Livezi
HVAC Systems

Technical Manual Part A
Design and Application

H-INV-7	H-DIG-18
H-INV-11	H-DIG-22
H-INV-15	H-DIG-26
H-VAV-7	H-RAD-18
H-VAV-11	H-RAD-22
H-VAV-15	H-RAD-26

livezi
the new space

Publisher
Livezi
Phone 1300 306 125
Fax 07 3870 8270
Internet www.livezi.com.au
Email info@livezi.com.au

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This Technical Manual describes the installation and commissioning of the Livezi Dual Inverter and Digital Inverter ducted split air conditioner.

Sourcing
Livezi has adopted an approach to manufacturing that protects intellectual property and business know how without compromising competitiveness by utilising large scale manufacturing houses to provide a range of turn key services. Our Digital series product utilises Emerson compressors, our inverter range utilises Mitsubishi compressors, our radical indoor fans are supplied by EBM Papst and our forward curve fans are Genteq or Nidec. Over 90% of our pipe circuit is assembled by an external supply chain and our sheet metal is punched, pressed and formed by strategic partners.

Our focus is on product development and build quality and our forward investment is targeted toward incremental improvement in product satisfaction and longevity. We do not lock business capital up in plant and equipment that distorts product lifestyle as an input to amortisation.

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Installation and commissioning instructions included in Technical Manual Part B

Service and Troubleshooting instructions included in Technical Manual Part C

System Specifications VAV Inverter Combination

	SINGLE OUTDOOR FAN		DUAL OUTDOOR FAN	
SYSTEM MODEL	**H-IV-7**	**H-IV-11**	**H-IV-15**	**H-IV-17**
Outdoor Unit Model	H-INV-7	H-INV-11	H-INV-15	H-INV-17
Indoor Unit Model	H-VAV-7	H-VAV-11	H-VAV-15	H-VAV-17
Compatible Control systems	Central, Z-Plus, Connect, Chatterbox			
CAPACITY DATA				
Nett Cooling Capacity (kW) [1) 3)]	7 (1.8-8.3)	10.5 (1.8-12.0)	15.2 (1.8-16.5)	TBA (?.??-??.?)
Nett Heating Capacity (kW) [1) 3)]	7.8 (1.8 - 9.1)	11 (1.8-13.0)	16.5 (1.8-17.5)	??.? (?.?-??.?)
Air Flow High (l/s)	500	880	1178	TBA
Air Flow Low (l/s)	200	200	200	200
ELECTRICAL DATA	**SINGLE PHASE**			
Power Supply	240 Volts ~ 1 Phase ~ 50Hz		240 Volts ~ 1 Phase ~ 50Hz	
Nom. Full Load Amps [2)]	18.5	22	30	TBA
Min. Circuit Size (Amps)	20	25	32	TBA
Electrical Input Cooling (kW) [1)]	2.09	3.26	4.52	TBA
Electrical Input Heating (kW) [1)]	2.17	3.2	4.98	TBA
EER	3.35	3.2	3.36	TBA
COP	3.59	3.44	3.31	TBA
Sound Pressure dB(A) @ 1m	58	62	64	TBA
Soft Starter	Variable Frequency		Variable Frequency	
DIMENSIONS (MM)				
Outdoor Unit Length	895	990	940	TBA
Width	313	354	360	TBA
Height	862	966	1245	TBA
Weight (kg)	70	79	122	TBA
Indoor Unit Length	856	1200	1400	TBA
Width	808	808	808	TBA
Height	400	400	400	TBA
Weight (kg)	51 (26 + 25)	71 (21+50)	71 (21 + 50)	TBA
Supply Air Size (mm) L x H	305 x 225	905 x 255	1105 x 255	TBA
Return Air Size (mm) L x H	515 x 345	1000 x 345	1200 x 345	TBA

NOTES:
1) Net Capacities are based on A.S.3823.1.2
2) Full Load Amps taken from Highest Phase
3) Inverter compressors have the capacity to operate at 40% loading. Capacity modulation is extended by variable indoor airflow. Actual percentage loading will vary depending on application.

DESIGN CONDITIONS
Cooling 35 °C DB Outdoor / 27 °C DB, 19 °C WB Air Entering Indoor Unit
Heating 7 °C DB, 6 °C WB Outdoor / 21 °C DB Air Entering Indoor Unit
Operating Range -10 °C WB to 50 °C DB
Sound Pressure Level is influenced by the surrounding, therefore it may vary upon location.

Any information in this table may be subject to change without notice. Please consult Livezi.

System Specifications RAD Inverter Combination

	SINGLE OUTDOOR FAN		DUAL OUTDOOR FAN	
SYSTEM MODEL	**H-IR-7**	**H-IR-11**	**H-IR-15**	**H-IR-17**
Outdoor Unit Model	H-INV-7	H-INV-11	H-INV-15	H-INV-17
Indoor Unit Model	H-RAD-7	H-RAD-11	H-RAD-15	H-RAD-17
Compatible Control systems	Central, Z-Plus, Connect, Chatterbox			
CAPACITY DATA				
Nett Cooling Capacity (kW) [1) 3)]	7 (1.8-8.3)	10.5 (1.8-12.0)	15 (1.8-16.5)	TBA (?.?-??.??)
Nett Heating Capacity (kW) [1) 3)]	7.8 (1.8 -9.1)	11 (1.8-13.0)	16.5 (1.8-17.5)	TBA (?.??-??.??)
Air Flow High (l/s)	500	880	1178	TBA
Air Flow Low (l/s)	200	200	200	200
ELECTRICAL DATA	**SINGLE PHASE**			
Power Supply	240 Volts ~ 1 Phase ~ 50Hz		240 Volts ~ 1 Phase ~ 50Hz	
Nom. Full Load Amps [2)]	18.5	22	30	TBA
Min. Circuit Size (Amps)	20	25	32	TBA
Electrical Input Cooling (kW) [1)]	2.09	3.26	4.52	TBA
Electrical Input Heating (kW) [1)]	2.17	3.2	4.98	TBA
EER	3.35	3.2	3.36	TBA
COP	3.59	3.44	3.31	TBA
Sound Pressure dB(A) @ 1m	58	62	64	TBA
Soft Starter	Variable Frequency		Variable Frequency	
DIMENSIONS (MM)				
Outdoor Unit Length	895	990	940	TBA
Width	313	354	360	TBA
Height	862	966	1245	TBA
Weight (kg)	70	79	122	TBA
Indoor Unit Length	856	1200	1400	TBA
Width	500	500	500	TBA
Height	400	400	400	TBA
Weight (kg)	31	43	49	TBA
Supply Air Size (mm) L x H	515 x 345	1165 x 365	1365 x 365	TBA
Return Air Size (mm) L x H	515 x 345	1000 x 345	1200 x 345	TBA

NOTES:
1) Net Capacities are based on A.S.3823.1.2
2) Full Load Amps taken from Highest Phase
3) Inverter compressors have the capacity to operate at 40% loading. Capacity modulation is extended by variable indoor airflow. Actual percentage loading will vary depending on application.

DESIGN CONDITIONS
Cooling 35 °C DB Outdoor / 27 °C DB, 19 °C WB Air Entering Indoor Unit
Heating 7 °C DB, 6 °C WB Outdoor / 21 °C DB Air Entering Indoor Unit
Operating Range -10 °C WB to 50 °C DB
Sound Pressure Level is influenced by the surrounding, therefore it may vary upon location.

Any information in this table may be subject to change without notice. Please consult Livezi.

System Specifications VAV Digital Combination

SYSTEM MODEL	H-DV-18	H-DV-22	H-DV-26	H-DV-30
Outdoor Unit Model	H-DIG-18	H-DIG-22	H-DIG-26	H-DIG-30
Indoor Unit Model	H-VAV-18	H-VAV-22	H-VAV-26	H-VAV-30
Compatible Control systems	Central, Z-Plus, Connect, Chatterbox			
CAPACITY DATA				
Nett Cooling Capacity (kW) [1) 3)]	18.0 (2.0-18.0)	21.8 (2.0-22.0)	25.6 (2.5-26)	TBA
Nett Heating Capacity (kW) [1) 3)]	18.5 (2.0 - 19)	20.8 (2.0-21)	24.1 (2.4-24)	TBA
Air Flow High (l/s)	1180	1200	1500	TBA
Air Flow Low (l/s)	200	200	200	200
ELECTRICAL DATA				
Power Supply			415 Volts ~ 3 Phase ~ 50Hz	
Nom. Full Load Amps [2)]	24.5	11	13	TBA
Min. Circuit Size (Amps)	40	20	25	TBA
Electrical Input Cooling (kW) [1)]	5.55	5.65	7.18	TBA
Electrical Input Heating (kW) [1)]	5.00	5.06	6.31	TBA
EER	3.24	3.86	3.56	TBA
COP	3.66	4.11	3.82	TBA
Sound Pressure dB(A) @ 1m	65	65	65	TBA
Soft Starter	Option		Option	
DIMENSIONS (MM)				
Outdoor Unit Length	1320	1320	1320	TBA
Width	620	620	620	TBA
Height	975	975	975	TBA
Weight (kg)	149	150	151	TBA
Indoor Unit Length	1400	1615	1615	TBA
Width	808	610	610	TBA
Height	400	490	490	TBA
Weight (kg)	84	94	94	TBA
Supply Air Size (mm) L x H	1105 x 255	1325 x 305	1325 x 305	TBA
Return Air Size (mm) L x H	1200 x 345	1400 x 417	1400 x 417	TBA

NOTES:
1) Net Capacities are based on A.S.3823.1.2
2) Full Load Amps taken from Highest Phase
3) Digital compressors have the capacity to operate at 10% loading. Actual percentage loading will vary depending on application.

DESIGN CONDITIONS
Cooling 35 °C DB Outdoor / 27 °C DB, 19 °C WB Air Entering Indoor Unit
Heating 7 °C DB, 6 °C WB Outdoor / 21 °C DB Air Entering Indoor Unit
Operating Range -10 °C WB to 50 °C DB
Sound Pressure Level is influenced by the surrounding, therefore it may vary upon location.

Any information in this table may be subject to change without notice. Please consult Livezi.

System Specifications RAD Digital Combination

SYSTEM MODEL	H-DR-18	H-DR-22	H-DR-26	H-DR-30
Outdoor Unit Model	H-DIG-18	H-DIG-22	H-DIG-26	H-DIG-30
Indoor Unit Model	H-RAD-18	H-RAD-22	H-RAD-26	H-RAD-30
Compatible Control systems	Central, Z-Plus, Connect, Chatterbox			
CAPACITY DATA				
Nett Cooling Capacity (kW) [1) 3)]	18 (2.0-18.0)	22 (2.0-22.0)	25.6 (2.5-26)	TBA
Nett Heating Capacity (kW) [1) 3)]	18.5 (2.0 - 19)	20.8 (2.0-21)	24.1 (2.4-24)	TBA
Air Flow High (l/s)	1180	1200	1500	TBA
Air Flow Low (l/s)	200	200	200	200
ELECTRICAL DATA	**SINGLE PHASE**		**THREE PHASE**	
Power Supply			415 Volts ~ 3 Phase ~ 50Hz	
Nom. Full Load Amps [2)]	24.5	11	13	TBA
Min. Circuit Size (Amps)	40	20	25	TBA
Electrical Input Cooling (kW) [1)]	5.55	5.65	7.18	TBA
Electrical Input Heating (kW) [1)]	5.00	5.06	6.31	TBA
EER	3.24	3.86	3.56	TBA
COP	3.66	4.11	3.82	TBA
Sound Pressure dB(A) @ 1m	65	65	65	TBA
Soft Starter	Option		Option	
DIMENSIONS (MM)				
Outdoor Unit Length	1320	1320	1320	TBA
Width	620	620	620	TBA
Height	975	975	975	TBA
Weight (kg)	149	150	151	TBA
Indoor Unit Length	1400	1615	1615	TBA
Width	500	365	365	TBA
Height	400	490	490	TBA
Weight (kg)	51	62	62	TBA
Supply Air Size (mm) L x H	1365 x 365	1395 x 415	1395 x 415	TBA
Return Air Size (mm) L x H	1200 x 345	1400 x 417	1400 x 417	1200 x 400

NOTES:
1) Net Capacities are based on A.S.3823.1.2
2) Full Load Amps taken from Highest Phase
3) Digital compressors have the capacity to operate at 10% loading. Actual percentage loading will vary depending on application.

DESIGN CONDITIONS
Cooling 35 °C DB Outdoor / 27 °C DB, 19 °C WB Air Entering Indoor Unit
Heating 7 °C DB, 6 °C WB Outdoor / 21 °C DB Air Entering Indoor Unit
Operating Range -10 °C WB to 50 °C DB
Sound Pressure Level is influenced by the surrounding, therefore it may vary upon location.

Any information in this table may be subject to change without notice. Please consult Livezi.

Capacity Selection Tables H-IV-7, H-IR-7

500l/s

Cooling

Cooling		Outdoor conditions (DB)			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	7.21	6.86	6.51	6.23
	SC	5.34	5.28	5.21	5.23
	Input	1.73	1.88	1.96	2.03
24/17ºC DB/WB	TC	7.42	7.07	6.72	6.30
	SC	5.57	5.51	5.44	5.29
	Input	1.84	1.96	2.05	2.15
27/19ºC DB/WB	TC	7.56	7.21	**7.00**	6.51
	SC	5.59	5.55	5.46	5.34
	Input	1.88	1.99	**2.09**	2.19
32/23ºC DB/WB	TC	7.70	7.42	7.28	6.72
	SC	6.55	6.46	6.41	6.25
	Input	1.96	2.05	2.19	2.28

Heating

Heating		Outdoor conditions				
Indoor Conditions (DB)	(kW)	24/18ºC DB/WB	7/6ºC DB/WB	2/1ºC DB/WB	-5/-6ºC DB/WB	-7/-8ºC DB/WB
15ºC	TC	9.88	7.98	6.54	5.93	5.55
	Input	2.29	1.97	1.70	1.59	1.51
20ºC	TC	9.58	7.60	6.16	5.78	5.32
	Input	2.50	2.12	1.87	1.72	1.61
27ºC	TC	8.97	7.14	5.78	5.62	5.02
	Input	2.65	2.29	2.01	1.87	1.74

Capacity Selection Tables H-IV-11, H-IR-11

880 l/s

Cooling

Cooling		Outdoor conditions (DB)			
Indoor Conditions	(kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	10.82	10.29	9.77	9.35
	SC	8.00	7.92	7.81	7.85
	Input	2.64	2.86	2.99	3.08
24/17ºC DB/WB	TC	11.13	10.61	10.08	9.45
	SC	8.35	8.27	8.16	7.94
	Input	2.80	2.99	3.12	3.28
27/19ºC DB/WB	TC	11.34	10.82	**10.50**	9.77
	SC	8.39	8.33	8.19	8.01
	Input	2.86	3.02	**3.18**	3.34
32/23ºC DB/WB	TC	11.55	11.13	10.92	10.08
	SC	9.82	9.68	9.61	9.37
	Input	2.99	3.12	3.34	3.47

Heating

Heating		Outdoor conditions				
Indoor Conditions (DB)	(kW)	24/18ºC DB/WB	7/6ºC DB/WB	2/1ºC DB/WB	-5/-6ºC DB/WB	-7/-8ºC DB/WB
15ºC	TC	14.30	11.55	9.46	8.58	8.03
	Input	3.34	2.87	2.47	2.32	2.19
20ºC	TC	13.86	11.00	8.91	8.36	7.70
	Input	3.65	3.09	2.72	2.50	2.35
27ºC	TC	12.98	10.34	8.36	8.14	7.26
	Input	3.86	3.34	2.94	2.72	2.53

Capacity Selection Tables H-IV-15, H-IR-15

1178 l/s

Cooling

Cooling		Outdoor conditions (DB)			
Indoor Conditions (	kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC	15.66	14.90	14.14	13.53
	SC	11.59 1	1.47	11.31 1	1.36
	Input	3.72	4.03	4.21	4.35
24/17ºC DB/WB	TC	16.11	15.35	14.59	13.68
	SC	12.08	11.97 1	1.82	11.49
	Input	3.94	4.21	4.39	4.61
27/19ºC DB/WB	TC	16.42	15.66	**15.20**	14.14
	SC	12.15	12.06	11.86	11.59
	Input	4.03	4.26	**4.48**	4.70
32/23ºC DB/WB	TC	16.72 1	6.11	15.81	14.59
	SC	14.21	14.02	13.91	13.57
	Input	4.21	4.39	4.70	4.88

Heating

Heating		Outdoor conditions				
Indoor Conditions (DB) (	kW)	24/18ºC DB/WB	7/6ºC DB/WB	2/1ºC DB/WB	-5/-6ºC DB/WB	-7/-8ºC DB/WB
15ºC	TC	21.45	17.33	14.19	12.87	12.05
	Input	5.40	4.65	4.00	3.75	3.55
20ºC	TC	20.79	16.50	13.37	12.54 1	1.55
	Input	5.90	5.00	4.40 4	.05 3	.80
27ºC	TC	19.47	15.51	12.54	12.21	10.89
	Input	6.25	5.40	4.75	4.40	4.10

Capacity Selection Tables H-DV-18, H-DR-18

1180 l/s

Cooling

Cooling		Outdoor conditions (DB)			
Indoor Conditions (	kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC				
	SC				
	Input				
24/17ºC DB/WB	TC		18.5	17.41	15.94
	SC		16.65	16.19	15.46
	Input		5.44	5.49	5.69
27/19ºC DB/WB	TC		19.42	18	16.65
	SC		17.08	16.5	15.85
	Input		5.53	5.55	5.82
32/23ºC DB/WB	TC				
	SC				
	Input				

Heating

Heating		Outdoor conditions				
Indoor Conditions (DB) (	kW)	24/18ºC DB/WB	7/6ºC DB/WB	2/1ºC DB/WB	-5/-6ºC DB/WB	-7/-8ºC DB/WB
15ºC	TC		19.43	15.94	14.43	13.51
	Input		4.65	4.0	3.75	3.55
20ºC	TC		18.5	14.99	14.06	12.95
	Input		5	4.4	4.05	3.8
27ºC	TC					
	Input					

Capacity Selection Tables H-DV-22, H-DR-22

1200 l/s

Cooling

Cooling		Outdoor conditions (DB)			
Indoor Conditions (	kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC				
	SC				
	Input				
24/17ºC DB/WB	TC		22.04	20.63	17.79
	SC		17.63	17.06	16.01
	Input		5.39	5.44	5.64
27/19ºC DB/WB	TC		23.25	21.8	19.78
	SC		19.12	18.435	18.39
	Input		5.48	5.5	5.77
32/23ºC DB/WB	TC				
	SC				
	Input				

Heating

Heating		Outdoor conditions				
Indoor Conditions (DB) (	kW)	24/18ºC DB/WB	7/6ºC DB/WB	2/1ºC DB/WB	-5/-6ºC DB/WB	-7/-8ºC DB/WB
15ºC	TC		21.83	17.92	16.21	15.18
	Input		4.7	4.05	3.8	3.56
20ºC	TC		20.79	16.84	15.8	14.55
	Input		5.06	4.45	4.12	3.85
27ºC	TC					
	Input					

Capacity Selection Tables H-DV-26, H-DR-26

1500 l/s

Cooling

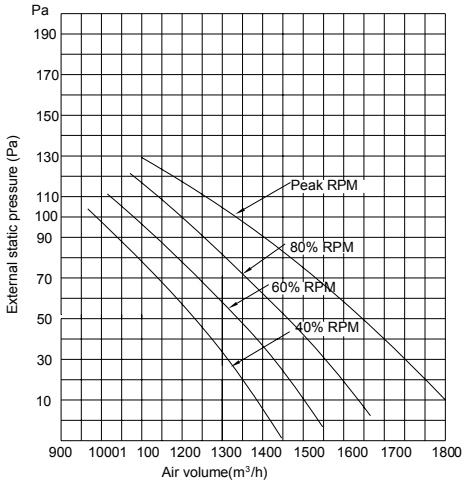
Cooling		Outdoor conditions (DB)			
Indoor Conditions (	kW)	21ºC	28ºC	35ºC	43ºC
21/15ºC DB/WB	TC				
	SC				
	Input				
24/17ºC DB/WB	TC		25.87	24.21	20.88
	SC		22.35	21.3	20.39
	Input		7.03	7.1	7.36
27/19ºC DB/WB	TC		28.67	25.56	23.2
	SC		24.95	22.924	21.60
	Input		7.04	7.18	7.53
32/23ºC DB/WB	TC				
	SC				
	Input				

Heating

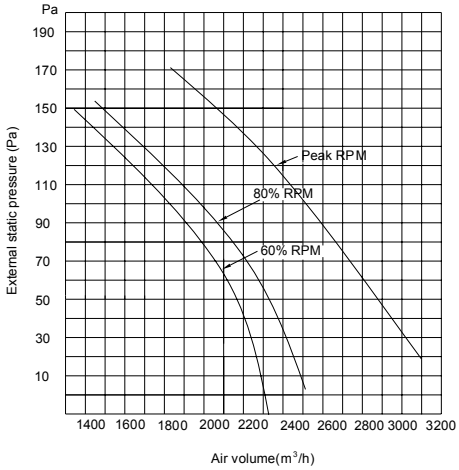
Heating		Outdoor conditions				
Indoor Conditions (DB) (	kW)	24/18ºC DB/WB	7/6ºC DB/WB	2/1ºC DB/WB	-5/-6ºC DB/WB	-7/-8ºC DB/WB
15ºC	TC		25.34	20.8	18.82	17.62
	Input		5.87	5.05	4.74	4.44
20ºC	TC		24.13	19.55	18.34	16.89
	Input		6.31	5.55	5.13	4.8
27ºC	TC					
	Input					

VAV forward curve airflow data at fixed RPM

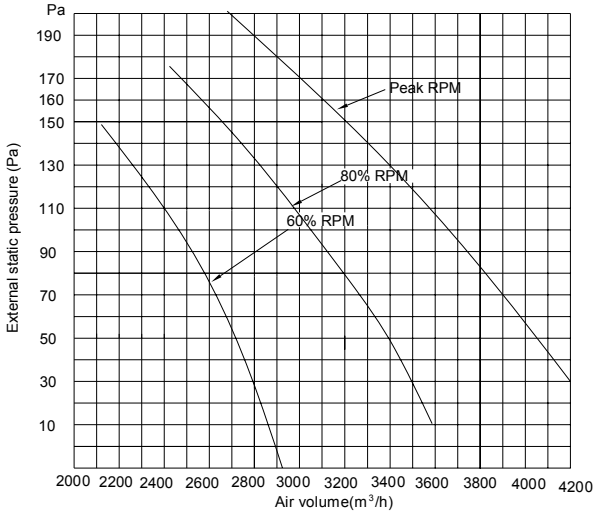
H-VAV-7



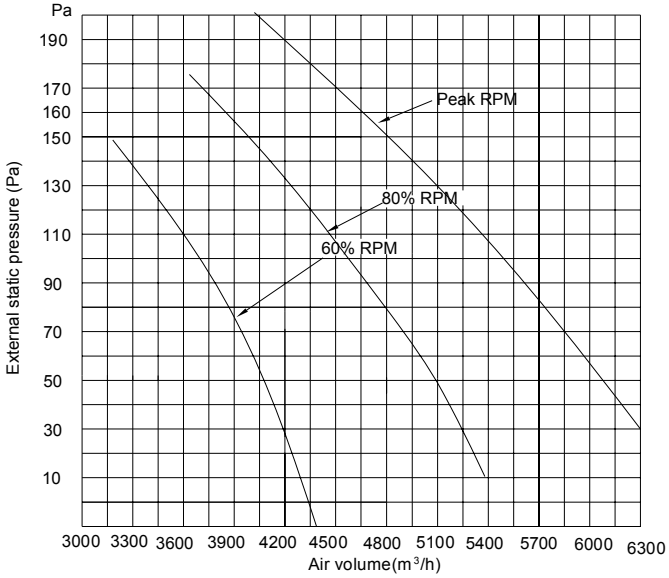
H-VAV-11



H-VAV-15 & H-VAV-18



H-VAV-22 & H-VAV-26



*Total and Sensible Capacity at specific Air Volume available on request

2.1 Outdoor Unit

The Livezi range consists of 2 series of outdoor units - horizontal discharge "Inverter compressor" and vertical discharge "Digital scroll compressor". Both the Inverter and the Digital range of products incorporate Electronically Commutated indoor fans to provide superior energy performance, not only at the snapshot condition required for Minimum Energy Performance Standard (MEPS) compliance, but right through the operating envelope.

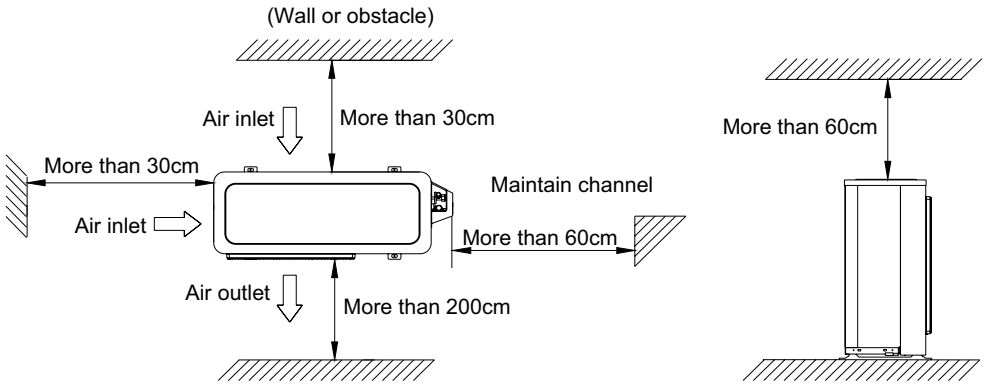
Inverter technology has not been well suited to concealed multizone ducted applications due to its inability to reduce capacity below 40% (over 80% of operating profile). Historically systems have overcome this problem by running the indoor fan at high flow rates and dumping excess air into part of the home. This strategy waists energy, sacrifices comfort and often results in the coil temperature being higher than the dew point of the air creating a muggy feeling within the home.

- All Inverter models are single Phase
- Dual Inverter models utilise 180 degree full wave DC inverter for refrigerant flow rate modulation and electronically commutated DC for indoor air flow rate modulation.
- All Digital models utilise Copeland Digital Scroll compressors.
- Digital Inverter models utilise a 100 second duty cycle for refrigerant flow rate modulation and electronically commutated DC for indoor air flow rate modulation.
- Inverter models are horizontal discharge configuration.
- Digital models are vertical discharge configuration.

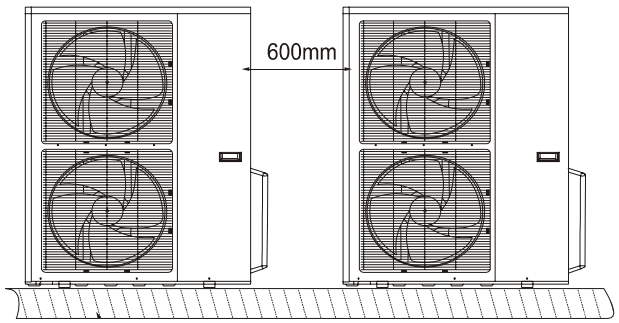
2.1.1 INVERTER OUTDOOR UNITS (H-INV-7, H-INV-11, H-INV-15, H-INV-17)

Livezi Dual Inverter systems use the latest motor speed control technology the modulate the flow of refrigerant at the outdoor unit and the flow of air at the indoor unit. Unlike single inverter systems the Dual Inverter approach maintains a constant temperature of conditioned air to all rooms.

Required clearance for Outdoor Units



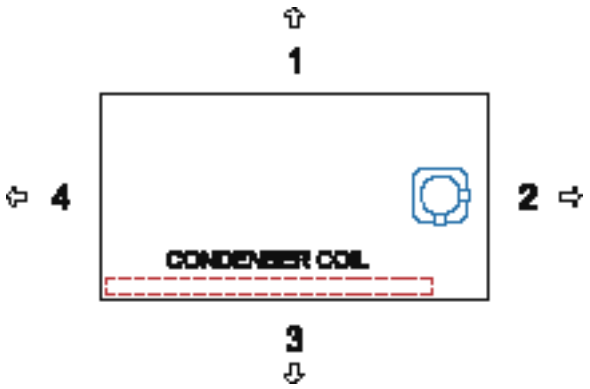
600mm is necessary between 2 outdoor units



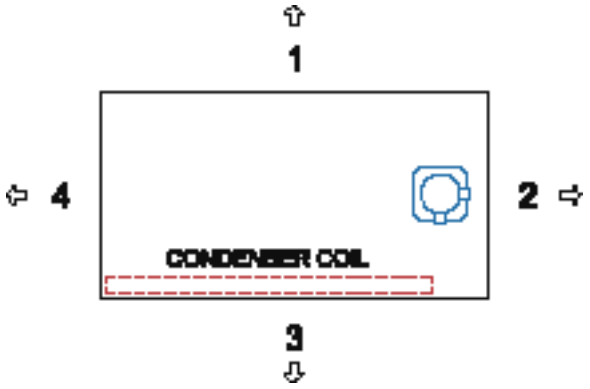
2.1.2 **Digital Outdoor Units** (H-DIG-18, H-DIG-22, H-DIG-26)

Livezi Digital Inverter systems are ideal for heat loads in excess of 18kW. The digital system of refrigerant flow management allows refrigerant mass flow rate to reduce to 10% of the peak without the danger of limiting oil circulation. The Digital Inverter maintains a constant temperature of conditioned air to all rooms.

Required clearance for Outdoor Units

SYSTEM MODEL	**H-DIG-18, H-DIG-22, H-DIG-26**	
Direction	**Required Clearance**	**Outdoor Unit Plan View**
1 Plain Back	0 mm	
2 Compressor Access	850 mm	
3 Condenser Coil	500 mm	
4 Fan Access	850 mm	
5 Height Clearance	2500 mm	

Required clearance for Outdoor Units

SYSTEM MODEL	**H-DIG-30**	
Direction	**Required Clearance**	**Outdoor Unit Plan View**
1 Condenser Coil	500 mm	
2 Compressor Access	850 mm	
3 Condenser Coil	500 mm	
4 Fan Access	850 mm	
5 Height Clearance	2500 mm	

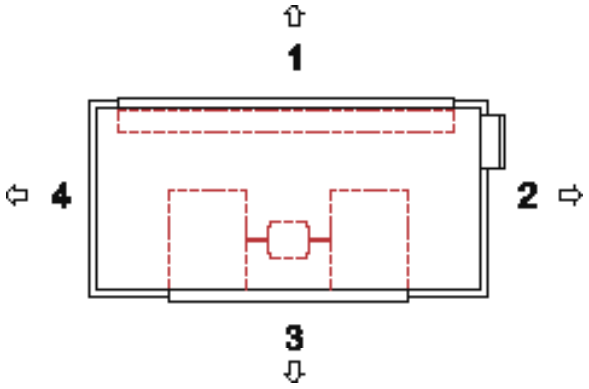
2.2 Indoor Unit

The Livezi variable airflow range consists of 2 series of indoor units -VAV models that incorporate one or more electronically commutated forward curve blower modules and RAD models that incorporate one or more electronically commutated backward curve blower modules.

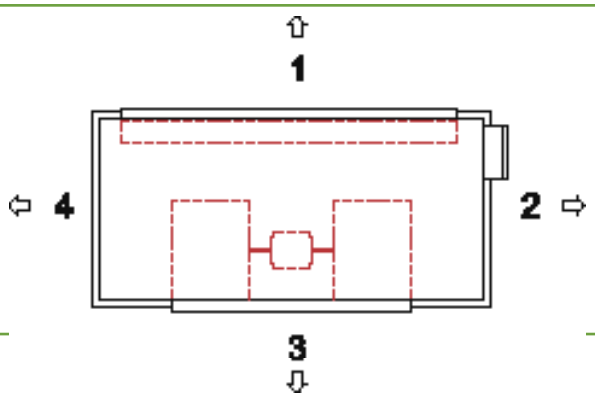
- The indoor unit should be slung or mounted on anti-vibration devices, in a location capable of supporting the weight of the unit.
- Provide sufficient clearance from the top and sides of the unit to enable servicing of the fan motor, coil, etc.
- All drain pipes are to be lower than the unit base and to have at least a 50 mm "P" trap or similar trap fitted.

2.2.1 Forward Curve (H-VAV-7, H-VAV-11, H-VAV-15, H-VAV-17, H-VAV-18, H-VAV-22, H-VAV-26)

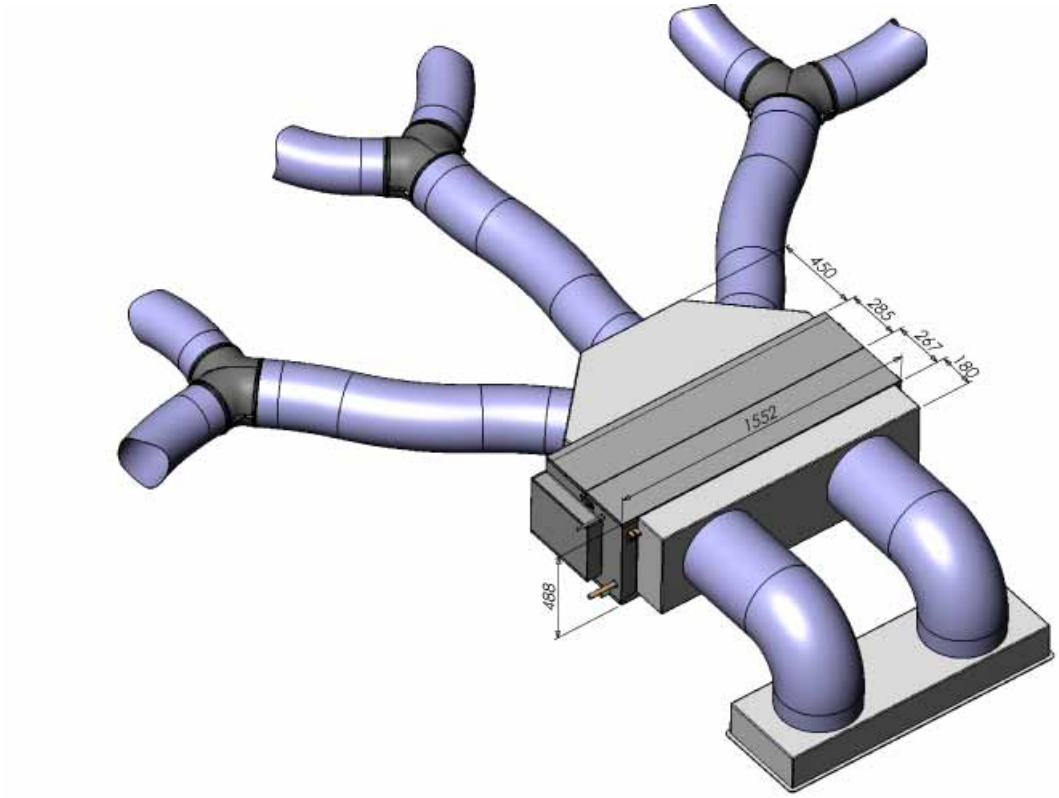
VAV series indoor units are appropriate for any air handling design with less than 200pa total duct system resistance. Duct design should be formulated to reduce dynamic losses where ever possible. VAV series units can be easily split into two parts during installation or to gain greater access during servicing. Care should be taken to make sure that all electrical connections are made correctly and locking pinse have ben fitted to the quick connect over center clips.

SYSTEM MODELS	H-VAV-7, H-VAV-11, H-VAV-15, H-VAV-18	
Direction	**Required Clearance**	**Indoor Unit Plan View**
1 Return Air	N/A	
2 Electrical Panel	500 mm	
3 Supply Air	N/A	
4 Side Fan Access	850 mm	
5 Top Fan Access	500 mm	

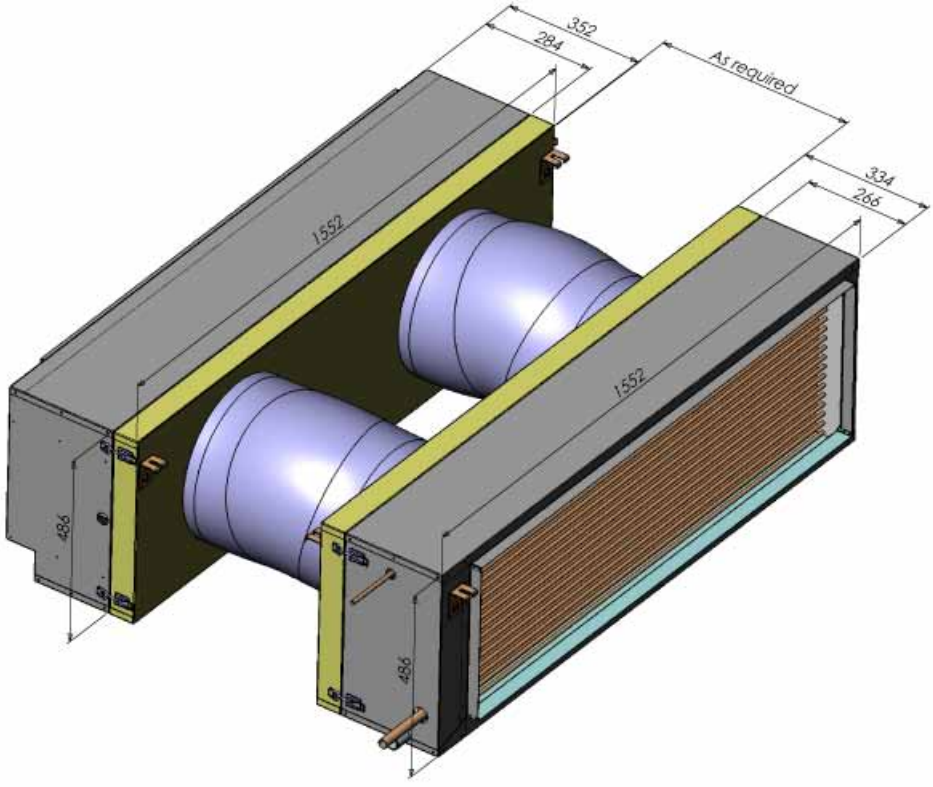
2.2.1 Required Clearance for Indoor Units

SYSTEM MODELS	H-VAV-22, H-VAV-26	
Direction	**Required Clearance**	**Indoor Unit Plan View**
1 Return Air	N/A	
2 Electrical Panel	500 mm	
3 Supply Air	N/A	
4 Side Fan Access	850 mm	
5 Top Fan Access	500 mm	

Typical Forward Curve Residential Duct Layout

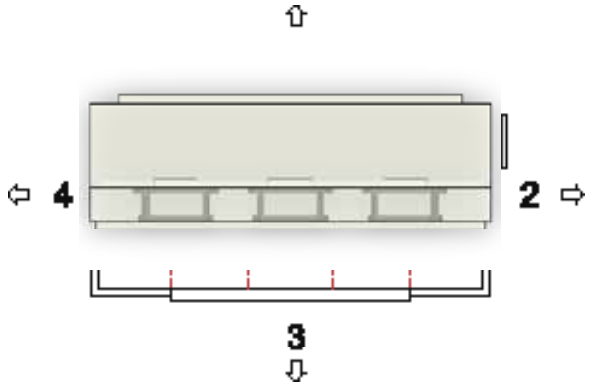


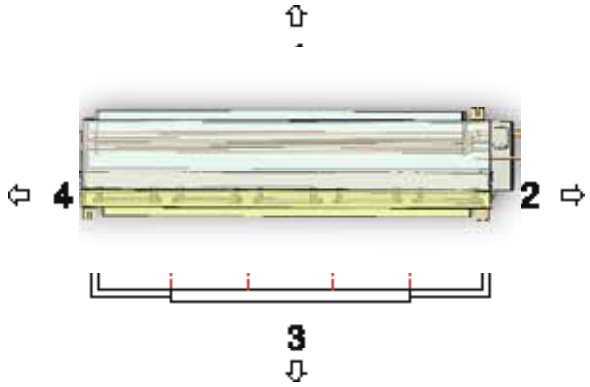
Typical Split Indoor Configuration for Residential



2.2.1 Backward Curve (H-RAD-7, H-RAD-11, H-RAD-15, H-RAD-17, H-RAD-18, H-RAD-22, H-RAD-26)

RAD series indoor units have been designed for system duct pressures up to 450pa. The compact design also make the RAD series product perfect for applications with reduced servicing or installation space. The combination of increased fins per meter on the heat exchanger, fin design, impeller design and greentech EC motor technology results in the most efficient air handling unit on the market in the 7 ~ 30 kW direct expansion classification.

SYSTEM MODELS	H-RAD-7, H-RAD-11, H-RAD-15, H-RAD-18	
Direction	**Required Clearance**	**Indoor Unit Plan View**
1 Return Air	N/A	
2 Electrical Panel	500 mm	
3 Supply Air	N/A	
4 Side Fan Access	850 mm	
5 Top Fan Access	500 mm	

SYSTEM MODELS	H-RAD-22, H-RAD-26	
Direction	**Required Clearance**	**Indoor Unit Plan View**
1 Return Air	N/A	
2 Electrical Panel	500 mm	
3 Supply Air	N/A	
4 Side Fan Access	850 mm	
5 Top Fan Access	500 mm	

Duct System Design Notes

When designing a system the first step before selecting an indoor unit is to calculate the duct system resistance (this is the resistance the system will impose at the air volume required or static pressure) expressed in Pascals (Pa). The system resistance depends on three factors: Friction Losses (resistance to airflow caused by duct size, duct lining and air velocity), Dynamic Losses (resistance to airflow caused by changes in air velocity and direction), Pressure Losses (resistance to airflow caused by components such as diffusers, coils and filters).

The Radical Flow series AHU product range allows system designers to relax many accepted conventions to adapt duct system design when building architecture inhibits conventional design. The total system pressure (TP) is the sum of the velocity pressure (VP) and the static pressure (SP). When the VP is high (usually because the duct area is small) then the static pressure (SP) must be low. SP is the pressure that causes the air in the duct to flow and VP is the pressure that results from the air movement. Duct system design conventions focus on having a high value of static pressure (SP) compared to total pressure (TP).

The most common methodology for designing duct systems is Equal Friction where the system is designed for a constant pressure loss per unit length. Equal Friction is the low pressure, low velocity industry standard. There is no equalisation of pressure drop in duct branches unless the system has a symmetrical layout. To achieve the correct airflow at each diffusion point dampers are required.

Static regain is a design methodology that achieves a uniform static pressure at all branches and outlets. Much more complex than equal friction, static regain can be used to design systems of any pressure or velocity. Duct velocities are systematically reduced over the length of the distribution layout, which allows the velocity pressure to convert to static pressure, offsetting friction losses in the succeeding section of the duct. Typically systems designed using the static regain methodology require little or no balancing.

Livezi have developed a series innovations that offer a great deal of flexibility to duct system designers in their effort to provide a reliable working solution for complex architectural challenges. Radical Flow series systems deliver approximately two times the airflow at system pressures at or around 300 Pa when compared with a forward curve system. At pressure between 300 ~ 450 Pa forward curve system require supplementary assistance such as additional fans distributed throughout the network to function. The ability of the Radical flow series air handling units to cope with high system total pressures provides scope for system designs to accommodate higher frictional, dynamic and pressure losses regardless of design methodology.

Many livezi control systems incorporate adjustable series of scaling values for the air handler and for each individual zone. Livezi's proprietary Air Stream Mapping technology allows a target airflow (l/s) to be set for each zone that contributes to the total system airflow demand value on a proportional basis. A PID algorithm controls air volume at the air handling unit. In complex networks the interplay of these innovations deliver unprecedented flexibility during the commissioning phase to match as installed operation to the intention of the system designer.

While the primary purpose of the Radical Flow series is to provide this flexibility for commercial office applications the advantages for residential application are equally compelling. A 50% reduction in AHU size and weight over conventional forward curve AHU designs and the ability to increase velocity pressure at changes in roof pitch or cross level droppers provides an ideal solution for designs restricted to flexible ducts.

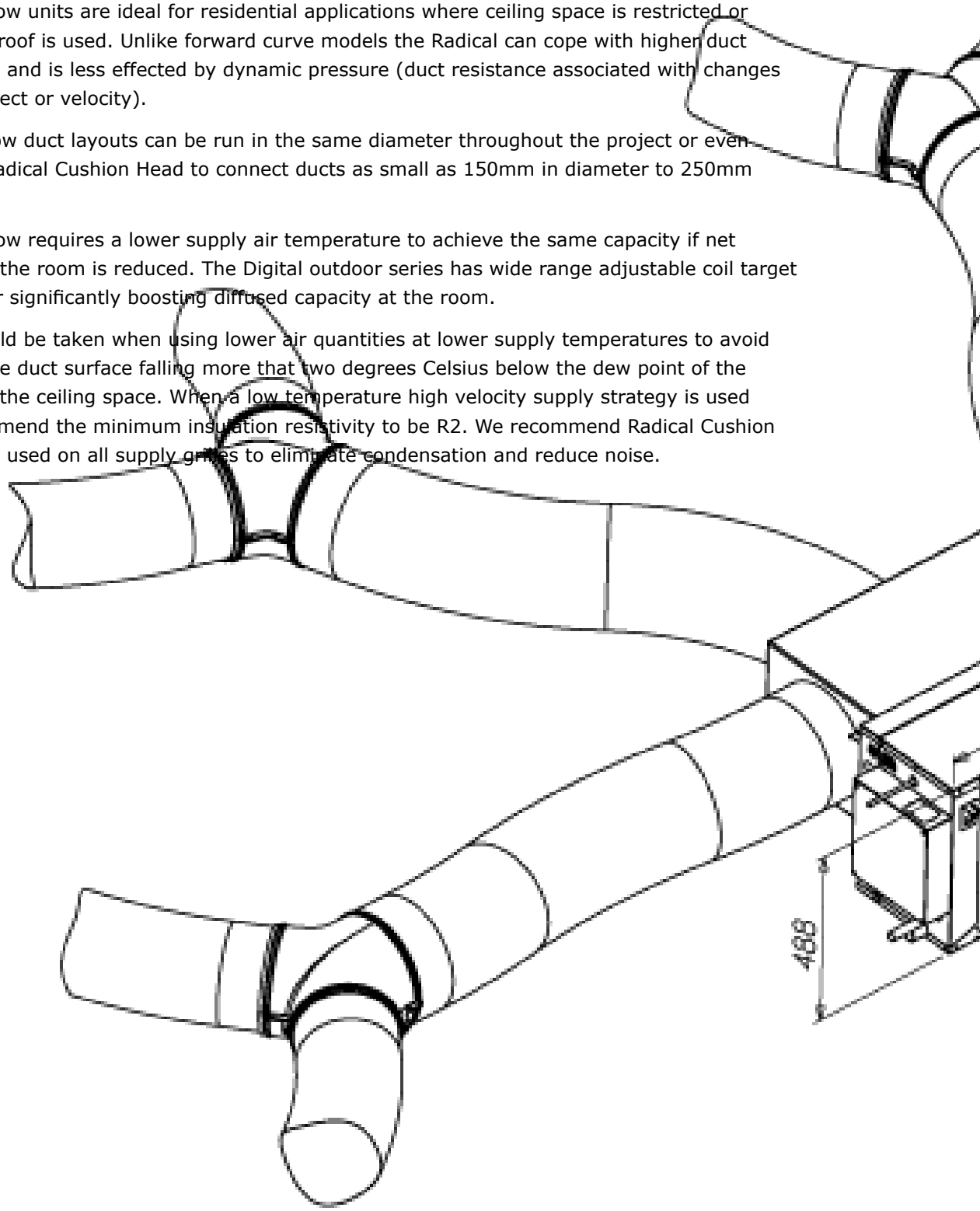
Radical Flow

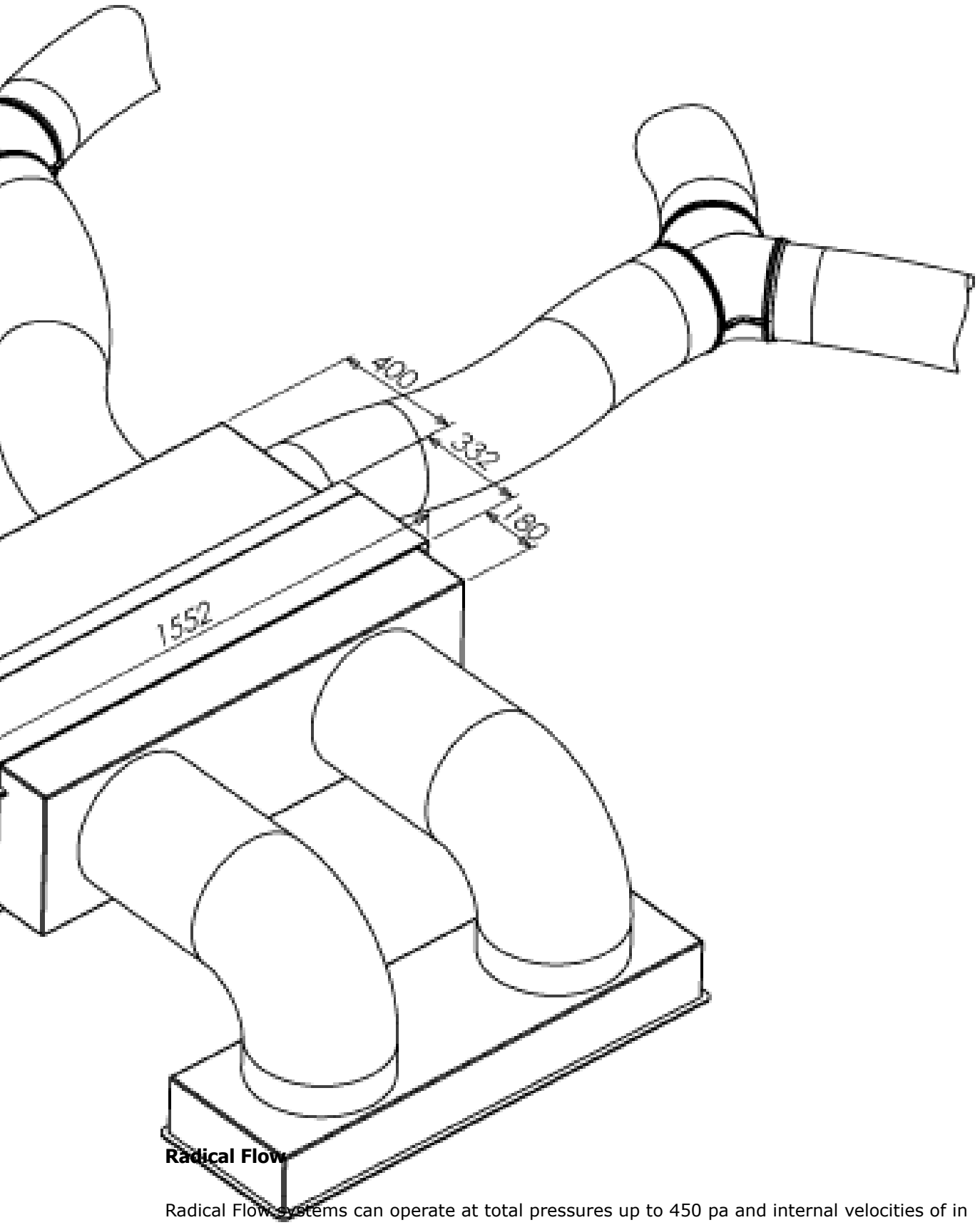
Radical Flow units are ideal for residential applications where ceiling space is restricted or a Skillion roof is used. Unlike forward curve models the Radical can cope with higher duct resistance and is less effected by dynamic pressure (duct resistance associated with changes of flow direct or velocity).

Radical flow duct layouts can be run in the same diameter throughout the project or even use the Radical Cushion Head to connect ducts as small as 150mm in diameter to 250mm diffusers.

Radical Flow requires a lower supply air temperature to achieve the same capacity if net airflow at the room is reduced. The Digital outdoor series has wide range adjustable coil target parameter significantly boosting diffused capacity at the room.

Care should be taken when using lower air quantities at lower supply temperatures to avoid the outside duct surface falling more that two degrees Celsius below the dew point of the air within the ceiling space. When a low temperature high velocity supply strategy is used we recommend the minimum insulation resistivity to be R2. We recommend Radical Cushion Heads are used on all supply grilles to eliminate condensation and reduce noise.





Radical Flow

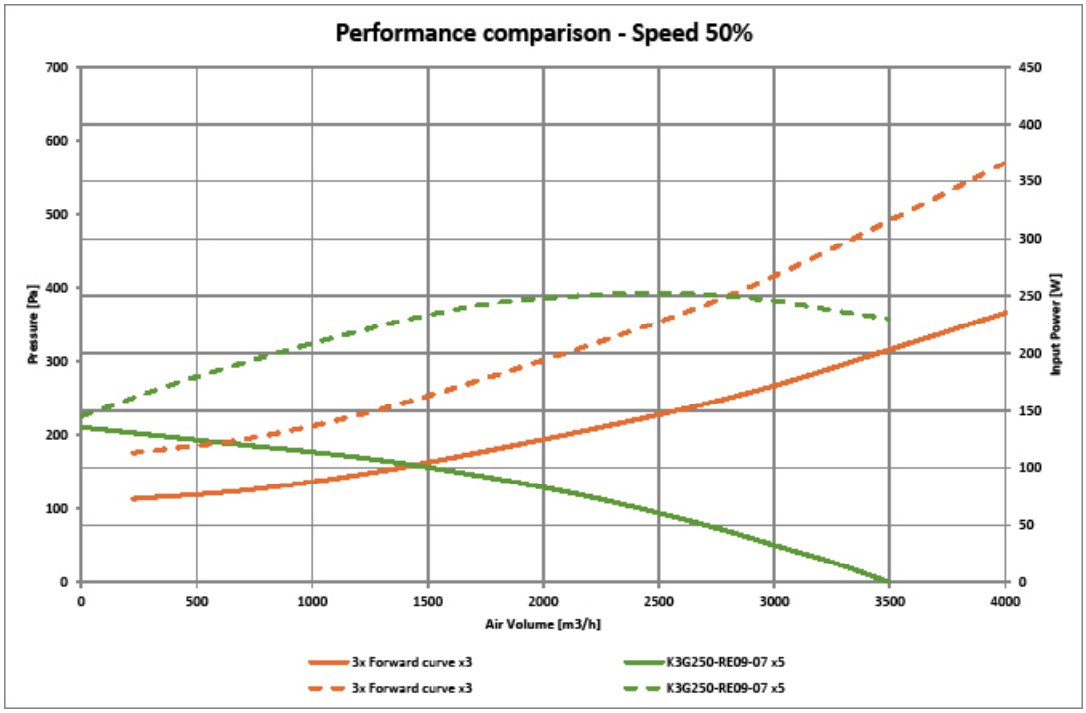
Radical Flow systems can operate at total pressures up to 450 pa and internal velocities of in excess of 15m/s. When a high pressure high velocity supply air strategy is used care should be taken to use only Livezi five NM zone valves. These are available in 250mm and 200mm. At the time of purchase request the Tropical Insulation version to eliminate condensation forming on the outside of the damper.

Supply Air Performance comparison between VAV series (forward Curve EC) and Radical Flow series (backward curve) with 75 Pa return resistance.

(grille, duct and filter TP = 75Pa)

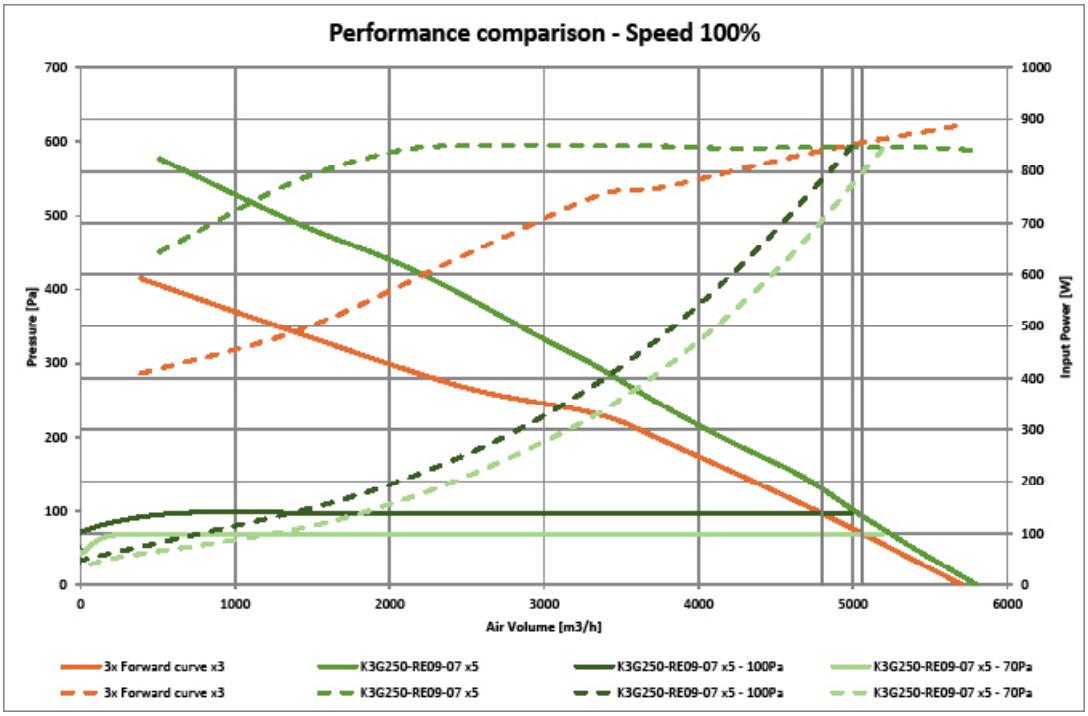
H-VAV-26 v H-RAD-26

Reduced Speed



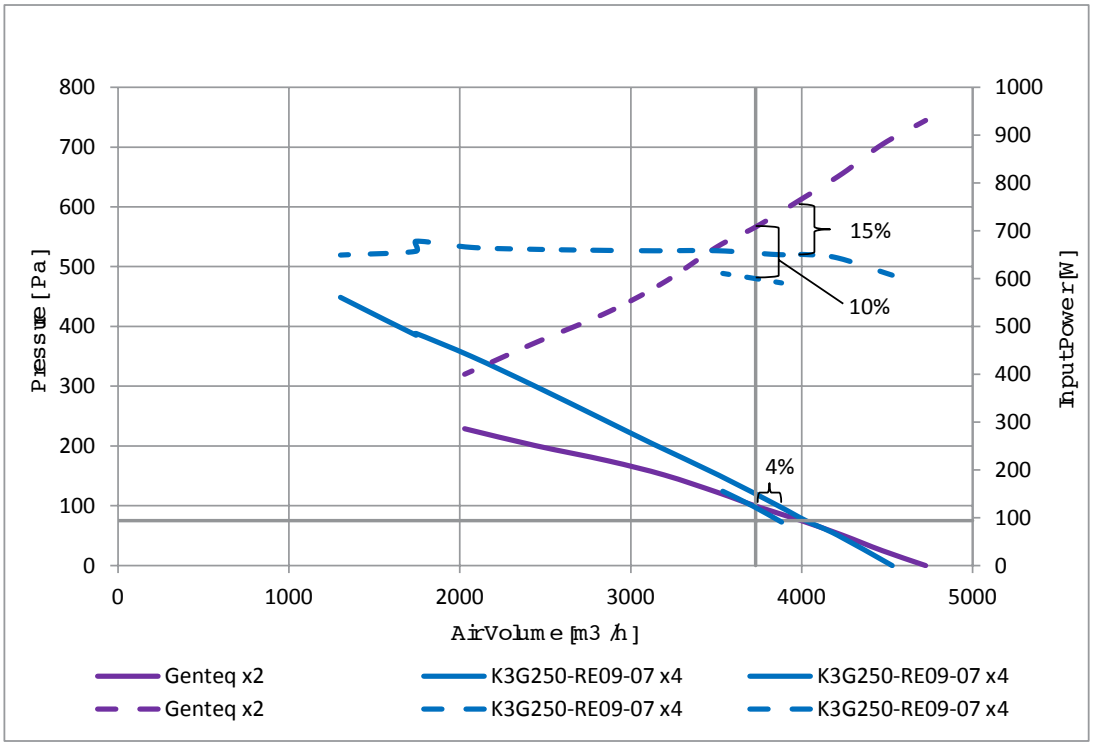
H-VAV-26 v H-RAD-26

Full Speed



H-VAV-18 v H-RAD-18

Full Speed



3 CONTROL SYSTEM

The air conditioning plant and control system contains no user serviceable parts. Installation, service and maintenance of these components should be carried out by a suitably qualified technician.

The control circuits for the indoor and outdoor units carry voltages ≥ 240 VAC which can cause serious injury or death.

The control system consists of control modules located in the indoor and outdoor units in addition to one of the following options.

1. Livezi Central controller.
2. Livezi Central Z-Plus Controller.
3. Livezi Connect variable air volume Controller
4. Livezi Chatterbox smart device interface Controller

Either of these control options may be connected by data cable to the communications ports of the indoor unit to complete the control system.

3.1 Livezi CENTRAL Controller

Figure 3.1 depicts a traditional system setup where the temperature is measured at a single fixed location. The Livezi LCD plant controller offers this level of control.

The Livezi LCD plant controller (3) is a wall mount touchpad connected to one of the communications ports on either the indoor (2) or outdoor (1) unit control modules. Up to three touchpads my be installed. Refer to the relevant connection diagram.

The LCD plant controller features the following user adjustable functions:

- Setpoint
  Default = 22.5 °C
  The setpoint may be adjusted from 15 to 30 °C.
- Mode
  Default = Auto
  The system operating mode can be selected from the following.
  Auto - Changes from cooling to heating mode automatically according to ambient conditions.
  Cool - Cooling only mode.
  Heat - Heating only mode.
  Vent - Fan only mode
- Fan Speed
  Default = 100%
  The fan speed may be adjusted from 100% to 30%
- Runtimer
  Default = Disabled
  The runtimer counts down run hours from a preset limit. At the end of the timer period the system switches off.

3.1.1 REAL TIME CLOCK

The REAL TIME CLOCK enables the use of up to 15 individual timer programs to schedule when the system switches on and off. Refer to the CENTRAL operating instructions for details.

3.1.3 Sensor selection

Temperature is measured from a single location - either from the sensor mounted on the touchpad, or a sensor directly connected to the indoor unit control module (generally located in the return air duct).

When using the touchpad mounted sensor, the touchpad is typically located 1.5 m above floor level near the return air grille.

When using the return air sensor input on the indoor unit controller, the touchpad(s) may be mounted in the most convenient location.

To enable use of the touchpad onboard sensor, DIP switch 1 on the back of the touchpad must be set to the on position. If there are multiple touchpads, only one LCD touchpad can have the onboard sensor enabled. If the touchpad sensor is enabled, make sure there is no sensor connected to the indoor unit controller

LCD Plant Control Touchpad DIP switches			
DIP switch #	**Function**	**OFF** Factory Default	**ON**
1	Onboard sensor	Disabled	Enabled
2	Not Used	-	-
3	Not Used	-	-
4	Not Used	-	-

3.2 Livezi CENTRAL Z-PLUS Controller

The Livezi Central Z-Plus Controller allows up to two separate control stations. System corrective action can be calculated at any or all sensor locations (averaged).

The Z-Plus touchscreen controller features the following user adjustable functions:

- Setpoint
  Default = 22.5 °C
  The setpoint may be adjusted from 15 to 30 °C.
- Mode
  Default = Auto
  The system operating mode can be selected from the following.
  Auto - Changes from cooling to heating mode automatically according to ambient conditions.
  Cool - Cooling only mode.
  Heat - Heating only mode.
  Vent - Fan only mode
- Fan Speed
  Default = 100%
  The fan speed may be adjusted from 100% to 30%
- Runtimer
  Default = Disabled
  The runtimer counts down run hours from a preset limit. At the end of the timer period the system switches off.

3.2.1 Plant Control

The REAL TIME CLOCK enables the use of up to 15 individual timer programs to schedule when the system switches on and off. Refer to the operating instructions for details.

3.2.2 Zone/ Damper Control

The Z-Plus includes eight zone motor outputs. All outputs are time proportional and can be set in increments between 5% ~ 100%.

3.3 Livezi Connect

The Livezi Connect control system is a variable air volume (VAV) system with a 24 volt AC supply.

The Livezi Connect control modules (3) monitor the temperature for each zone from the sensor mounted in each zone touchpad (5). The zone dampers (4) open and close depending on whether or not the air being supplied by the HVAC plant (1) & (2) will assist the zone in maintaining the set temperature.

3.3.1 Connect Main Processor Module

The main processor module is best installed on or near the indoor unit. Maintain a minimum distance of 300 mm from sources of EMI such as the indoor fan motor.

3.3.2 Connect Zone Expansion Module

The zone expansion module must be connected to the right hand side of the main processor module. A separate 24 VAC power supply is required (Refer to Connection Diagram).

3.3.3 Zone Touchpads

The zone touchpads house the zone sensors and must be mounted within the area controlled by the corresponding motorised damper. The ideal position is 1.5 m off the floor in the return air path. Care must be taken to avoid solar radiation, wall cavity drafts and other heat sources.

The LCD zone touchpads allow the user to adjust various aspects of the indoor climate. By default access to all control functions is available from all LCD touchpads.

Access to some control functions from individual touchpads may be limited via hardware DIP switch settings during installation. These DIP switches are located on the back of each LCD zone touchpad.

If access to a function has been limited the LCD touchpad will respond with a beep only.

Smartzone LCD Touchpad DIP switches			
DIP switch #	**Function**	**OFF**	**ON**
1	My Zone Lock	Factory Default	Access sepoint and clock functions for this zone only. No access to other zones.
2	My Zone Return	Factory Default	Display defaults to this zone when backlighting goes out.
3	Setpoint Limit	Factory Default	Limit setpoint range to 20 - 25 °C
4	Mode Lock	Factory Default	Mode changes are disabled from this zone touchpad.

3.3.4 Motorised Dampers

The motorised dampers must all have the same motor type.

3.4 Livezi Chatterbox

Livezi chatterbox is an easy to use application that will run on any iOS device (iPad, Ipod, Iphone). It takes advantage of the large canvas associated with the iPad to provide an intuitive user interface.

3.4.1 Chatterbox HVAC

Livezi chatterbox creates a page for each zone within the home.
It displays zone specific information in a user friendly format enhancing the Livezi experience.

3.4.2 Chatterbox LTE

Chatterbox LTE provides the same easy to use interface for lighting control.

3.4.2 Chatterbox NRG

Chatterbox NRG provides the same easy to use interface for energy management.

3.4.2 Chatterbox LOK

Chatterbox LOK provides the same easy to use interface for security.

3.5 Control Wiring

- All control wiring to touchpads and motors is by RJ12 type connectors, with the exception of the 24 VAC supply to the Livezi Smartzone main modules.
  Refer to Appendix B for control cable crimping instructions.
- Shielded cable is recommended for all data connections to minimise the possibility of external interference.
- Data cables are to be kept the maximum practical distance from any LV power supply cables ≥ 240 volts (Minimum distance 300 mm).
- Maximum cable length is not to exceed 50 m.
  Suggested cabling: Livezi supplies and recommends the following cable:
  RM-CAB-6-100 - six core flat cable for damper motors
  RM-CAB-S-100 - five core + shield flat cable for all data connections and touchpads.

Livezi
Phone 1300 306 125
Fax 07 3870 8270
Web: www.livezi.com.au
Email: info@livezi.com.au