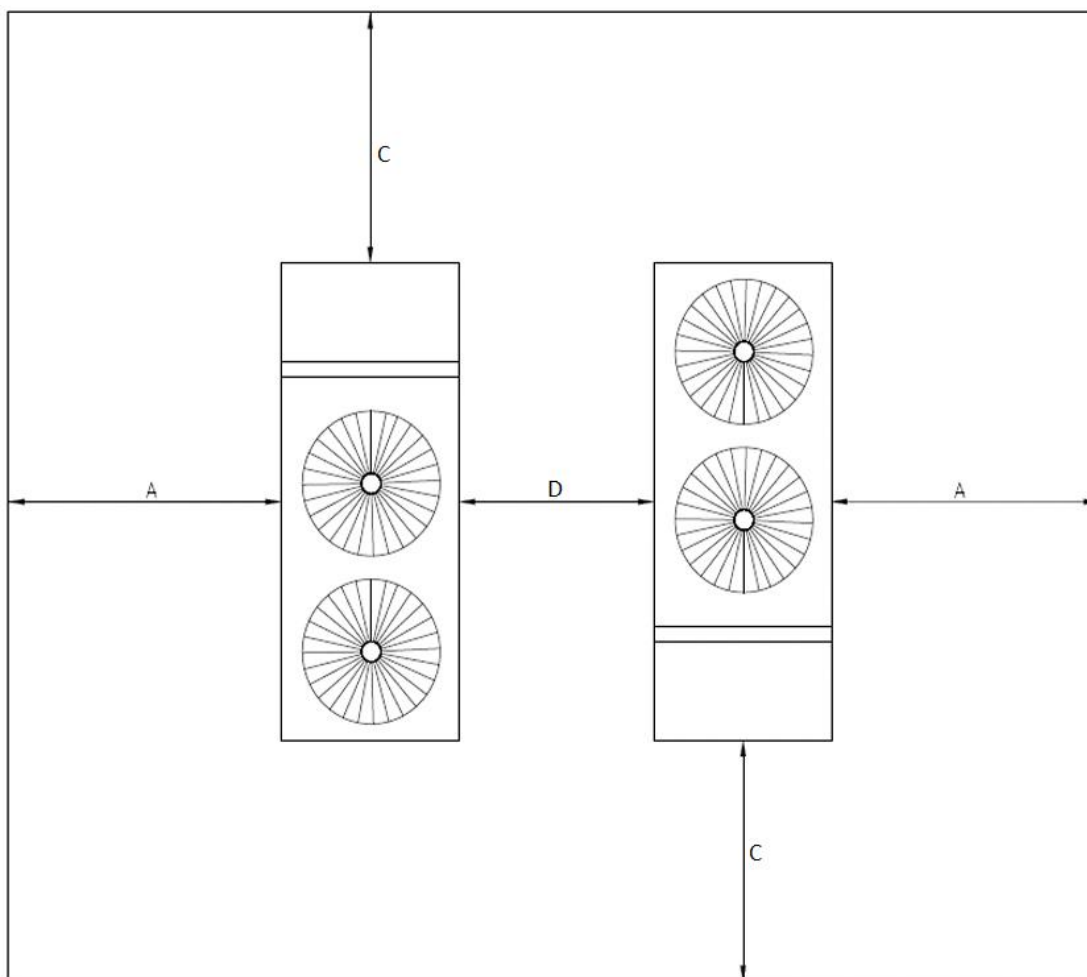
Positioning multiple units

When positioning Multiple Amicus units' minimum distances must be observed according to model size to ensure uninterrupted airflow and service access, to make the most of the available space some suggested plant layouts are shown in the layout drawings 7 to 11.

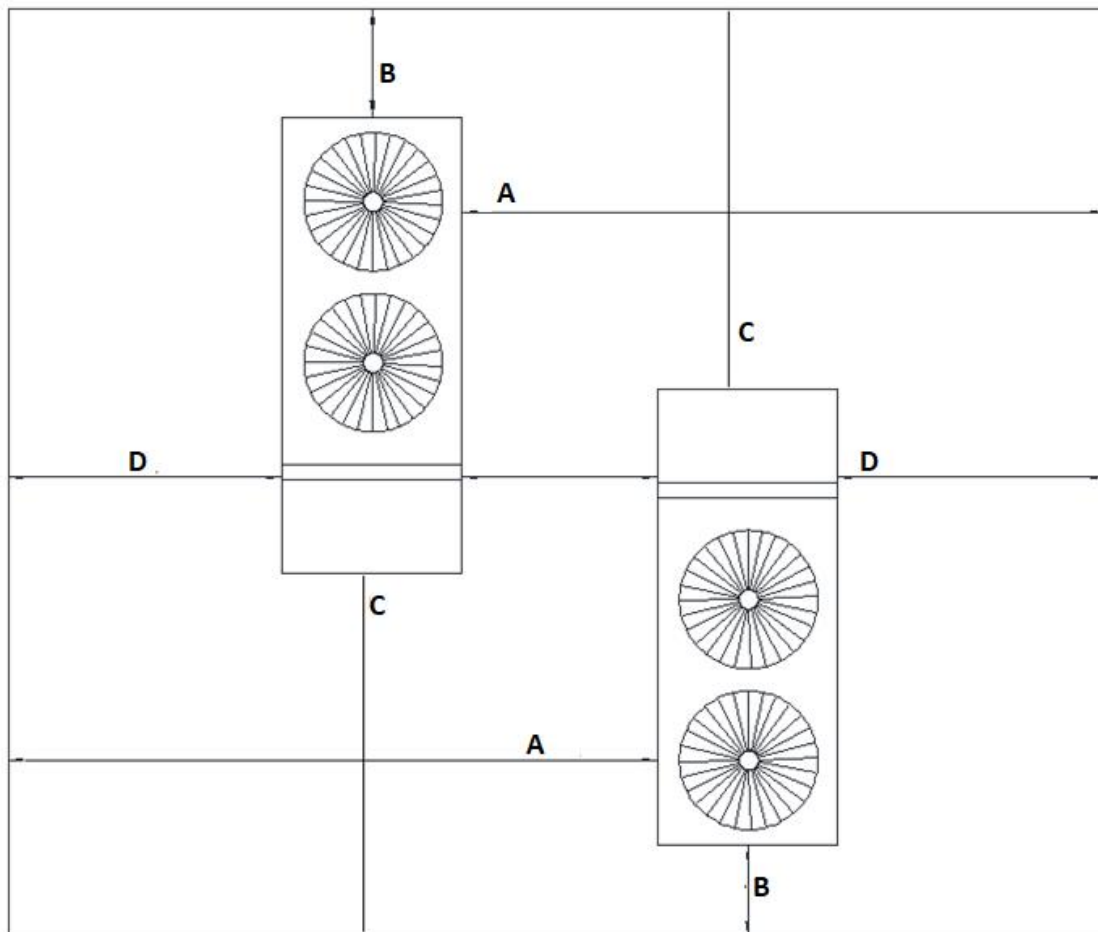
Distance A1 should be a minimum of 1.5 times distance A as shown in table 2.



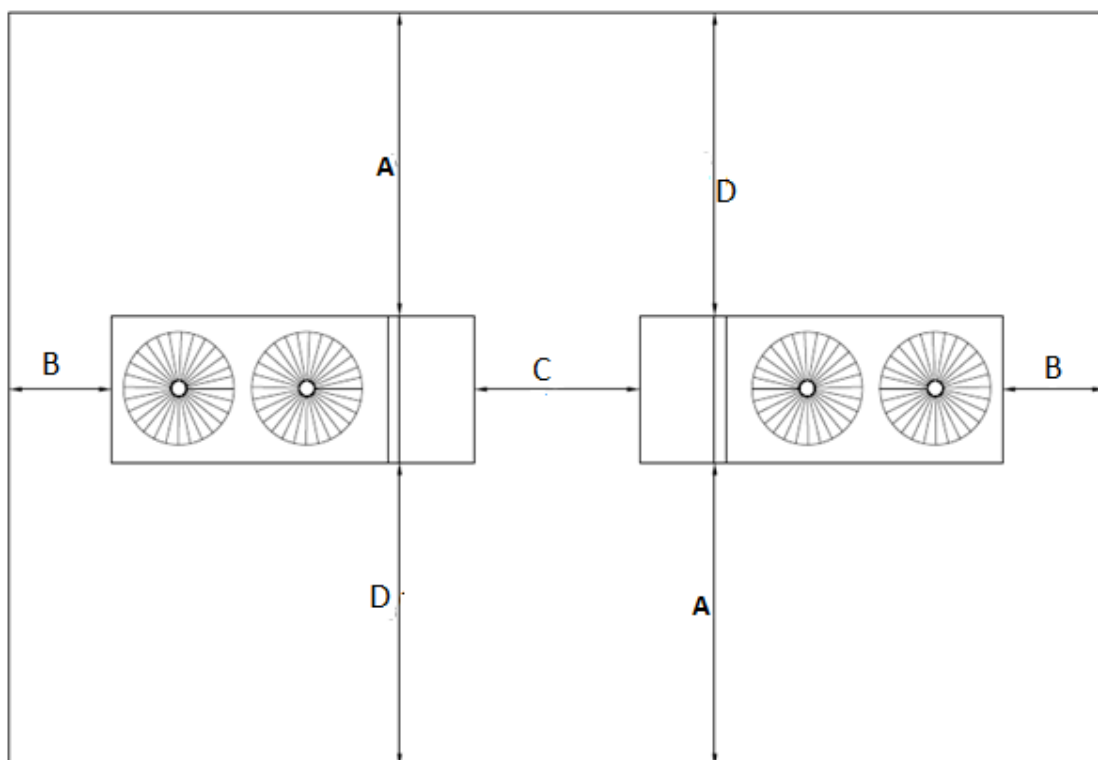
Drawing 7, Units sited side by side facing the same way



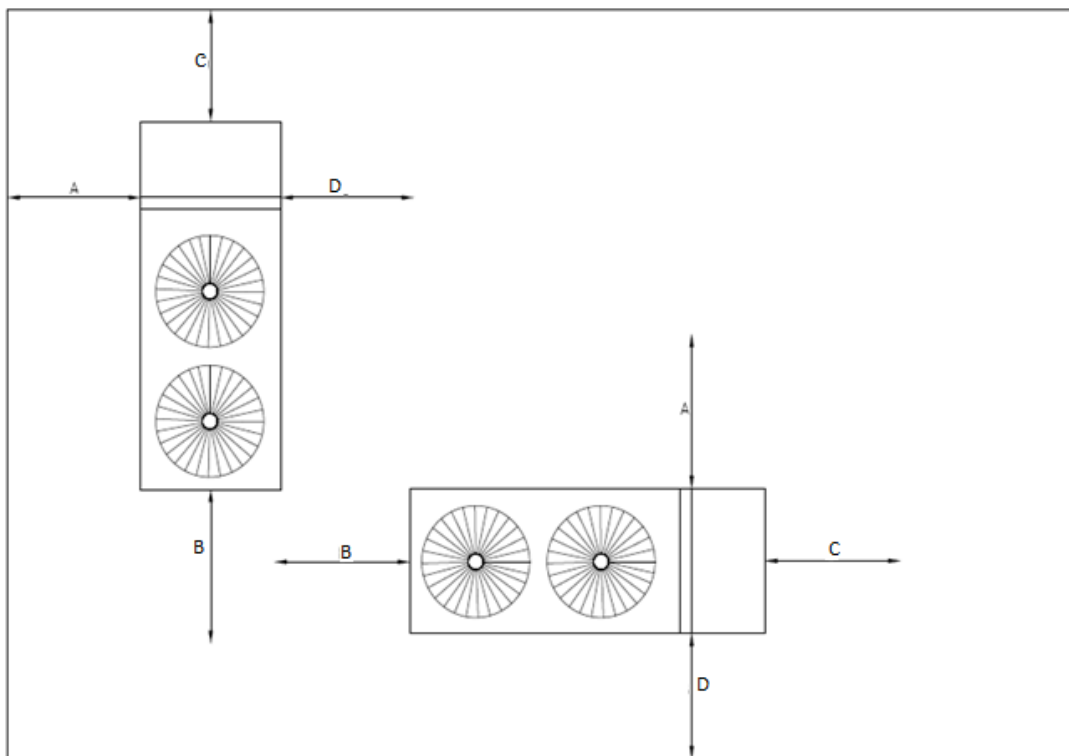
Drawing 8, Units sited side by side facing opposite ends, useful when using models 452-752 as they have the source heat exchanger on one side only.



Drawing 9, Units
sited side by
side facing
opposite ends
and front
overlap



Drawing
10, Units sited
facing each
other



Drawing 11,
Units sited in a
corner

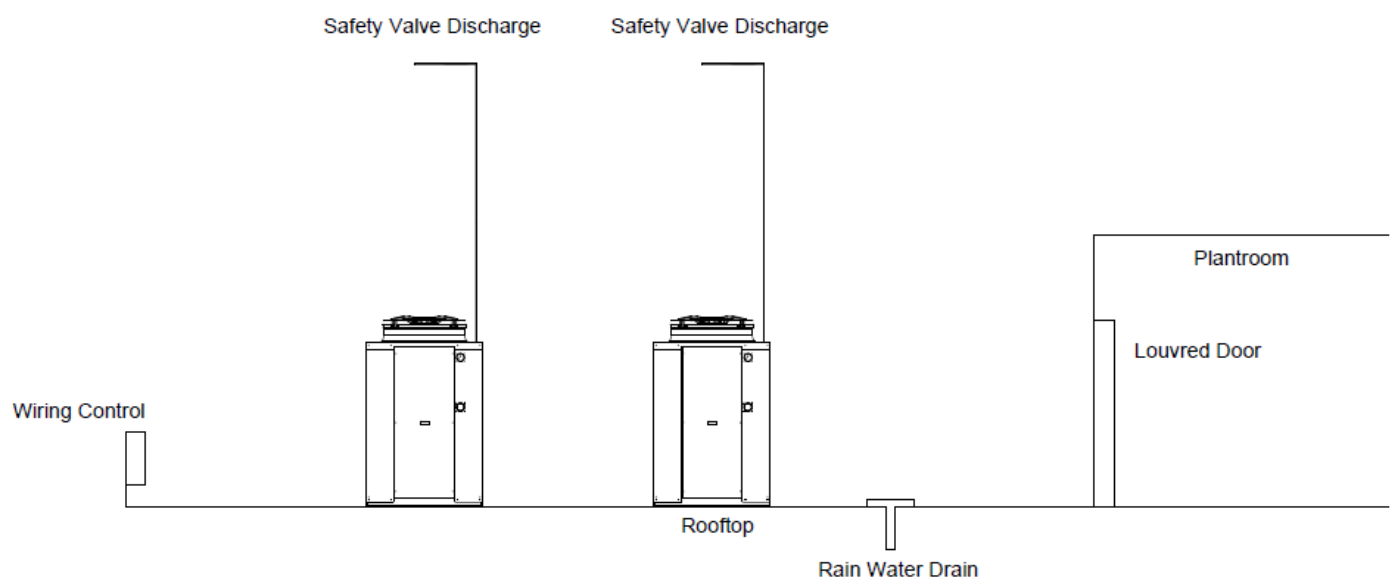
Safety Clearances

The refrigerant used on these models is R454B which is classed as A2L and is slightly flammable, all installations must be in accordance with EN378-1 and EN378-3 and as such the installation site must take into effect the accidental leakage of any refrigeration.

The unit(s) must be installed within a 3000mm exclusion zone from any electrical installations such as switches and any entrances into the building that are not sealed such as drains or doorways.

THE UNIT MUST BE INSTALLED IN SUCH A POSITION THAT ANY ACCIDENTAL LEAKAGES CANNOT ENTER THE BUILDING.

In the example below the wiring centre, rainwater drain and louvred door would all need to be outside the exclusion zone.



Sound Power data

Table 5 Sound power levels for standard LTS units

Model	Octave band (Hz)								Lw	Lp
	63	125	250	500	1K	2K	4K	8K		
	dB	dB	dB	dB	dB	dB	dB	dB		
LAHP-452LTS-454	53	60	66	71	74	71	64	56	78	46
LAHP-512LTS-454	54	61	66	72	75	73	66	57	79	47
LAHP-682LTS-454	56	63	68	74	77	75	71	62	81	49
LAHP-752LTS-454	56	63	68	74	80	75	68	59	82	50
LAHP-912LTS-454	60	68	73	77	82	79	75	69	86	54
LAHP-1102LTS-454	61	69	74	78	83	80	76	70	87	55
LAHP-1152LTS-454	62	70	75	79	84	81	77	71	88	56
LAHP-1352LTS-454	63	71	76	80	85	82	78	72	89	57
LAHP-1502LTS-454	62	70	75	83	84	81	77	71	89	56
LAHP-1612LTS-454	63	71	76	84	85	82	78	72	90	57
LAHP-1792LTS-454	63	71	76	85	85	82	78	75	90	58
LAHP-2012LTS-454	64	72	77	85	89	83	79	76	92	59
LAHP-2304LTS-454	65	73	78	82	87	84	80	74	91	58
LAHP-2312LTS-454	64	72	77	87	89	83	79	76	92	60
LAHP-2654LTS-454	65	73	78	82	87	84	80	74	91	58
LAHP-2954LTS-454	65	73	78	86	87	84	80	74	92	59
LAHP-3214LTS-454	65	73	78	86	87	84	80	74	92	59
LAHP-3514LTS-454	66	74	79	88	84	85	81	78	93	60
LAHP-3954LTS-454	68	71	78	86	89	83	79	74	91	59
LAHP-4454LTS-454	65	68	75	83	86	80	76	72	89	56

Lw: Sound power level according to ISO 9614

Lp: Sound pressure level measured at 10 metres from the unit in free field conditions direction factor Q=2 to ISO 9614

Pipework sizing and flow rates

Pipework should always be sized to match the flow rates below and maintaining a 5k delta T, this will result in larger pipework compared to a traditional 20k system design. Amicus can be supplied with a hydraulic kit which includes a suitably sized primary pump within the unit or alternatively one can be specified by the design engineer and fitted within the plantroom, this will enable a twin-head pump to be used if required. A suitable flow setter must be fitted to every Amicus unit installed to set the correct flow rate at commissioning.

Table 6 Design flow rates

	Unit	452LTS	512LTS	682LTS	752LTS	912LTS	1102LTS	1152LTS	1352LTS	1502LTS	1612LTS
Design flow rate	m ³ /hr	7.837	8.865	11.92	12.87	15.83	17.97	19.78	23.33	26.05	28.08

	Unit	1792LTS	2012LTS	2304LTS	2312LTS	2654LTS	2954LTS	3214LTS	3514LTS	3954LTS	4454LTS
Design flow rate	m ³ /hr	31.3	34.92	39.15	39.85	46.98	51.95	55.59	62.33	69.75	76.92

Buffer vessel sizing

Amicus air source heat pumps require a certain amount of system volume to ensure problem free running and to reduce the number of starts and hence wear and tear on the compressor. In practise in most installations a buffer vessel will be required. The minimum system volume will:

1. Prevent the unit cycling during low demand.
2. Allow the unit to defrost without affecting the heat available to the system.

Table 7 Minimum water content required.

Min water content in the user circuit	Unit	452	512	682	752	912	1102	1152	1352	1502	1612
	litre	460	520	700	750	920	1040	1150	1360	1520	1630

Min water content in the user circuit	Unit	1792	2012	2304	2312	2654	2954	3214	3514	3954	4454
	litre	1850	2050	1170	2340	1370	1530	1640	1870	2080	2320

Lochinvar will offer a suitably sized buffer vessel depending upon what the Amicus units are supplying but are generally sized according to the output of the unit at 2°C ambient. Multiple units with cascade control fitted do not require a substantially larger buffer as only one unit will be allowed to go into defrost at a time. For example, two number LAHP-602LTS units may only require 800litres.

DHW Supply

Amicus LTS can supply low temperature hot water at up to 59°C for use in providing domestic hot water (DHW), because of the way the internal control works this will result in a maximum temperature within the DHW vessel of 57°C. The Amicus LTS range will only achieve this maximum temperature when external air temperatures are above +5°C so an immersion heater or gas fired water heater will be required to assist during cold winter days. Lochinvar can provide a full bespoke bi-valent hot water system, contact us for further details. Generally, DHW is provided by a specially designed plate and buffer arrangement which has been sized according to the required flow rate, delta T and only a 2k temperature drop between the primary and secondary side of the plate. (See drawing 13) The plate must be sized according to the Amicus kW rating during summer months to take advantage of the extra power available. For system requiring DHW to be stored above these temperatures or those requiring a higher temperature pasteurisation this will need the assistance of a boost immersion heater fitted to the DHW vessel.

If the Amicus is supplying DHW only then the DHW storage vessel will also act as the buffer vessel.

Electrical Connections

All models require a 3-phase supply with standard electrical requirements as per table 8.

Table 8 electrical requirements for a standard unit.

Electrical Data	Unit	452LTS	512LTS	682LTS	752LTS	912LTS	1102LTS	1152LTS	1352LTS	1502LTS	1612LTS
Maximum input power	kW	21	23.6	29.4	32.8	39.2	44.2	54.2	60.6	66	76
Maximum input current standard unit	A	44.6	49.6	61.7	70.7	86.7	98.7	106	123	141	148
Peak input current standard unit	A	124	168	189	232	253	265	310	327	363	370
Peak input current unit with soft start option fitted	A	81	110	123	151	162	174	201	219	255	262
Fuse rating (delayed)	A	100	125	125	200	200	200	200	200	200	200
Optional Hydraulic kit input power	kW	1.28	1.28	1.3	1.3	2.45	2.45	2.45	2.45	3.4	3.4
Optional Hydraulic kit maximum input current	A	2.37	2.37	2.53	2.53	4.53	4.53	4.53	4.53	6.46	6.46

Electrical Data	Unit	1792LTS	2012LTS	2304LTS	2312LTS	2654LTS	2954LTS	3214LTS	3514LTS	3954LTS	4454LTS
Maximum input power	kW	86.5	91	107	101	121	130	151	172	187	208
Maximum input current standard unit	A	167	183	209	202	246	278	294	332	374	412
Peak input current standard unit	A	420	436	413	455	450	500	516	585	627	665
Peak input current unit with soft start option fitted	A	276	292	311	302	338	390	404	437	470	499
Fuse rating (delayed)	A	200	250	315	315	400	400	400	400	400	400
Optional Hydraulic kit input power	kW	3.4	3.4	3.4	3.4	4.5	4.5	6.1	6.1	6.1	6.1
Optional Hydraulic kit maximum input current	A	6.46	6.46	6.46	6.46	8.9	8.9	10.8	10.8	10.8	10.8

These are generic values, actual values will depend on accessories chosen.

Provision should be made for local isolation with a lockable isolator fitted on or very close to the heat pump. If the heat pump is to be sited some way from the plantroom, a single weatherproof 230v plug socket should also be fitted to aid commissioning and future maintenance of the unit.

Standard electrical connections available

Standard electrical connections	
Connection	Note
BTI sensor	Monitor's temperature in the buffer vessel
BTs sensor	Monitor's temperature in the DHW vessel
Primary pump	Either integrated as part of Hydraulic kit or fitted within the plantroom
DHW Primary pump	Fitted between the heat pump plate and DHW storage vessel
Remote on/off	
Summer/winter mode	Switches to DHW only in summer
Hot water priority	
General alarm	
3-way valve	Switches between heating and DHW

Electrical ancillaries available

1. Cascade control, this will be supplied as standard on projects with more than one heat pump.
2. Soft start, this reduces the peak Amps at start-up as shown in table 8.

Harmonics

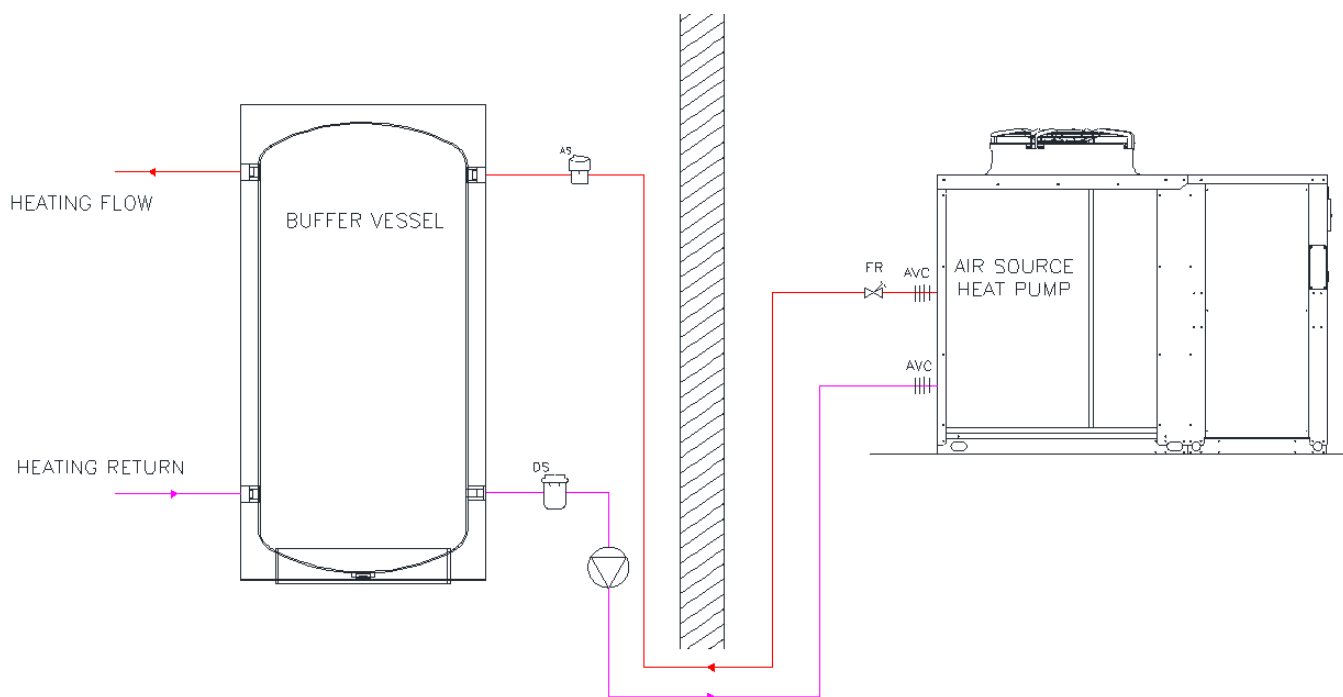
Power supply companies often ask for information regarding the harmonics of the units, all Amicus air source heat pumps are constructed in compliance with the following standards:

1. EN61000-3-2
2. EN61000-3-3
3. EN61000-3-11
4. EN61000-3-12

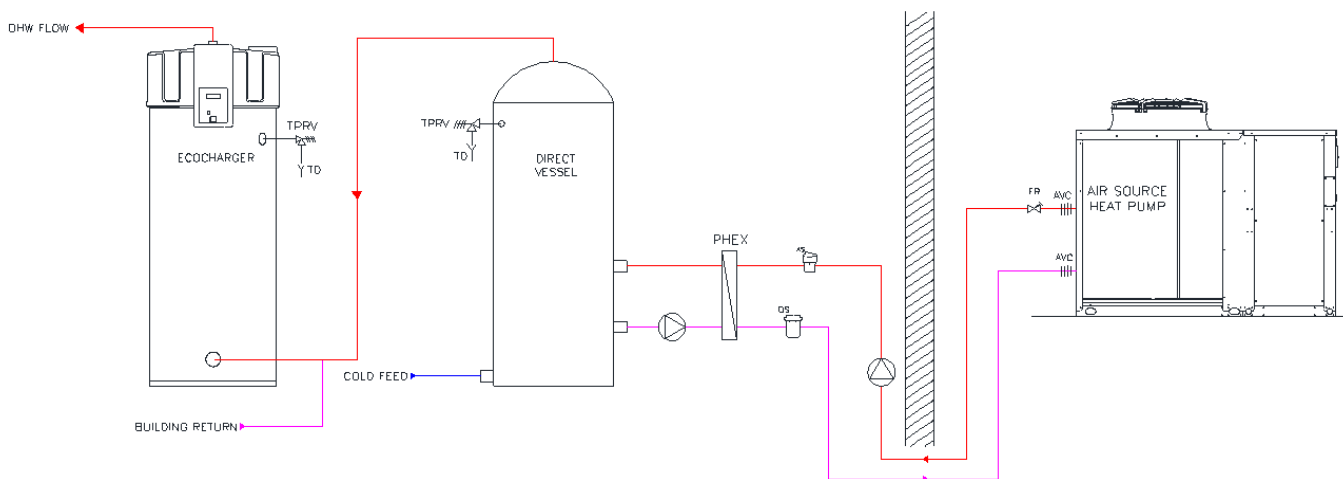
This will satisfy the Power supply company that the heat pump will not give problems on site.

Standard installation schematics

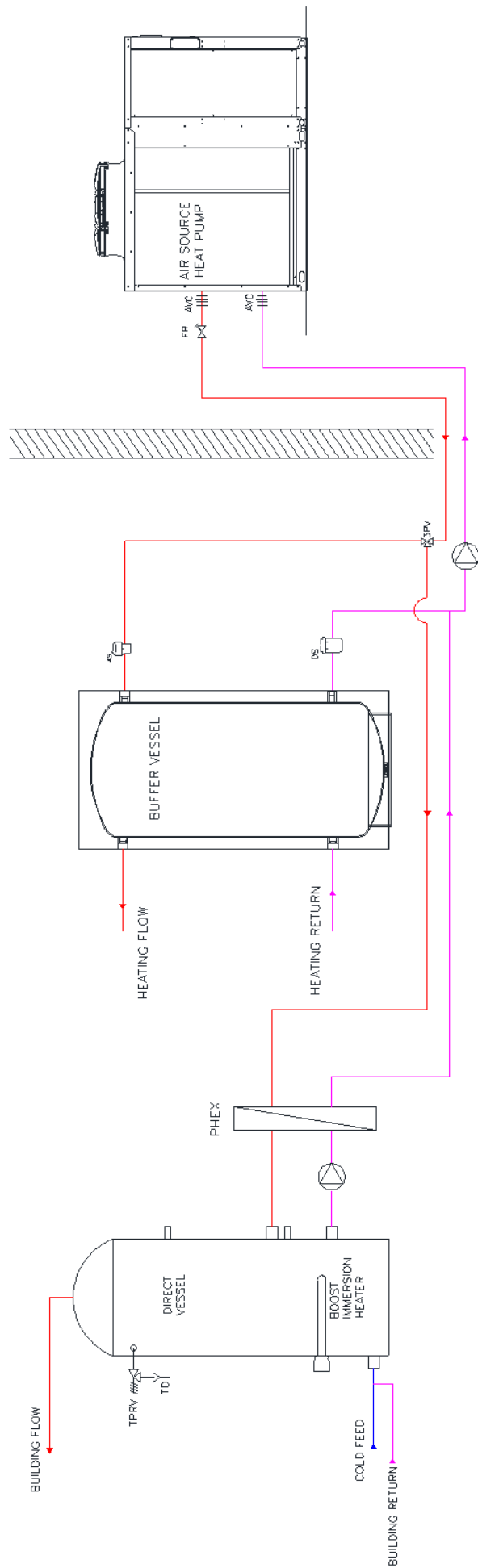
This section contains various standard schematics showing the concept installation options for the Amicus range. These drawings must not be used for detailed design but can be built upon by the design team to produce their own installations drawings. Lochinvar does not provide detailed installation drawings but can review any produced by the design team.



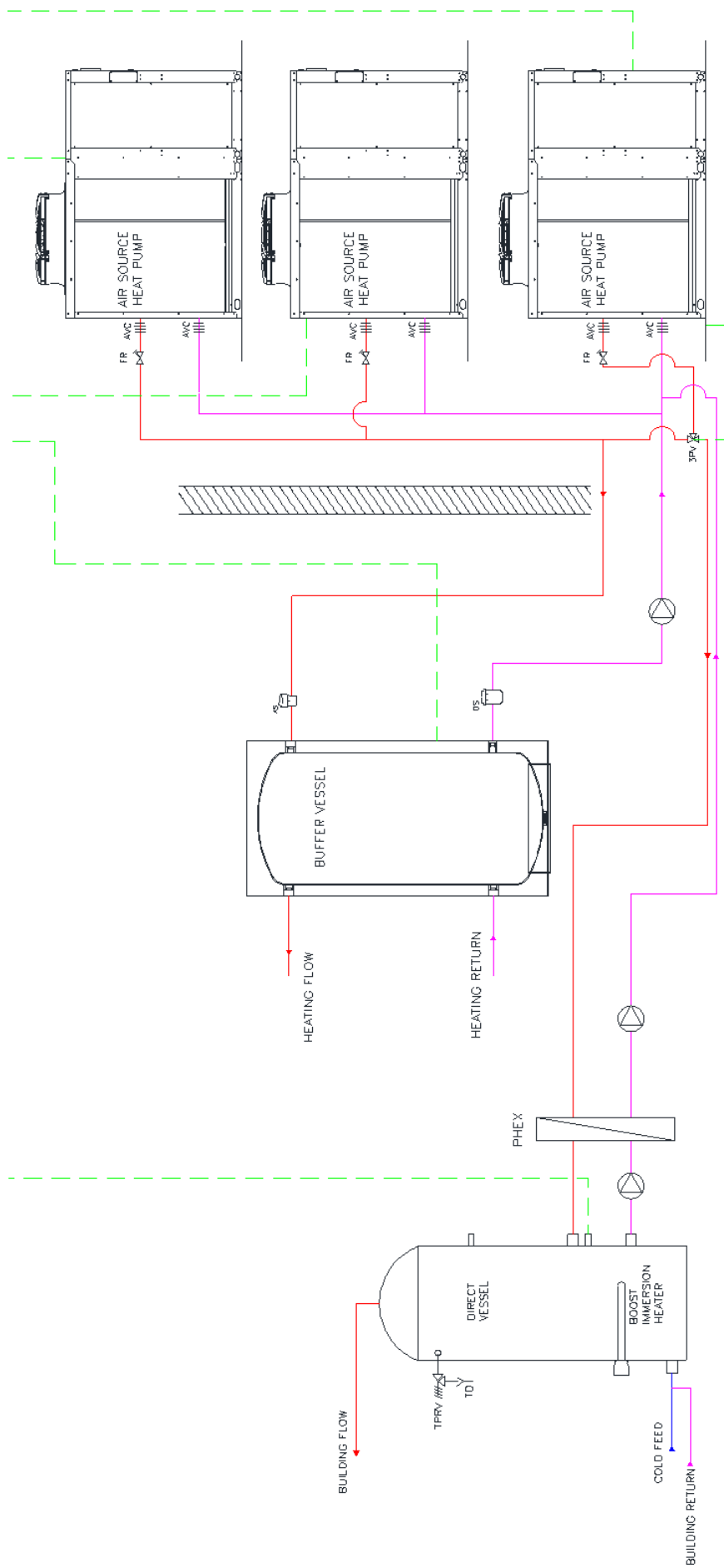
Drawing 12, Amicus unit supplying heating buffer



Drawing 13, Amicus unit supplying domestic hot water only in a pre-heat BI-valent system



Drawing 14, Amicus unit supplying heating and domestic hot water with domestic hot water priority



Drawing 15, MultiSiple Amicus unit supplying heating and domestic hot water with domestic hot water priority

Installation assistance

Included in the cost of every Amicus unit is the use of the Lochinvar Project Engineer and commissioning. This helps ensure the units are installed correctly and the end user has the assurance the unit has been commissioned by the manufacturer. After orders are placed a Project Engineer will contact the installer and offer:

1. Initial pre-start visit to ensure the installer has all the required information to install the units and has the Project Engineer contact details for telephone and email support during the construction phase.
 - a. This visit covers flow rates, Location of equipment, wiring/controls, integration with other equipment and any other questions the installers may have.
2. A second visit during installation to make sure everything is OK.
 - a. This visit will review the progress and check everything is going ok, answer any further questions relating to the install – at this stage it is also good to meet the controls/BMS team.
3. A pre-commissioning visit to ensure all installation work is complete prior to the Lochinvar commissioning engineer visit.
 - a. On this visit we will complete the pre-com sheet ensure all works are complete and plan in a commissioning date.
4. Commissioning visit

On completion of the commissioning the installer will receive a detailed report.

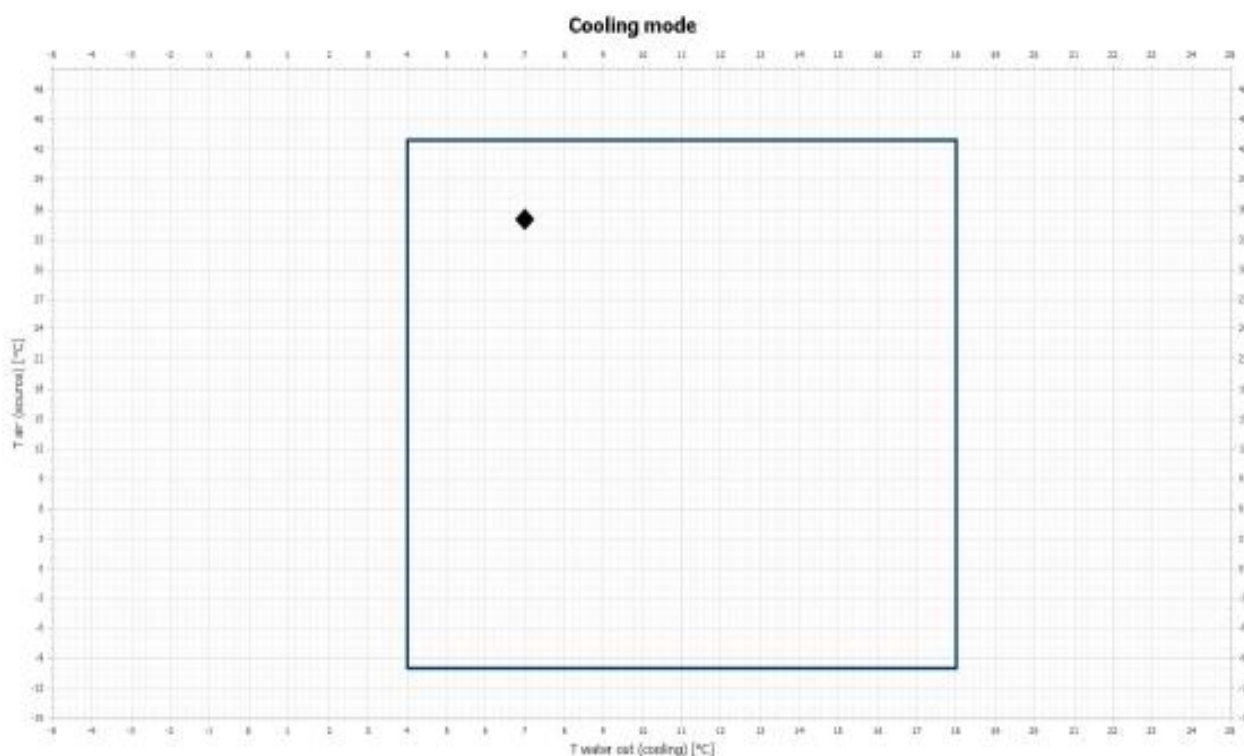
Cooling

Amicus LTS models can be supplied as RV models, these are two pipe heating and/or cooling units with domestic hot priority in either heating or cooling mode.

The units are identical in size to the heating only versions with all technical data available on the individual model Technical product submittal available from <https://lochinvar.ltd.uk/amicus-air-source-heat-pumps-lt/>

Operational limits

Amicus high temperature heat pumps can provide cooling even with external air temperatures of 40°. The diagram below shows the general working limits and should be crossed reference with the data shown in the individual model Technical Product Submittal as each is slightly different.





8 Lombard Way, The MXL Centre, Banbury, Oxon, OX16 4TJ

Tel: +44(0) 1295 269 981, Fax: +44(0) 1295 271 640, Email: info@lochinvar.ltd.uk

www.lochinvar.ltd.uk