Livezi Enduro
Ducted Split System

Technical Manual

LEND-12LSZ
LEND-16LSZ
LEND-18LSZ
LEND-20LSZ

livezi
the new space

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This Technical Manual describes the operation and specifications of the Livezi Enduro ducted split air conditioner and Livezi Smartzone control system.

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1 INTRODUCTION

The Enduro series by Livezi is a range of split ducted air conditioning systems incorporating VRAF (Variable Refrigerant and Air Flow) capacity modulation with individual VAV (Variable Air Volume) load segment control for up to eight areas. The systems combine the energy efficiencies of VRAF and VAV technology to deliver the finest climate control package available in today's market. The Enduro series has been specifically designed for the large number of Australians living close to the ocean. Full stainless steel body and tough corrosion resistant heat exchangers ensure that the Enduro will last in the harshest environment.

All Livezi Enduro systems offer the following standout features:

- VRAF and VAV capacity matching
- Control up to eight VAV zones
- LCD control panel in each zone
- Kirby Kote corrosion protection for outdoor unit coil
- Heavy duty acoustic hood for compressor
- Stainless steel outdoor unit
- Home automation interface (Optional)

Livezi Enduro systems are available to suit a range of load conditions.

SYSTEM MODEL	LEND-12LSZ	LEND-16LSZ	LEND-18LSZ	LEND-20LSZ
Nett Cooling Capacity (kW) [1) 3)]	12.54 (1.25-12.54)	15.00 (1.50-15.00)	17.43 (1.74-17.43)	20.16 (2.01-20.16)
Nett Heating Capacity (kW) [1) 3)]	12.66 (1.26 - 12.66)	15.90 (1.51-15.90)	19.18 (1.91-19.18)	21.32 (2.13-21.32)
Air Flow High (L/s)	700	900	1100	1250
Air Flow Low (L/s)	200	200	200	200
ELECTRICAL DATA	**SINGLE PHASE**		**THREE PHASE**	
Power Supply	240 Volts ~ 1 Phase ~ 50Hz		415 Volts ~ 3 Phase ~ 50Hz	
Nom. Full Load Amps [2)]	22	28	16.5	20
Min. Circuit Size (Amps)	32	40	20	25
Electrical Input Cooling (kW) [1)]	4.31	5.56	6.4	7.45
Electrical Input Heating (kW) [1)]	3.70	5.22	6.1	6.60
Sound Pressure dB(A)	49	50	52	54
Soft Starter	Standard		Standard	
DIMENSIONS				
Outdoor Unit (mm) Length	1150		1150	1450
Width	565		565	560
Height	960		960	
Weight (kg)	98.5	115	116	160.5
Indoor Unit (mm) Length	1135		1135	1360
Width	540		540	630
Height	400		400	450
Weight (kg)	45.5	45.5	53.5	66
Supply Air Size (mm) L x H	710 x 300		710 x 300	830 x 300
Return Air Size (mm) L x H	1000 x 340		1000 x 340	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.

2 System Overview

The Enduro series is ideally suited for any structure with dynamic heat loads, particularly those where a constant temperature is required across different areas.

The conditioned space is divided into individual load segments (zones) as depicted in Figure 1. Temperature sensors located in each area send data to the Smartzone control system which monitors the status of each load segment and modulates the capacity of the VAV dampers and VRAF air conditioning plant to match the total load (heating or cooling requirement).

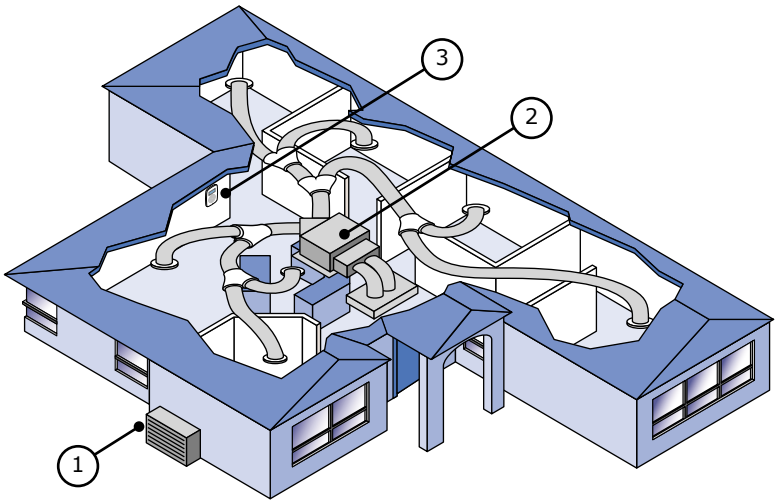


Figure 1.

In contrast, Figure 2 depicts a more traditional system setup where the temperature is measured at a single fixed location (generally in the return duct).

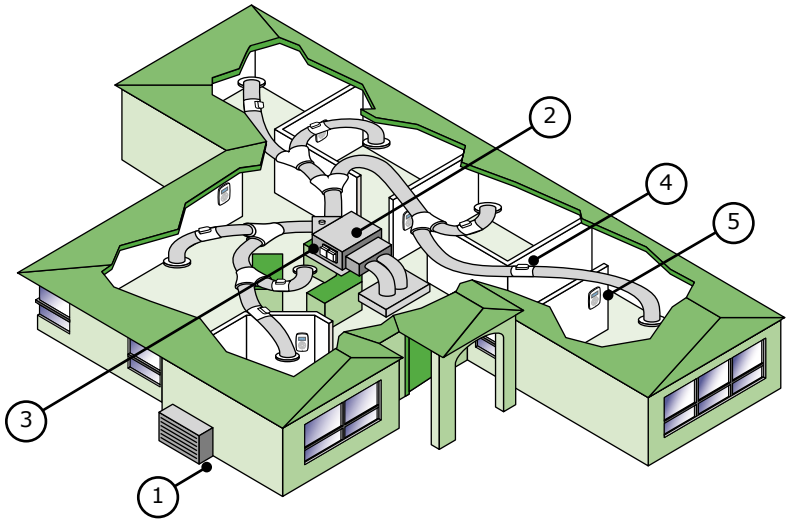


Figure 2.

2.1 How It Works

The operation can best be explained by separating it into the following areas:

1. VRF capacity modulation
2. VAF capacity modulation
3. VAV capacity modulation

Capacity modulation in an AC system refers to varying capacity output deliberately to better match the cooling/heating load on the system. This can be achieved by applying a range of technologies, including VAV, Digital Scroll, inverter, hot gas bypass, etc.

To truly understand the benefits of capacity modulation, first consider the behaviour of non-modulated systems. Such systems do have a degree of capacity variance as load varies, but in an undesirable manner.

Consider the cooling case in Figure 3. A traditional AC system has a capacity output equivalent to the cooling load at point A. This is the optimum capacity for these load conditions.

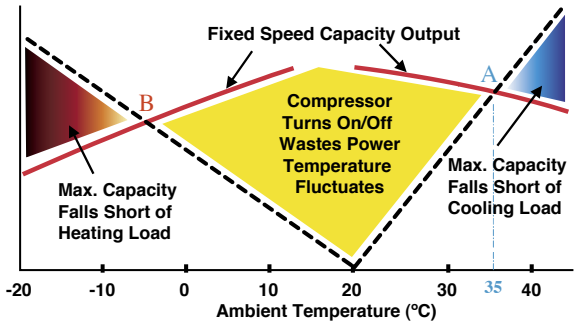


Figure 3.

If the ambient (outdoor) temperature rises above 35 °C (move right from point A), the cooling load increases (indicated by the black dotted line), but the AC's capacity actually decreases (indicated by the red line). The result is a shortfall in capacity.

If the ambient temperature falls below 35 °C, the cooling load falls as well but the AC's capacity actually increases, as shown in Figure 1 moving left from point A. The resulting surplus capacity is wasted in this instance.

The same undesirable capacity changes are in effect when considering the heating case.

Figure 4 clearly shows the effect of excess capacity on comfort levels. As the compressor cycles inefficiently in an attempt at modulation, the temperature fluctuates.

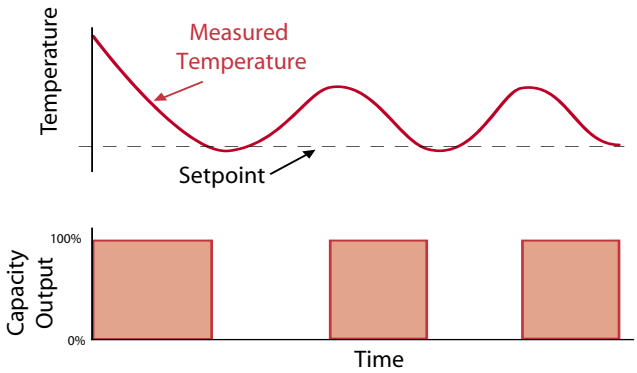


Figure 4.

By modulating the capacity equal to the load variation, within the design parameters, the AC capacity is always optimised. See Figure 5.

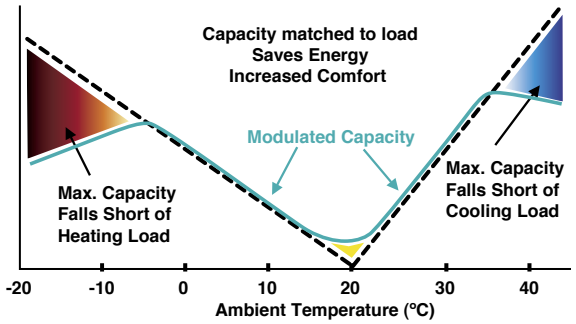


Figure 5.

As is evident in Figure 6, optimising capacity results in more consistent temperature outcomes and greater efficiency.

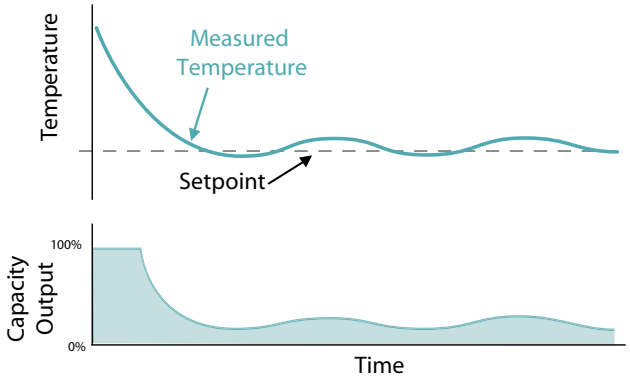


Figure 6.

In reality, it is not possible to modulate the capacity to equal the load in all conditions, nor in infinitesimal amounts of time. However, by incorporating capacity modulation at both system level (VRAF) and the individual load segment level (VAV), the capacity output can be highly optimised, allowing the system to respond quickly to load variations, limiting temperature fluctuations to approximately ±0.5 oC.

2.1.1 VRF Capacity Modulation

VRF management system controls the output capacity of the outdoor unit by monitoring the indoor coil temperature and comparing this to the target temperature range. As the indoor coil temperature moves beyond the limits of the target temperature range the conditioning capacity of the compressor is modulated to bring the indoor coil temperature back within the optimum range.

The indoor coil target temperature range for cooling operation can be set to either 7 - 9 °C, or 5 - 7 °C. This is selected by DIP switch 2 on the outdoor unit controller. It is important to ensure that duct insulation is sufficient to maintain an external duct surface temperature above dew point.

The indoor coil target temperature range for heating operation is 40 - 44 °C.

The total capacity requirement of the conditioned space is constantly re-evaluated by the control system. As the temperature of each load segment approaches set-point and the

dampers begin to close the control system instructs the indoor fan to reduce the airflow. The reduced airflow across the indoor heat exchanger (coil) results in a temperature difference indicating excess capacity.

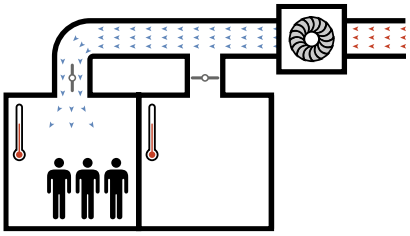
2.1.2 VAF Capacity Modulation

The influence of the VAV capacity modulation function on system pressure results in the requirement for a control strategy to maintain acceptable duct pressure and noise levels. This is accomplished by controlling the speed of the indoor fan to match the requirements of the conditioned space via the VAF management algorithm.

The VAF management system modulates the speed of the indoor fan based on the condition of the VAV system as a whole. The position of the VAV damper to each load segment is monitored and at any given time the status of the VAV system can be expressed as a percentage open.

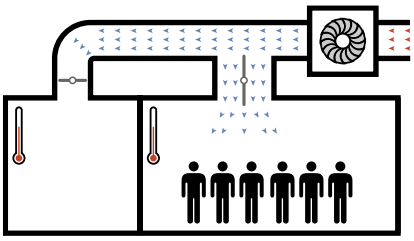
Consider the following simple examples:

Example 1
A system is made up of two load segments of equal size. The VAV damper to one segment is fully closed and the damper to the other is fully open. In this instance the VAV system status is the same regardless of which VAV damper is open.



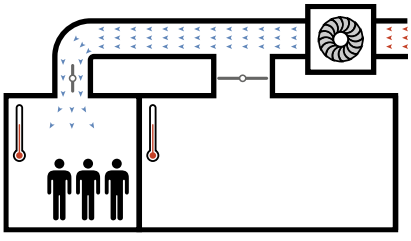
(Actual system open ≈ 50%)

Example 2
Now consider the case where one of the load segments is larger (one is twice the size of the other). The status of the VAV system when the large load segment is fully open and the smaller one fully closed,



(Actual system open ≈ 67%)

is obviously different from when the small load segment is fully open and the large one fully closed.



(Actual system open ≈ 33%)

To ensure optimum operation of the airflow management algorithm for the case in example 2, each load segment is assigned a virtual setting called the airflow profile.

2.1.2.a Airflow Profiles

The airflow profile represents the nominal maximum airflow for each individual load segment when the VAV damper is fully open. By adjusting the airflow profile setting for each segment, the system's airflow management algorithm may be fine tuned to compensate for variations in room and duct size when optimising the airflow.

The default value for each segment is 200 L/s. This is the minimum value and can be adjusted in increments of 10 up to the 660 L/s maximum value.

The airflow management algorithm uses the airflow profile values to determine the status of the VAV system as a whole. The VAV damper position (percentage open) for each load segment is multiplied by the airflow profile. The sum of these values is then expressed as a percentage of the sum of the airflow profiles for each segment.

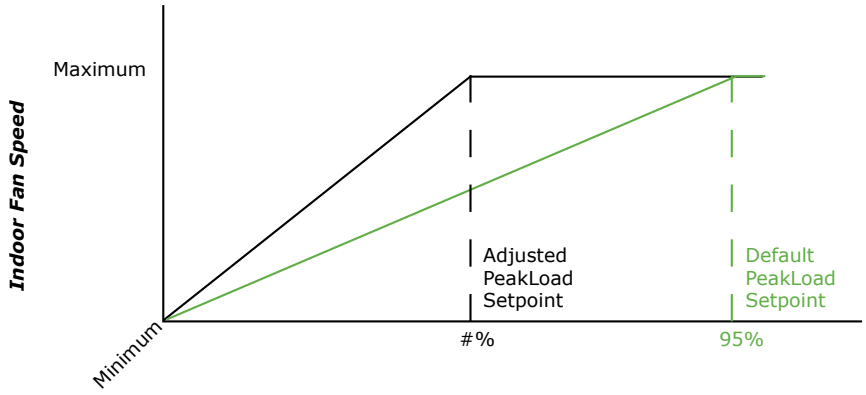
In the examples on the previous page the following settings will have the desired effect.

Example 1:
Both zones - Airflow profile = 200

Example 2:
Large zone - Airflow profile = 400 Small zone - Airflow profile = 200

2.1.2.b PeakLoad Setpoint

The PeakLoad setpoint determines at what point the airflow management algorithm engages maximum airflow, in relation to the total VAV system open percentage. The PeakLoad setpoint value is expressed as a percentage of the total VAV system open. The default is 95%.



The speed of the indoor fan is ramped up and down as the actual VAV system open percentage fluctuates between the minimum and PeakLoad value.

The maximum and minimum fan speeds can be adjusted via DIP switches 1 to 8 on the Indoor Unit Controller.

The following example is one way to calculate the PeakLoad setpoint:
A 12 kW system is installed with eight zones.
The total capacity required to condition all eight zones (at design conditions) is 16 kW.

Simply divide the system capacity by the total capacity required and multiply by 100 to determine the PeakLoad setpoint expressed as a percentage of the total VAV dampers open.

In this example the PeakLoad setpoint is: 12 ÷ 16 x 100 = 75%.

2.1.3 VAV Capacity Modulation

VAV capacity modulation applies a layer of control at the level of individual load segments by changing the position of the damper to control the volume of conditioned air being delivered to each area.

Three variables influence the damper position for each load segment. Two of these are measured (room temperature and supply air temperature) and the third is set (target temperature or set-point). The damper to each load segment will remain in the closed position (or minimum ventilation position - if set) unless the supply air temperature is such that it will cause the room temperature to move towards the set-point. When this condition is satisfied the controller incrementally opens the damper over a 2 $^{\circ}$C proportional band.

The control system also includes a minimum ventilation function. This may be set from 0% to 30% and when activated the dampers to all active load segments are modulated between the minimum ventilation setting and fully open. The dampers to any load segment that is not active will remain fully closed.

2.2 Control System Components

The Livezi Smartzone control system is tailored to suit each application using the following components:

1. Smartzone Main Processor Module (MPM)
2. Zone Expansion Module (ZEM) - Optional
3. Zone Touchpads
4. Motorised Barrel Dampers

2.2.1 Main Processor Module

The main processor module gathers and processes the information required to control the temperature for all the zones. This information comes from the connected sensors. The supply air sensor sends information about the temperature of conditioned air directly off the indoor heat exchanger to the control module. The main processor module has sensor inputs and motor outputs for 4 zones.

The main processor module is equipped with a clock module. The clock module enables the use of a weekly system timer program, and weekly timer programs for individual zones. Each zone may be programmed with a start and stop time for selected days of the week. A timer program must meet the following conditions to be valid.

- Be active for at least one day of the week.
- Have EITHER a Start or Stop time, OR both.

For example: The timer program for Zone 1 may be set up to be active on Saturday and Sunday with no start time and a stop time of 6.00 p.m.. In this instance Zone 1 must be turned on manually at all times but will automatically turn off at 6.00 p.m. on weekends only. Zone 1 must be turned off manually at all other times. In addition the system provides a global weekly timer programme. This programme will activate all zones at the scheduled times.

2.2.2 Zone Expansion Module

The zone expansion module houses the sensor inputs and motor outputs for 4 additional zones. The zone expansion module sends sensor data to, and receives motor drive signals from the main processor module.

2.2.3 Zone Touchpads

The zone touchpads house a sensor that measures the zone temperature. This information is sent to the control module for processing. There are two types of zone touchpad.

2.2.3.a LCD Touchpad

In addition to sending zone temperature data to the control module, the LCD touchpad displays system information and allows the user to change settings for any zone accessible from the touchpad. Zone access may be restricted on each touchpad. All zones are accessible by default.

2.2.3.b Room Controller

In addition to sending zone temperature data to the control module, the room controller displays basic system information about the zone. Three LEDs indicate if the zone is on or off, and, whether the zone requires cooling or heating.

2.2.4 Motorised Barrel Damper

The barrel dampers receive drive signals from the control module to modulate the airflow to each zone.

2.3 Air Conditioning Plant

The units in the Enduro range are reverse cycle split ducted systems consisting of the following components:

1. Indoor Unit
2. Outdoor Unit

2.3.1 Indoor Unit

The indoor unit houses the indoor heat exchanger and indoor fan. The indoor heat exchanger functions as the evaporator (cooling) or condenser (heating) depending on the systems operating mode. The indoor fan generates the airflow to deliver the system conditioning capacity to the space.

Operation is governed by the indoor unit controller.

2.3.2 Outdoor Unit

The outdoor unit houses the compressor, outdoor heat exchanger and outdoor fans. The outdoor heat exchanger functions as the condenser (cooling) or evaporator (heating) depending on the systems operating mode. The outdoor unit controls the refrigerant flow to generate the conditioning capacity for the space.

Operation is governed by the outdoor unit controller.

3 Technical Specifications

3.1 Smartzone Control System

3.1.1 Environmental Requirements

Operating Temperature ..... 0 ˚C to 60 ˚C
Altitude ..... 0 m to 2000 m
Operating Relative Humidity ... 10 % to 80 %

⚠ Avoid exposure to:

- static electricity
- intense electromagnetic radiation
- dusty conditions
- highly corrosive environments
- excess vibration

3.1.2 System Power Consumption

Number of Zones	DM6-IC	DM4C-IC
2	11.2 VA	9.8 VA
3	16.4 VA	12.8 VA
4	21.5 VA	15.8 VA
5	26.7 VA	18.8 VA
6	31.8 VA	21.8 VA
7	37.0 VA	24.8 VA
8	42.2 VA	27.8 VA

The power consumption data in the table above is for the Smartzone control system only (not the main plant) and represents maximum values with all motors driving and LCD touchpads with backlighting on. Typical loads will be less than this.

3.1.3 Inputs/Outputs

24 VAC Power Input
MPM: 2 x Terminal Active, Neutral (Separate 24V supply required)
ZEM: 2 x Terminal Active, Neutral (Separate 24V supply required)

24 VAC Zone Motor Outputs
MPM: 4 x RJ12 socket
ZEM: 4 x RJ12 socket

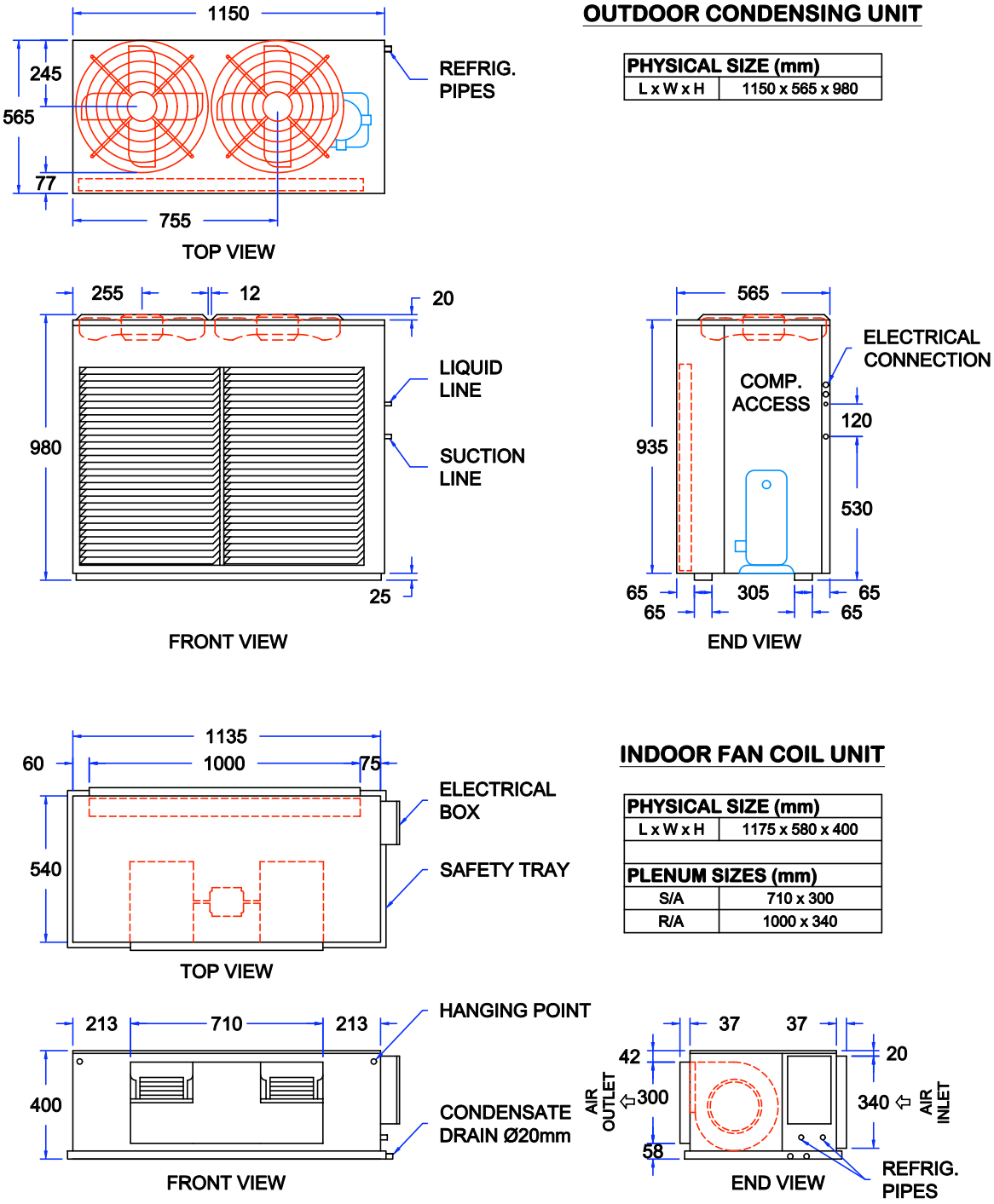
Sensor Inputs
MPM: 1 x RJ12 socket supply air sensor (NTC thermistor)
MPM: 4 x RJ12 socket zone sensors (NTC thermistor)
ZEM: 4 x RJ12 socket zone sensors (NTC thermistor)

Clock I/O
MPM: 1 x IDC 10 Connector (Female)
CLK: 1 x IDC 10 Connector (Male)

LED Indicators
MPM: 4 x Red zone motor fault
ZEM: 4 x Red zone motor fault

3.2 Enduro 12

3.2.1 System Dimensions



3.2.2 Specifications

COMPRESSOR	
Make	Copeland
Type	Digital Scroll
Number per Unit	1
Volt/Phase	240V / 1
RLA (Running Load Amp)	19.3 Amp
LRA (Lock Rotor Amp)	114.0 Amp
Pole/RPM	2/2900
Acoustic Hood	Heavy duty
CONDENSER FAN	
Type	Propeller
Number per unit	2
RPM	910
Motor	145 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	0.64 Amp (Each)
EVAPORATOR FAN	
Type	Torin Centrifugal Twin Deck
Number per unit	1
Pole / RPM	4 / 1400
Motor	315 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	2.13 Amp
ELECTRICAL INPUT	
Voltage/Phase	240V / 1
System Input (Cooling)	4.31 kW
System Input (Heating)	3.70 kW
Nom. Full Load Amps	22.0 Amp
Min. Circuit Size	32.0 Amp
GENERAL INFORMATION	
Refrigerant Control	Eliminator Valve
Pressure Control Cut Out	- Hi 2,800 kPa - Lo 105 kPa
De-Ice Control	Time-Temperature
SOUND PRESSURE LEVEL	
Condenser (Outdoor Unit)	49 dB(A)
Supply Air Outlet	64 dB(A)
Return Air Inlet	56 dB(A)
SUPPLY & RETURN AIR SIZES (mm)	
Supply Air Outlet	710 x 300
Return Air Inlet	1000 x 340

OUTDOOR COIL	
Type	Rifle Bore
Row	2
FPI/FPM	12 / 472
Fin Type	Aluminium Louvre
Corrosion Protection	Kirby Kote
Air Flow	1100 L/s
INDOOR COIL	
Type	Rifle Bore
Row	3
FPI/FPM	12 / 472
Tube	9.53 mm (3/8”)
Fin Type	Aluminium Louvre
Air Flow (Max)	700 L/s
Air Flow (Min)	200 L/s
CABINET	
Indoor Unit	Galvabond
Outdoor Unit	Stainless Steel 304 Grade
Outdoor Unit Base	Stainless Steel 304 Grade
WEIGHT	
Outdoor Weight	98.5 kg
Indoor Weight	45.5 kg
PIPE SIZING	
Liquid	9.53 mm (3⁄8”)
Suction (Vapour)	19.05 mm (3⁄4”)
Maximum pipe run	40m
REFRIGERANT	
R22	4 kg
Pipe Work	Silver Brazed Copper

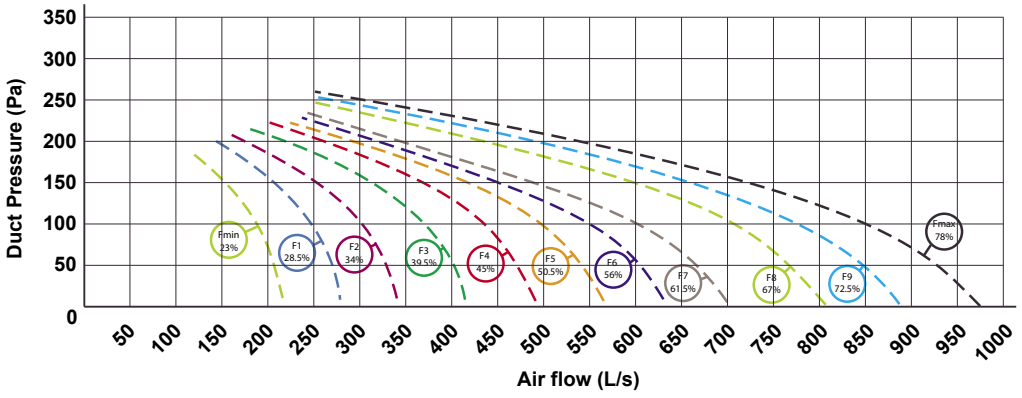
PIPE RUN CORRECTION MULTIPLIER		
	Cooling	Heating
5m	1.00	1.00
10m	0.97	1.00
15m	0.95	1.00
20m	0.935	1.00
25m	0.925	1.00
30m	0.919	1.00
35m	0.914	0.998
40m	0.910	0.996

COOLING CAPACITY Note: Capacities are **gross** and do not include allowance for fan motor heat loss									
LEND-12LSZ		**Nominal Maximum Air Flow ≈ 700 L/s @ 150 Pa**							
		30 °C		**32 °C**		**35 °C**		**40 °C**	
DB °C	**WB °C**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**
23	17	12.41	9.84	12.34	9.77	12.10	9.66	11.71	9.47
	18	12.74	9.21	12.58	9.14	12.33	9.03	11.90	8.84
	19	13.12	8.42	12.94	8.35	12.67	8.24	12.19	8.06
	21	13.86	6.82	13.68	6.76	13.39	6.65	12.90	6.46
25	17	12.41	11.23	12.34	11.15	12.10	11.04	11.71	10.83
	18	12.74	10.54	12.58	10.46	12.33	10.35	11.90	10.17
	19	13.12	9.79	12.94	9.72	12.67	9.63	12.19	9.46
	21	13.86	8.36	13.68	8.29	13.39	8.19	12.90	8.01
27	17	12.41	12.40	12.34	12.34	12.10	12.10	11.71	11.71
	18	12.74	11.88	12.58	11.80	12.33	11.67	11.90	11.43
	19	13.12	11.24	12.94	11.17	**12.67**	**11.06**	12.19	10.85
	21	13.86	9.89	13.68	9.82	13.39	9.71	12.90	9.39
29	17	12.90	12.90	12.76	12.76	12.55	12.55	12.15	12.15
	18	12.93	12.93	12.80	12.80	12.56	12.56	12.16	12.16
	19	13.17	12.51	13.00	12.42	12.74	12.27	12.30	11.99
	21	13.86	11.19	13.68	11.12	13.40	11.02	12.91	10.83

COOLING CAPACITY FACTORS Note: Where duct pressure variation results in a maximum airflow greater or less than Nominal use the correction factors in this table.					
Maximum Airflow (L/s)	560	630	700	770	840
Total cooling	0.95	0.97	1.00	1.02	1.04
Sensible cooling	0.90	0.95	1.00	1.06	1.10

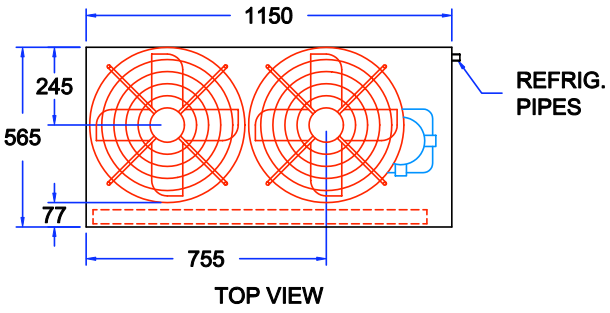
NETT HEATING CAPACITY						
Outside Coil Entering °C DB Temp.		**0**	**2**	**4**	**7**	**8**
Indoor Heating Capacity °C DB	**19**	8.87	9.38	10.07	13.03	13.40
	21	8.86	9.37	10.04	12.99	13.36

3.2.3 Indoor Fan Performance Curve



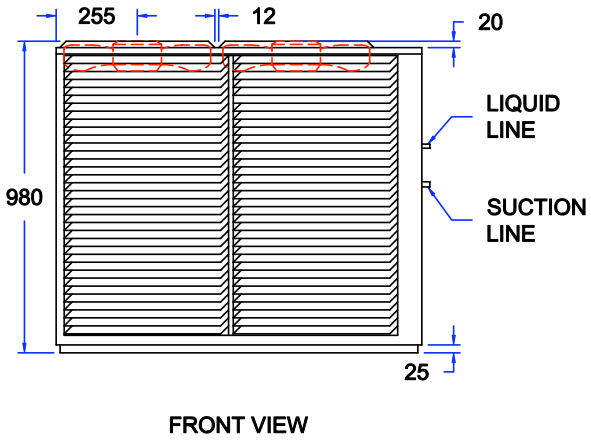
3.3 Enduro 16

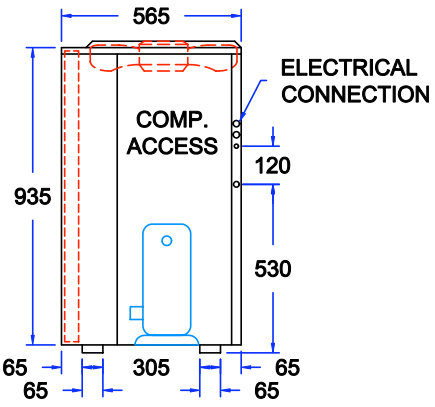
3.3.1 System Dimensions

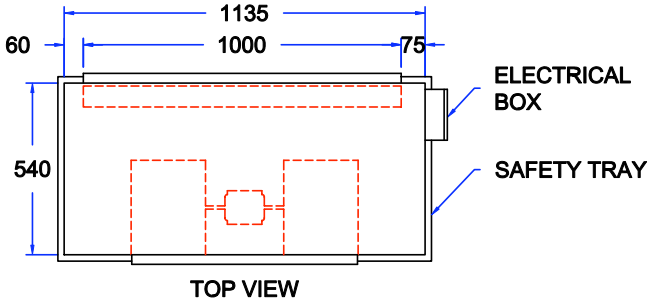


OUTDOOR CONDENSING UNIT

PHYSICAL SIZE (mm)	
L x W x H	1150 x 565 x 980

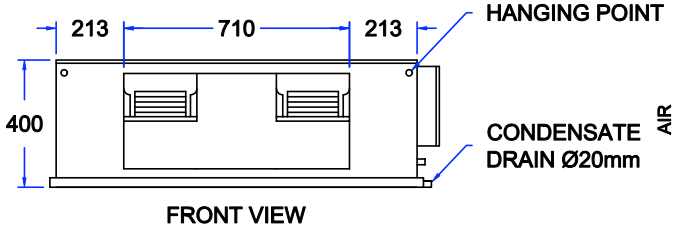


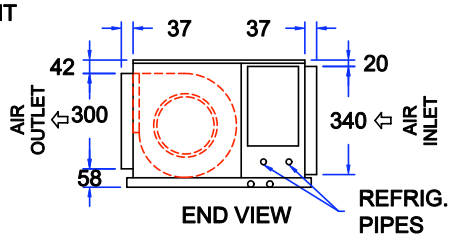




INDOOR FAN COIL UNIT

PHYSICAL SIZE (mm)	
L x W x H	1175 x 580 x 400
PLENUM SIZES (mm)	
S/A	710 x 300
R/A	1000 x 340





3.3.2 Specifications

COMPRESSOR	
Make	Copeland
Type	Digital Scroll
Number per Unit	1
Volt/Phase	240V / 1
RLA (Running Load Amp)	28.6 Amp
LRA (Lock Rotor Amp)	150.0 Amp
Pole/RPM	2/2900
Acoustic Hood	Heavy duty
CONDENSER FAN	
Type	Propeller
Number per unit	2
RPM	910
Motor	145 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	0.64 Amp (Each)
EVAPORATOR FAN	
Type	Torin Centrifugal Twin Deck
Number per unit	1
Pole / RPM	4 / 1360
Motor	600 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	3.60 Amp
ELECTRICAL INPUT	
Voltage/Phase	240V / 1
System Input (Cooling)	5.56 kW
System Input (Heating)	5.22 kW
Nom. Full Load Amps	28.0 Amp
Min. Circuit Size	40.0 Amp
GENERAL INFORMATION	
Refrigerant Control	Eliminator Valve
Pressure Control Cut Out	- Hi 2,800 kPa - Lo 105 kPa
De-Ice Control	Time-Temperature
SOUND PRESSURE LEVEL	
Condenser (Outdoor Unit)	50 dB(A)
Supply Air Outlet	64 dB(A)
Return Air Inlet	57 dB(A)
SUPPLY & RETURN AIR SIZES (mm)	
Supply Air Outlet	710 x 300
Return Air Inlet	1000 x 340

OUTDOOR COIL	
Type	Rifle Bore
Row	2
FPI/FPM	12 / 472
Fin Type	Aluminium Louvre
Corrosion Protection	Kirby Kote
Air Flow	1300 L/s
INDOOR COIL	
Type	Rifle Bore
Row	3
FPI/FPM	12 / 472
Tube	9.53 mm (3/8”)
Fin Type	Aluminium Louvre
Air Flow (High)	900 L/s
Air Flow (Low)	200 L/s
CABINET	
Indoor Unit	Galvabond
Outdoor Unit	Stainless Steel 304 Grade
Outdoor Unit Base	Stainless Steel 304 Grade
WEIGHT	
Outdoor Weight	115.0 kg
Indoor Weight	45.5 kg
PIPE SIZING	
Liquid	9.53 mm (3/8”)
Suction (Vapour)	19.05 mm (3/4”)
Maximum pipe run	40m
REFRIGERANT	
R22	4 kg
Pipe Work	Silver Brazed Copper

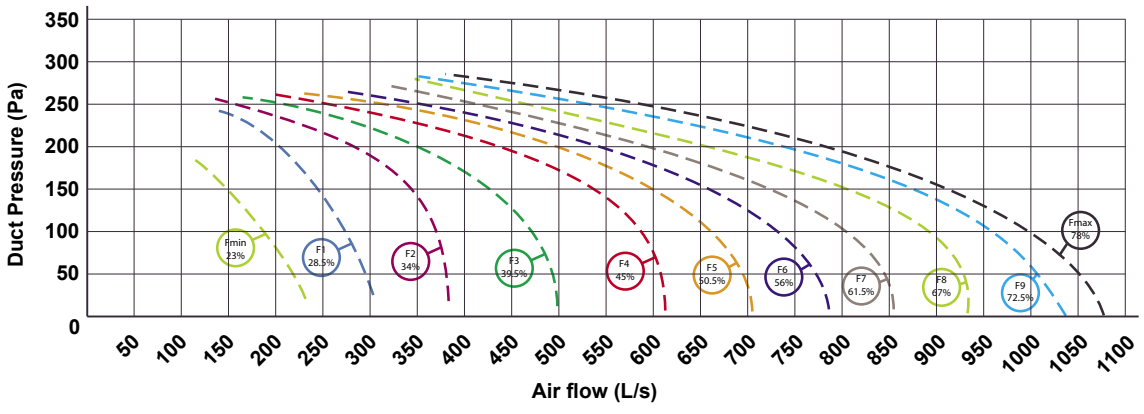
PIPE RUN CORRECTION MULTIPLIER		
	Cooling	Heating
5m	1.00	1.00
10m	0.97	1.00
15m	0.95	1.00
20m	0.935	1.00
25m	0.925	1.00
30m	0.919	1.00
35m	0.914	0.998
40m	0.910	0.996

COOLING CAPACITY Note: Capacities are **gross** and do not include allowance for fan motor heat loss									
LEND-16LSZ		**Nominal Maximum Air Flow ≈ 900 L/s @ 150 Pa**							
		30 °C		**32 °C**		**35 °C**		**40 °C**	
DB °C	**WB °C**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**
23	17	15.05	11.36	14.64	11.26	14.31	11.10	13.85	10.83
	18	15.42	10.63	15.19	10.53	14.83	10.37	14.22	10.10
	19	15.90	9.62	15.65	9.51	15.27	9.36	14.61	9.10
	21	16.91	7.60	16.63	7.50	16.22	7.34	15.51	7.08
25	17	15.05	13.08	14.64	12.97	14.31	12.83	13.85	12.51
	18	15.42	12.25	15.19	12.13	14.83	11.98	14.22	11.71
	19	15.90	11.54	15.65	11.44	15.27	11.04	14.61	10.79
	21	16.91	9.55	16.63	9.45	16.22	9.29	15.51	9.03
27	17	15.05	14.49	14.64	14.36	14.31	14.27	13.85	13.85
	18	15.42	13.92	15.19	13.8	14.83	13.62	14.22	13.31
	19	15.90	13.11	15.65	13.00	**15.27**	**12.84**	14.61	12.56
	21	16.91	11.46	16.63	11.36	16.22	11.20	15.51	10.95
29	17	15.42	15.42	15.22	15.22	14.94	14.94	14.36	14.36
	18	15.46	15.34	15.28	15.26	14.98	14.98	14.41	14.41
	19	15.96	14.71	15.71	14.58	15.33	14.38	14.7	14.02
	21	16.90	13.05	16.63	12.95	15.22	12.79	15.51	12.52

COOLING CAPACITY FACTORS Note: Where duct pressure variation results in a maximum airflow greater or less than Nominal use the correction factors in this table.					
Maximum Airflow (L/s)	720	810	900	990	1080
Total cooling	0.95	0.97	1.00	1.02	1.04
Sensible cooling	0.90	0.95	1.00	1.06	1.10

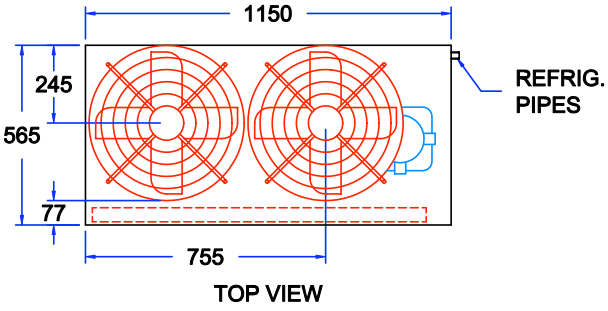
NETT HEATING CAPACITY						
Outside Coil Entering °C DB Temp.		**0**	**2**	**4**	**7**	**8**
Indoor Heating Capacity °C DB	**19**	11.19	12.01	12.84	16.05	16.50
	21	11.13	11.97	12.80	16.08	16.43

3.3.3 Indoor Fan Performance Curve



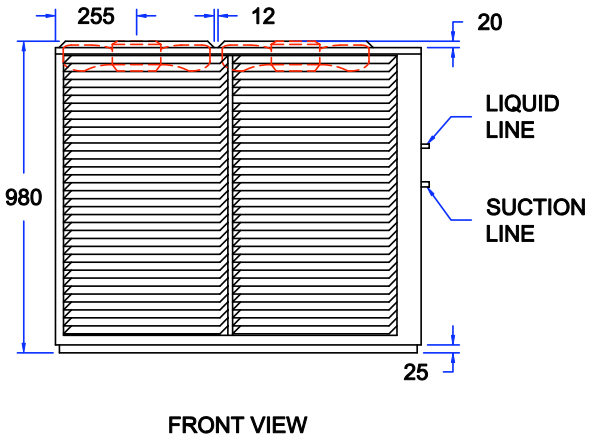
3.4 Enduro 18

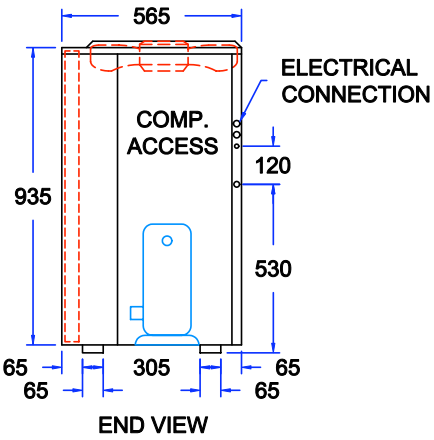
3.4.1 System Dimensions

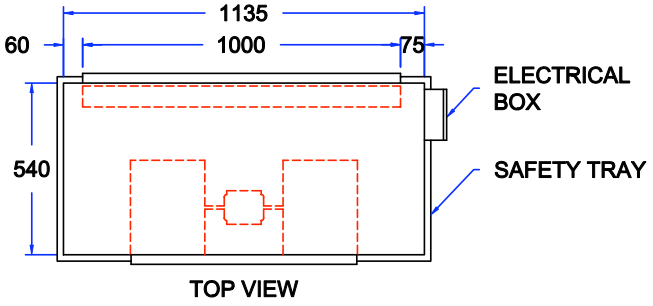


OUTDOOR CONDENSING UNIT

PHYSICAL SIZE (mm)	
L x W x H	1150 x 565 x 980

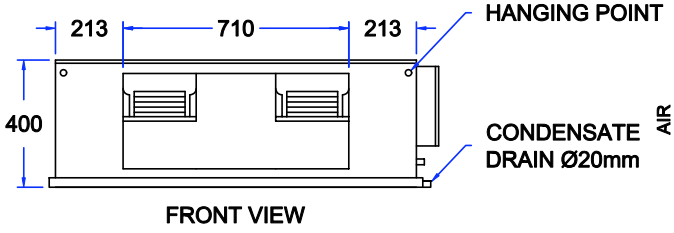


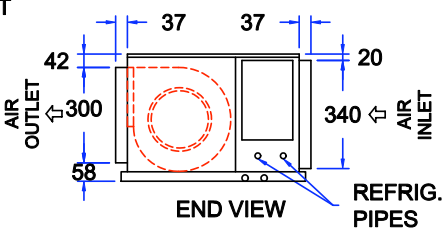




INDOOR FAN COIL UNIT

PHYSICAL SIZE (mm)	
L x W x H	1175 x 580 x 400
PLENUM SIZES (mm)	
S/A	710 x 300
R/A	1000 x 340





3.4.2 Specifications

COMPRESSOR	
Make	Copeland
Type	Digital Scroll
Number per Unit	1
Volt/Phase	415V / 3
RLA (Running Load Amp)	10.0 Amp
LRA (Lock Rotor Amp)	74.0 Amp
Pole/RPM	2/2900
Acoustic Hood	Heavy duty
CONDENSER FAN	
Type	Propeller
Number per unit	2
RPM	910
Motor	145 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	0.64 Amp (Each)
EVAPORATOR FAN	
Type	Torin Centrifugal Twin Deck
Number per unit	1
Pole / RPM	4 / 1360
Motor	750 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	5.10 Amp
ELECTRICAL INPUT	
Voltage/Phase	415V / 3
System Input (Cooling)	6.40 kW
System Input (Heating)	6.10 kW
Nom. Full Load Amps	16.5Amp
Min. Circuit Size	20.0 Amp
GENERAL INFORMATION	
Refrigerant Control	Eliminator Valve
Pressure Control Cut Out	- Hi 2,800 kPa - Lo 105 kPa
De-Ice Control	Time-Temperature
SOUND PRESSURE LEVEL	
Condenser (Outdoor Unit)	52 dB(A)
Supply Air Outlet	66 dB(A)
Return Air Inlet	59 dB(A)
SUPPLY & RETURN AIR SIZES (mm)	
Supply Air Outlet	710 x 300
Return Air Inlet	1000 x 340

OUTDOOR COIL	
Type	Rifle Bore
Row	3
FPI/FPM	12 / 472
Fin Type	Aluminium Louvre
Corrosion Protection	Kirby Kote
Air Flow	1800 L/s
INDOOR COIL	
Type	Rifle Bore
Row	4
FPI/FPM	12 / 472
Tube	9.53 mm (3/8”)
Fin Type	Aluminium Louvre
Air Flow (Max)	1100 L/s
Air Flow (Min)	200 L/s
CABINET	
Indoor Unit	Galvabond
Outdoor Unit	Stainless Steel 304 Grade
Outdoor Unit Base	Stainless Steel 304 Grade
WEIGHT	
Outdoor Weight	116 kg
Indoor Weight	53.5 kg
PIPE SIZING	
Liquid (Under 18m)	9.53 mm (3/8”)
Liquid (Over 18m)	12.7 mm (1/2”)
Suction (Vapour) (Under 18m)	22.22 mm (7/8”)
Suction (Vapour) (Over 18m)	25.4 mm (1”)
Maximum pipe run	40 m
REFRIGERANT	
R22	5.5 kg
Pipe Work	Silver Brazed Copper

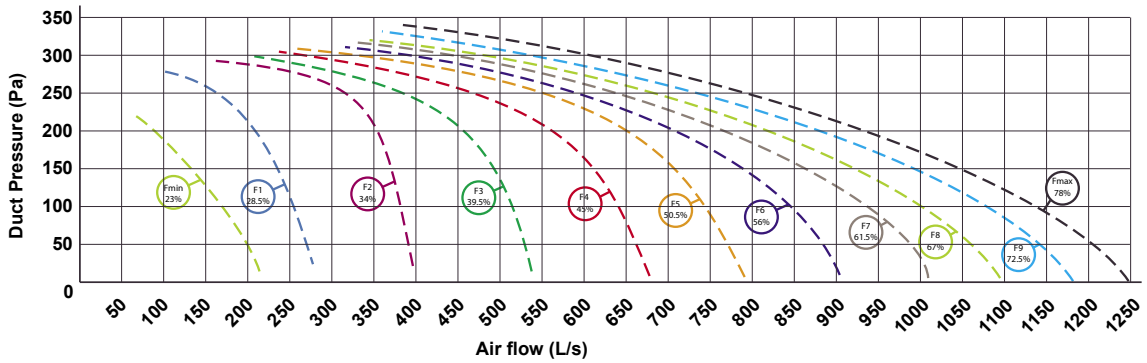
PIPE RUN CORRECTION MULTIPLIER		
	Cooling	Heating
5m	1.00	1.00
10m	0.97	1.00
15m	0.95	1.00
20m	0.935	1.00
25m	0.925	1.00
30m	0.919	1.00
35m	0.914	0.998
40m	0.910	0.996

COOLING CAPACITY Note: Capacities are **gross** and do not include allowance for fan motor heat loss									
LEND-18LSZ		**Nominal Maximum Air Flow ≈ 1100 L/s @ 125 Pa**							
		30 °C		**32 °C**		**35 °C**		**40 °C**	
DB °C	**WB °C**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**
23	17	17.92	13.98	17.75	13.86	17.30	13.66	16.61	13.29
	18	18.46	12.77	18.13	12.65	17.69	12.48	16.89	12.14
	19	18.95	11.74	18.65	11.62	18.19	11.42	17.30	11.09
	21	20.16	9.16	19.83	9.04	19.32	8.85	18.39	8.52
25	17	17.92	16.16	17.75	16.04	17.30	15.80	16.61	15.39
	18	18.46	15.08	18.13	14.95	17.69	14.75	16.89	14.41
	19	18.95	13.93	18.65	13.81	18.19	13.61	17.30	13.26
	21	20.16	11.64	19.83	11.52	19.32	11.33	18.39	11.00
27	17	17.92	17.92	17.75	17.75	17.30	17.30	16.61	16.61
	18	18.46	17.20	18.13	17.03	17.69	16.78	16.89	16.29
	19	18.95	16.19	18.65	16.06	**18.19**	**15.86**	17.30	15.46
	21	20.16	13.85	19.83	13.73	19.32	13.54	18.39	13.21
29	17	18.64	18.64	18.40	18.40	18.01	18.01	17.32	17.32
	18	18.66	18.66	18.43	18.43	18.02	18.02	17.33	17.33
	19	19.08	18.14	18.79	17.97	18.34	17.69	17.37	17.32
	21	20.10	16.11	19.78	15.99	19.29	15.80	18.33	15.43

COOLING CAPACITY FACTORS Note: Where duct pressure variation results in a maximum airflow greater or less than Nominal use the correction factors in this table.					
Maximum Airflow (L/s)	880	990	1100	1210	1320
Total cooling	0.95	0.97	1.00	1.02	1.04
Sensible cooling	0.90	0.95	1.00	1.06	1.10

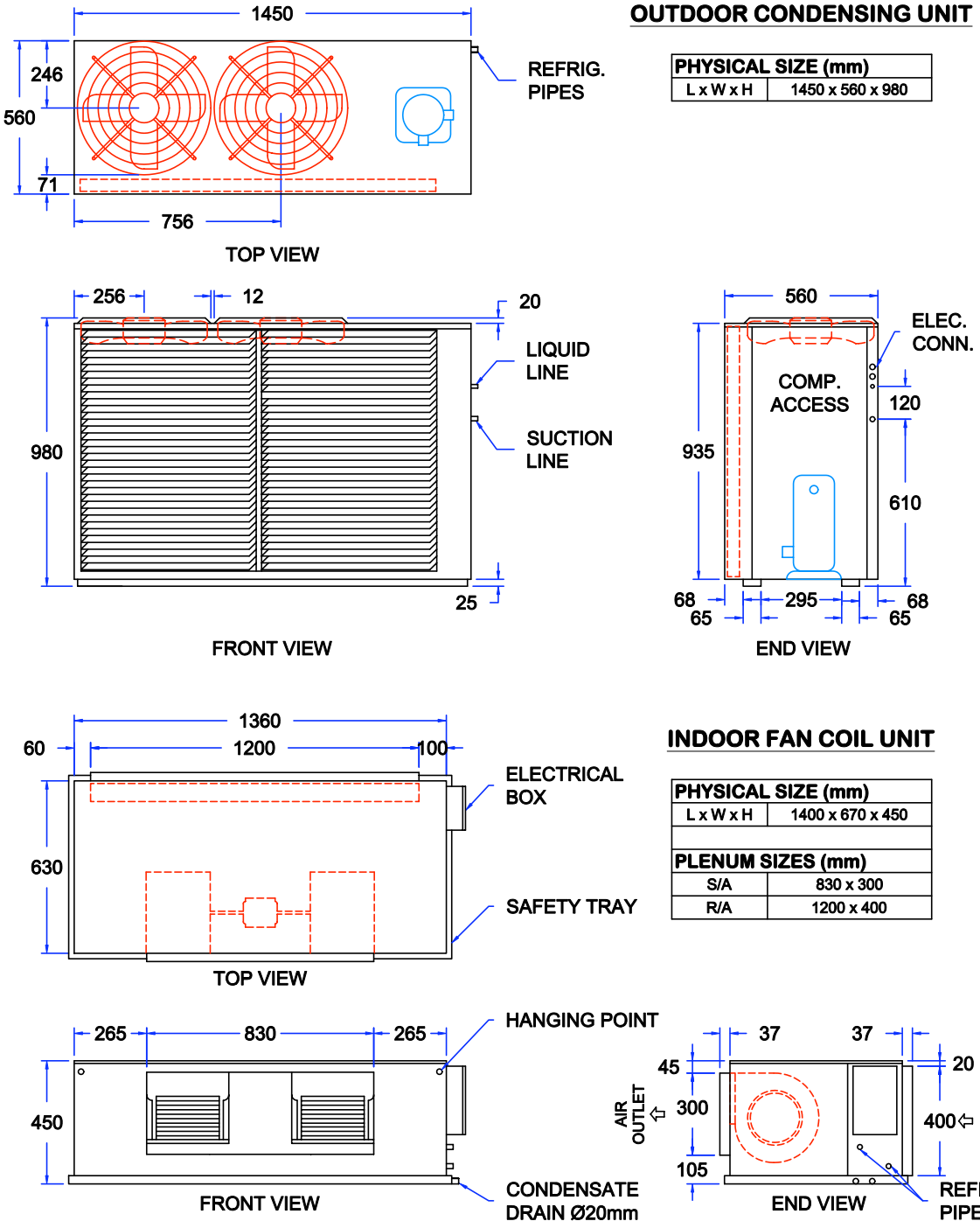
NETT HEATING CAPACITY						
Outside Coil Entering °C DB Temp.		**0**	**2**	**4**	**7**	**8**
Indoor Heating Capacity °C DB	**19**	13.01	14.03	15.02	18.52	19.07
	21	12.89	13.96	14.94	18.52	18.99

3.4.3 Indoor Fan Performance Curve



3.5 Enduro 20

3.5.1 System Dimensions



3.5.2 Specifications

COMPRESSOR	
Make	Copeland
Type	Digital Scroll
Number per Unit	1
Volt/Phase	415V / 3
RLA (Running Load Amp)	12.0 Amp
LRA (Lock Rotor Amp)	101.0 Amp
Pole/RPM	2/2900
Acoustic Hood	Heavy duty
CONDENSER FAN	
Type	Propeller
Number per unit	2
RPM	910
Motor	145 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	0.64 Amp (Each)
EVAPORATOR FAN	
Type	Torin Centrifugal Twin Deck
Number per unit	1
Pole / RPM	4 / 1360
Motor	750 W
Volt/Phase	240V / 1
FLA (Full Load Amps)	5.50 Amp
ELECTRICAL INPUT	
Voltage/Phase	415V / 3
System Input (Cooling)	7.45 kW
System Input (Heating)	6.60 kW
Nom. Full Load Amps	20.0 Amp
Min. Circuit Size	25.0 Amp
GENERAL INFORMATION	
Refrigerant Control	Eliminator Valve
Pressure Control Cut Out	- Hi 2,800 kPa - Lo 105 kPa
De-Ice Control	Time-Temperature
SOUND PRESSURE LEVEL	
Condenser (Outdoor Unit)	54 dB(A)
Supply Air Outlet	66 dB(A)
Return Air Inlet	59 dB(A)
SUPPLY & RETURN AIR SIZES (mm)	
Supply Air Outlet	830 x 300
Return Air Inlet	1200 x 400

OUTDOOR COIL	
Type	Rifle Bore
Row	2
FPI/FPM	12 / 472
Fin Type	Aluminium Louvre
Corrosion Protection	Kirby Kote
Air Flow	1800 L/s
INDOOR COIL	
Type	Rifle Bore
Row	3
FPI/FPM	12 / 472
Tube	9.53 mm (3/8”)
Fin Type	Aluminium Louvre
Air Flow (Max)	1250 L/s
Air Flow (Min)	200 L/s
CABINET	
Indoor Unit	Galvabond
Outdoor Unit	Stainless Steel 304 Grade
Outdoor Unit Base	Stainless Steel 304 Grade
WEIGHT	
Outdoor Weight	160.5 kg
Indoor Weight	66.0 kg
PIPE SIZING	
Liquid	12.7 mm (1/2”)
Suction (Vapour) (Under 18m)	22.22 mm (7/8”)
Suction (Vapour) (Over 18m)	28.6 mm (1 1/8”)
Maximum pipe run	40m
REFRIGERANT	
R22	5.5 kg
Pipe Work	Silver Brazed Copper

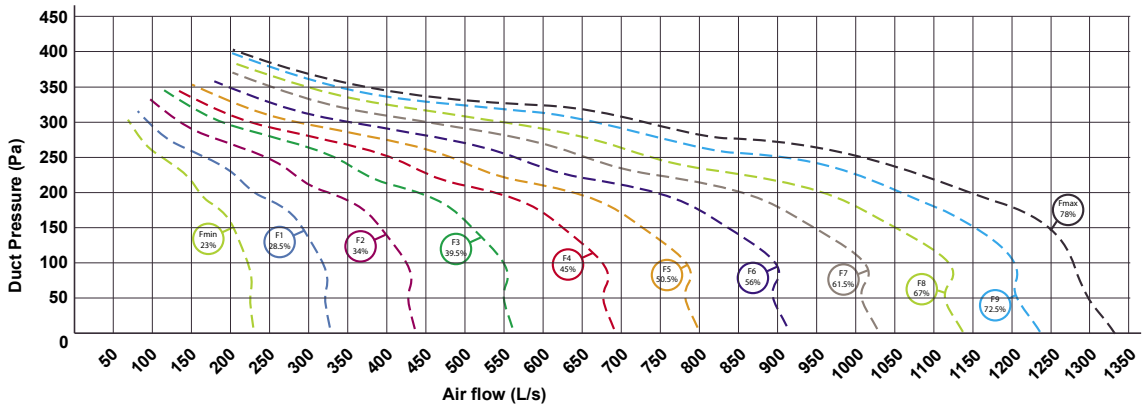
PIPE RUN CORRECTION MULTIPLIER		
	Cooling	Heating
5m	1.00	1.00
10m	0.97	1.00
15m	0.95	1.00
20m	0.935	1.00
25m	0.925	1.00
30m	0.919	1.00
35m	0.914	0.998
40m	0.910	0.996

COOLING CAPACITY Note: Capacities are **gross** and do not include allowance for fan motor heat loss									
LEND-20LSZ		**Nominal Maximum Air Flow ≈ 1250 L/s @ 150 Pa**							
		30 °C		**32 °C**		**35 °C**		**40 °C**	
DB °C	**WB °C**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**	**Total kW**	**Sens kW**
23	17	19.99	15.27	19.74	15.14	19.35	14.93	18.67	14.57
	18	20.36	13.98	19.87	13.86	19.42	13.69	18.68	13.36
	19	20.78	12.88	20.48	12.76	20.00	12.58	19.17	12.24
	21	22.00	10.04	21.68	9.92	21.13	9.74	20.20	9.41
25	17	19.99	17.50	19.74	17.34	19.35	17.08	18.67	16.65
	18	20.36	16.47	19.87	16.34	19.42	16.14	18.68	15.75
	19	20.78	15.23	20.48	15.11	20.00	14.91	19.17	14.56
	21	22.00	12.77	21.68	12.66	21.13	12.48	20.20	12.15
27	17	19.99	18.89	19.74	18.64	19.35	18.25	18.67	17.57
	18	20.36	18.46	19.87	18.15	19.42	18.15	18.68	17.58
	19	20.78	17.60	20.48	17.46	**20.00**	**17.24**	19.17	16.82
	21	22.00	15.18	21.68	15.06	21.13	14.86	20.20	14.53
29	17	20.17	19.66	20.51	19.41	20.12	19.02	19.40	16.30
	18	20.77	19.67	20.51	19.41	20.12	19.02	19.41	18.31
	19	21.37	19.51	20.50	19.37	20.13	19.03	19.43	18.33
	21	21.88	17.58	21.62	17.47	21.11	17.27	20.22	16.90

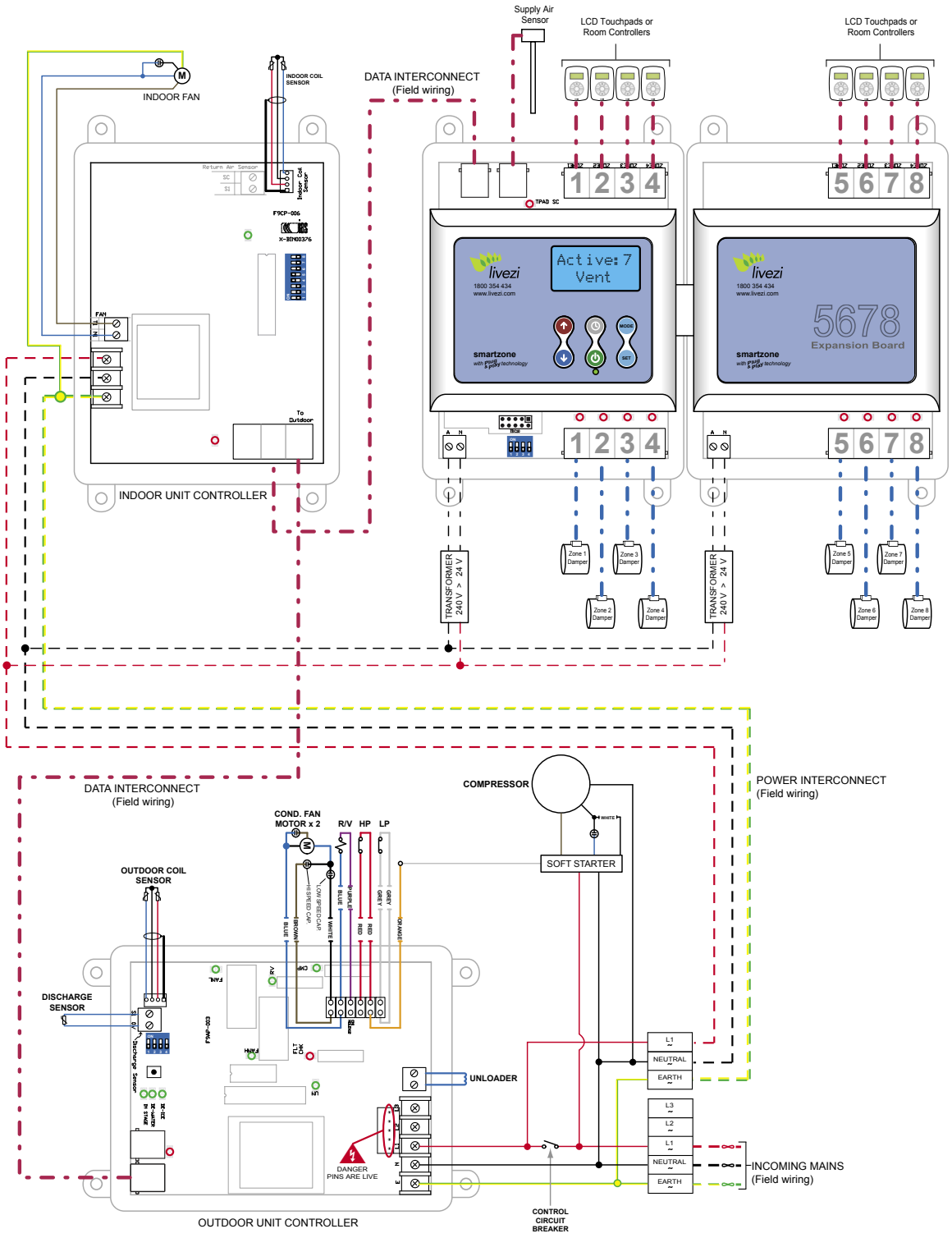
COOLING CAPACITY FACTORS Note: Where duct pressure variation results in a maximum airflow greater or less than Nominal use the correction factors in this table.					
Maximum Airflow (L/s)	1000	1125	1250	1375	1500
Total cooling	0.95	0.97	1.00	1.02	1.04
Sensible cooling	0.90	0.95	1.00	1.06	1.10

NETT HEATING CAPACITY						
Outside Coil Entering °C DB Temp.		**0**	**2**	**4**	**7**	**8**
Indoor Heating Capacity °C DB	**19**	13.72	14.78	15.76	20.15	21.59
	21	13.69	14.72	15.68	20.08	21.51

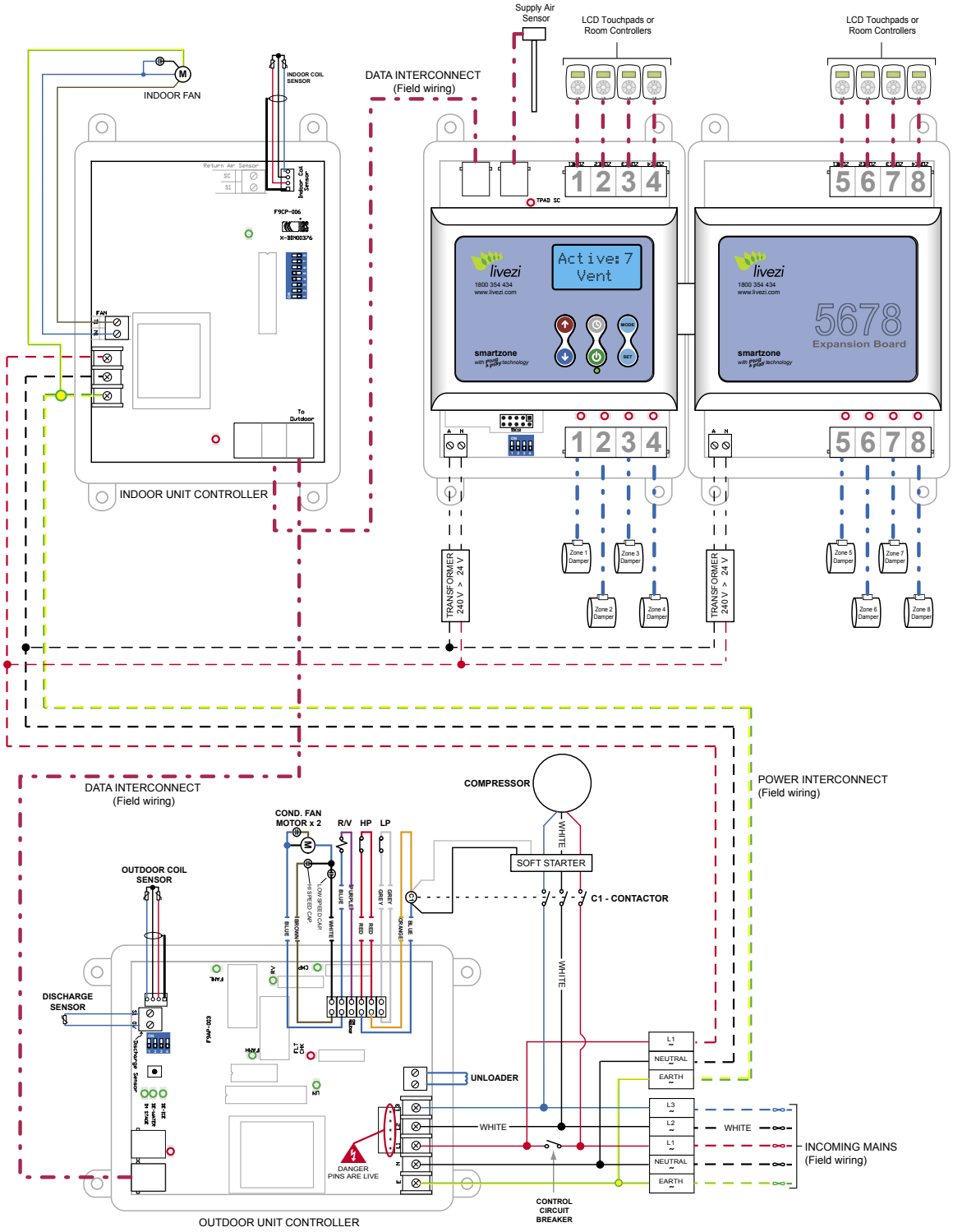
3.5.3 Indoor Fan Performance Curve



3.6 Single Phase Connection Schematic



3.7 Three Phase Connection Schematic



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