



New Altitude of Efficiency and Comfort



TVR 5G GUIDE SPECS

Part 1 TRANE VARIABLE REFRIGERANT FLOW SYSTEM

1.1 General

Unit shall be air cooled variable refrigerant flow system, module split type multi-system air conditioner comprising of outdoor and indoor units, each having capability to cool or heat independently for the requirement of the rooms.

Up to 13 different types and 2.2 KW to 56.0 KW capacity indoor units shall be connected to one refrigerant circuit and controlled individually. Maximum 64 numbers of indoor machines shall be connected to a single refrigeration circuit in case of 100% combination ratio.

Compressor shall be high efficiency DC inverter compressor, high pressure chamber, more compact structure, refrigerant be compressed directly, more efficiency, Preheating the oil make more suitable temperature.

The capacity of the standalone outdoor unit ranging from 8HP to 16 HP shall be of one module, the capacity of the outdoor unit ranging from 18HP to 32 HP shall be of two modules, the capacity of the outdoor unit ranging from 34 HP to 48 HP shall be of three module and the capacity of the outdoor unit ranging from 50 HP to 64 HP shall be of four modules.

** The new 18HP outdoor unit is available as a customization unit, modulation combination can reach up 72HP.

Outdoor unit shall be suitable to match connection of any of the following models

1. Wall Mounted Type
2. Ceiling Mounted cassette type(One-way, two-way, four-way)
3. Ceiling mounted duct type(Low, middle and high static pressure)
4. Exposed convertible/console type.
5. Outdoor air processing unit.

The refrigerant used shall be environment friendly CFC-free **R410A**. The refrigerant piping shall be extended up to 200m equivalent pipe length.

Unit shall be equipped with oil recovery system to ensure stable operation with this long refrigerant piping.

ELECTRICAL

PRODUCT	50hz		60hz	
	ELECTRICAL CHARATRISTICS	UTILIZATION RANGE	ELECTRICAL CHARATRISTICS	UTILIZATION RANGE
OUTDOOR	380~415 v/3 ph/50 hz	342~440 v/3 ph/50 hz	380~415 v/3 ph/60 hz	342~440v/3 ph/60 hz
INDOOR	220~240 v/1 ph/50 hz	198~254 v/1 ph/50 hz	220~240 v/1 ph/60 hz	198~254v / 1 ph / 60 hz
INDOOR	*	*	208-230 v/ 1 ph/60 hz	198~254v/ 1 ph/ 60 hz

This table is applicable for all 50/60hz OUTDOORS & INDOORS through the entire TVR product line

1.2 Outdoor Condensing unit

1.2.1 Quality Assurance

- A. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- B. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- C. A full charge of R-410A for the condensing unit only shall be provided in the condensing unit.

1.2.2 Delivery, Storage and Handling

Unit shall be stored and handled according to the manufacturer's recommendation the contractor shall supply, Install and Commission factory assembled air cooled packaged TVR condensing units. The number and capacity of the units shall be as indicated in the capacity schedule given in the specifications and on the drawings.

Each machine shall consist of at least one refrigerating circuit consisting of DC inverter compressor, air cooled condenser, Interconnecting piping, controls, safety devices like high pressure switch ,crank case heater, fuse for PCB, over voltage protection, current transformer and fan motor over heat /current protector.

The machine shall be factory assembled, leak tested, evacuated and completely charged with environment friendly refrigerant for minimum factory charge of 9 Kg. All factory wiring and piping shall be contained within the machine enclosure.

Each machine shall be capable of operating satisfactory in a wide range of ambient air temperatures ranging as follows:

For T1 condition :48°C in cooling mode and -20°C in heating mode.
For T3 condition :54°Cin cooling mode and -20°C in heating mode.

Unless indicated otherwise on electrical wiring diagram, each unit shall be factory equipped to connect to only one electrical power feeder with built-in protection of over current.

The outdoor unit shall be:

1. Modular in design and should be allowed for side by side installation.
2. The sound pressure level of single outdoor shall not be more than 62dBA at normal operation measured 1 meter away from the unit.
3. The outdoor unit shall have an accumulator with factory installed crank case heater and controls.
4. The outdoor unit shall have a high pressure safety switch, fuse, over-current protection and crank case heater.
5. The outdoor unit shall have the ability to operate with a maximum height difference of 110m and have total refrigerant tubing length of 500m. The greatest length is not to exceed 175m between outdoor unit and the indoor units (Please refer to below table)
6. The outdoor unit shall be capable of operating in heating down to -20 °C ambient temperatures without additional low ambient controls.

7. The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained.

TVR RANGE	Piping length			Level difference			
	Total piping length* (Actual)	Longest piping (L) / Equivalent length	From ODU to first Y joint	Piping (The farthest IDU from the first Indoor unit branch)equivalent length	Level difference between IDU-ODU		Level difference between IDU-IDU
					Outdoor unit up	Outdoor unit down	
INVERTER + FIX	≤30HP ≤350m; >30HP ≤500m	175m	/	40m	70m	70m	15m
ALL INVERTER	1000m	200m	/	40/90m	70m	110m	30m
INVERTER HR/3 PIPES	1000m	200m	/	40/90m	70m	110m	30m

1.3 Compressors

Each unit shall have at least one DC inverter compressor. Compressor shall be high performance and high efficiency. The units realized the industry's top class energy efficiency by adoption of brushless reluctance DC compressor control, DC Fan motor and improved heat exchanger.

COMPRESSOR		INVERTER + FIX					ALL INVERTER						ALL INVERTER / 3 PIPES				
		8	10	12	14	16	8	10	12	14	16	18	8	10	12	14	16
INVERTER	QTY	1	1	1	1	1	1	1	2	2	2	2	1	1	1	2	2
FIX	QTY	1	1	1	2	2	/	/	/	/	/	/	/	/	/	/	/

According to the running load and system pressure, the system controls the speed of DC fan to achieve the minimum energy consumption and best performance.

Compressor shall have discharge shut off valves, built in microprocessor controlled oil separator, long life fine oil filter, insertion type oil heater with sleeve, oil fill and suction gas filter.

Compressor shall have inherent self-analyzing lubrications system in which oil pressure is maintained. The unit shall be provided with oil recovery system to ensure stable operation with long refrigerant piping. The oil recovery system shall be able to handle 175 running meter of refrigerant pipe works.

Each compressor shall be provided with safety devices including check valve in discharge gas outlet, liquid shut off valves, differential relief valve, thermal motor protection by integrated sensors in each winding coil, phase sequence protection for direction of rotation, manual reset lock out and oil temperature protection.

All compressors shall be provided with electrical protections, short circuit protection.

1.4 Condenser Coils

Condenser coil shall be air cooled and shall be constructed of seamless copper tubes, 5/16" (7.94mmOD) and mechanically bonded to high efficient aluminum. Fins spacing shall be maximum 1.6mm. The condenser fins shall be pre-coated for saline and corrosive environment by epoxy acrylic coating and hydrophilic layer acrylic resin plus surfactant.

The coils shall be tested against leakage by air pressure of 450psig (3100kpa). The factory test certificates confirming the same shall be furnished.

1.5 Condenser Fans and Motors

The machine shall be equipped with direct driven propeller fans discharging air upward. Fans shall be constructed of corrosion resistant blades.

The fan and drive shall be held in proper alignment. The condenser fan shall be high static pressure propeller fan with optimum bell mouth form, for high external static pressure (external pressure 20Pa, max. up to 40Pa can be customized)

All condenser fans shall be individually statically and dynamically balanced for vibration free operation.

Condenser fan motors shall be ambient thermal overload relay for overload protection of the motors. Short circuit protection for the motors shall be provided.

1.6 Refrigerant Circuits

Refrigeration circuits piping shall be fabricated from copper pipes and each refrigeration circuit shall include oil separator, high pressure switch, high pressure sensor, and ambient air temperature sensor, condenser out temperature sensor, liquid tube temperature sensor, accumulator, oil solenoids valves.

The refrigerant circuit shall be provided with efficient oil recovery system consisting of solenoid valves, check valves and accumulator operating on microprocessor logic.

1.7 Casing

Machine casing shall be made of heavy gauge zinc coated galvanized steel sheets conforming to ASTM-A 635.

Machine casing shall be provided with access door for easy service and maintenance. The machine shall be fully assembled on structural steel skid painted with one coat primer and minimum one coat of rust preventing black enamel.

1.8 Control Panel & Controls

Controls panel enclosure shall be fabricated out of heavy gauge steel in phosphatized, powder coated baked finish in compact casing. A check window should be provided to make it easy for maintain or commission.

The panel shall be factory wired, labelled, tagged. The PCB shall be lead free coated for outdoor application.

Control panel should include the following components as minimum:

1. Individual compressor and condenser fan motor contactor

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2. Thermal overload relays for condenser fan motor over current protection
 3. Evaporator freeze protection thermostat
 4. Control ON/OFF toggle switch.
 5. Control circuit fuses
 6. Power and control circuit terminal blocks

The microprocessor must provide proactive control of the unit with all of the safeties and alarm capabilities built into the base algorithms. The controller must recognize potential problems and take corrective action to avoid problems. The targets and safeties must be flexible and changeable from the local panel.

The controller shall be able to monitor the cyclic start up sequence equalizing the compressor running time.

Pressure and temperature values must be displayed in either English or Metric units, which is user selectable.

- Alarms must be clearly identified using common English language terms.
- Main pressure readings must be easily obtained per circuit in one display (i.e. suction pressure discharge pressure, oil differential pressure and amp draw or motor fault).

Following safeties and faults must be mentioned with proactive control and a safety features:

- Low suction pressure,
- Low discharge pressure
- High discharge pressure,
- Low differential oil pressure
- High motor amps
- Internal compressor motor faults
- Loss of flow
- Phase loss protection
- Run / stop switch

1.9 Indoor Evaporator Units

System Description

Horizontal 2 or 3 pipes, room fan coil unit above ceiling for ducting or with cabinet for exposed ceiling installations or multi-flow cassette type.

Quality Assurance

shall be tested and certified in accordance with IEC 60335-2-40;2005. Each coil shall be factory tested for leakage at 3.2MPa with Nitrogen.

Equipment

Factory assembled, horizontal blow thru type fan coil, exposed ceiling or ducted installations or multi-flow cassette type installation.

Units shall be complete with cooling coils, fan(s), motor(s), drain pan, and all required wiring, piping, controls and special features.

1.10 INDOOR UNIT

1.10.1 One-way Cassette Type

A. General:

1. The indoor unit shall be a one-way cassette style indoor unit that recesses into the ceiling and shall have a modulating linear expansion device. Indoor unit shall support individual control by using individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling recessed.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. The one-way grille shall be fixed to bottom of cabinet allowing for one-way airflow.
4. There shall be a digital display on the panel to show running parameters and state.

C. Fan:

1. The indoor fan shall be an assembly with two multi-blade centrifugal fans direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three speeds, Low, Mid, and High.

D. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate lift mechanism shall be able to raise drain water 750mm above the condensate pan.
7. The Fins of coil are coated hydrophilic paints.
8. Both refrigerant lines to the indoor units shall be insulated.

F. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264 volts.

G. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.

1.10.2 Two-way Cassette Type

A. General:

1. The indoor unit shall be a two-way cassette style indoor unit that recesses into the ceiling and shall have a modulating linear expansion device. Indoor unit shall support individual control by using individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling recessed.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. The two-way grille shall be fixed to bottom of cabinet allowing for two-way airflow.

C. Fan:

1. The indoor fan shall be an assembly with two multi-blade centrifugal fans direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three speeds, Low, Mid, and High.

D. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The condensate lift mechanism shall be able to raise drain water 750mm above the condensate pan.
7. The Fins of coil are coated hydrophilic paints.
8. Both refrigerant lines to the indoor units shall be insulated.

F. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198- 264 volts.

G. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.

1.10.3 Four-way Cassette Type

A. General:

3. The indoor unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille and shall have a modulating linear expansion device. Unit shall be support individual controller, centralized controller or intelligent network control system.
4. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.
2. There shall be a digital display inside the panel.
3. The cabinet panel shall have provisions for a field installed outside air intake. Branch ducting shall be allowed from cabinet.

C. Panel

1. Standard with 4-way air outlet panel and 360 degree air outlet can be customized.
2. 4 different colors of panels for optional (please contact your nearest Trane Rep. for further clarification on MOQ)

D. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of four speeds, Low, Mid, and High, and Super high is for optional by changing the wire connection in field.
4. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The Fins of coil are coated hydrophilic paints.
7. The condensate lift mechanism shall be able to raise drain water 750mm above the condensate pan.
8. Both refrigerant lines to the indoor units shall be insulated.

G. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264 volts.

H. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.

1.10.4 Compact Four-way Cassette Type

A. General:

1. The unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille and shall have a modulating linear expansion device. Unit shall be support individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet:

1. The cabinet shall be space-saving ceiling-recessed cassette.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. There shall be a digital display inside the panel.
4. Branch ducting shall be allowed from cabinet.
5. The compact cabinet size can be installed on one standard ceiling tile

C. Panel

1. Standard with 360 degree air outlet panel

D. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.

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2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
 3. The indoor fan shall consist of three (3) speeds, Low, Mid, and High.
 4. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The Fins of coil are coated hydrophilic paints.
7. The condensate lift mechanism shall be able to raise drain water 500mm above the condensate pan.
8. Both refrigerant lines to the indoor units shall be insulated.

G. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264volts.

H. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.

1.10.5 High Static Pressure Ducted Type

A. General:

1. The unit shall be a high static pressure duct style indoor unit that conceal installing into the ceiling and shall have a modulating linear expansion device. Unit shall be support individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet

1. Casing shall be galvanized steel, with a collar for supply duct connection.
2. The drain pan shall be constructed of galvanized steel extending the entire length and width of the coil(s) and shall be pitched for drainage. The inside surface of the drain pan shall be coated with closed cell fire retardant foam insulation.

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3. The max. Height should not exceed 522 mm (28Kw), it shall be equipped with filter to trap dust particulars.
 4. In cases where drain pump is required, it shall have drain pump with pump head of 750mm.

C. Fan

1. The indoor fan shall be an assembly with a multi-blade cross-flow fan direct driven by one or two single motors, according to the capacity.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three speeds, Low, Mid, and High.
4. The static pressure should up to 196Pa (for 7.1kw to 16kw) or 250Pa (for 20kw to 28kw)

D. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

E. Coil

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The Fins of coil are coated hydrophilic paints.
7. Both refrigerant lines to the indoor units shall be insulated.

F. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264volts.

G. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wired remote controller. Units shall be equipped with provision to use wireless remote controller.

1.10.6 Middle Static Pressure Ducted Type

A. General:

1. The unit shall be a middle static pressure duct style indoor unit that conceal installing into the ceiling and shall have a modulating linear expansion device. Unit shall be support individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet

1. Casing shall be galvanized steel, with a collar for supply duct connection.
2. The drain pan shall be constructed of galvanized steel extending the entire length and width of the coil(s) and shall be pitched for drainage.
3. The max. Height should not exceed 300mm (for 14Kw), it shall be equipped with filter to trap dust particulars.
4. In cases where drain pump is required, it shall have drain pump as standard with pump head 750mm

C. Fan

5. The indoor fan shall be an assembly with a cross blow fan direct driven by one or two single motors, according to the capacity.
6. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
7. The indoor fan shall consist of four speeds, Low, Mid, and High, and Super high speed is for optional by changing the wire connection in field.
8. The static pressure should up to 100Pa (for 14kw)

D. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

E. Coil

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The Fins of coil are coated hydrophilic paints.
7. Both refrigerant lines to the indoor units shall be insulated.

F. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264volts.

G. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wired remote controller. Units shall be equipped with provision to use wireless remote controller.

1.10.7 Low Static Pressure Ducted Type

A. General:

1. The unit shall be a low static pressure duct style indoor unit that conceal installing into the ceiling and shall have a modulating linear expansion device. Unit shall be support individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-

diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet

1. Casing shall be galvanized steel, with a collar for supply duct connection.
2. The drain pan shall be constructed of galvanized steel extending the entire length and width of the coil(s) and shall be pitched for drainage. The inside surface of the drain pan shall be coated with closed cell fire retardant foam insulation.
3. The max. Height should not exceed 190mm; it shall be equipped with filter to trap dust particulars.
4. Fresh air intake hole is provided.
5. Air inlet/outlet flange are standard for easy duct connection.
6. Two ways of return air for optional, a rear air inlet is standard, and an inlet at the bottom is optional.
7. In cases where drain pump is required, it shall have drain pump as standard with pump head 750mm

C. Fan

1. The indoor fan shall be an assembly with a multi-blade cross-flow fan direct driven by one motors.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of three speeds, Low, Mid, and High.
4. The static pressure should be 5Pa.

D. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

E. Coil

1. The indoor coil shall be of nonferrous construction with slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The Fins of coil are coated hydrophilic paints.
7. Both refrigerant lines to the indoor units shall be insulated.

F. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264volts.

G. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.

1.10.8 Wall Mounted Type

A. General:

1. The unit shall be a wall mounted style indoor unit that exposed to mount on the wall and shall have a modulating linear expansion device with 2000 stage. Unit shall be support individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet:

1. The casing shall be artistic for exposed installation, and shall have three different panels for choosing.
2. There shall be a digital display inside the panel.
3. Offering three directions for refrigerant piping connection.
4. There shall be a separate color plate which secures the unit firmly to the wall.
5. The front panel can be removed for easy maintenance access.

C. Fan:

1. The indoor fan shall be an assembly with multi-blade cross-flow fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
4. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
5. The indoor fan shall consist of three speeds, Low, Middle and High speed.

D. Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with Slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The fins of coil are coated hydrophilic paints.
7. Both refrigerant lines to the indoor units shall be insulated.

H. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264volts.

I. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.

1.10.9 Convertible Type

A. General:

1. The unit shall be a convertible style indoor unit that exposed to suspend on the ceiling or mounted on the wall, and shall have a modulating linear expansion device. Unit shall be support individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet:

1. The casing shall be artistic, suitable for exposed installation. And there shall be a digital display on the panel.
2. The front panel and display panel shall have different colors for choosing.
3. Offering three directions for refrigerant piping connection.
4. There shall be a digital display inside the panel.
5. The front panel can be removed for easy maintenance access.

C. Fan:

1. The indoor fan shall be an assembly with multi-blade cross-flow fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).
4. A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.
5. The indoor fan shall consist of three speeds, Low, Middle and High speed.

D. Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with Slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.
5. A condensate pan and drain shall be provided under the coil.
6. The fins of coil are coated hydrophilic paints.
7. Both refrigerant lines to the indoor units shall be insulated.

F. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264volts.

G. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.

1.10.10 Console Type

A. General:

1. The unit shall be a console style indoor unit that exposed to mounted on the lower wall or the floor, and shall have a modulating linear expansion device with 2000 stage. Unit shall be support individual controller, centralized controller or intelligent network control system.
2. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air (Nitrogen Gas) before shipment from the factory.

B. Unit Cabinet:

1. The casing shall be artistic, suitable for exposed installation. And there shall be a digital display on the panel.
2. Offering two air outlet on the up and bottom on the panel. Two air inlet on the left and right on the panel.
3. There shall be a digital display inside the panel.
4. The front panel can be removed for easy maintenance access.

C. Fan:

1. The indoor fan shall be an BLDC fan with five fan speeds to meet different requirement.
2. The fan shall assembly with multi-blade cross-flow fan direct driven by a single motor.
3. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
4. The indoor fan shall consist of three speeds, Low, Middle and High speed.

D. Filter:

1. Return air shall be filtered by means of an easily removable, washable filter.

E. Coil:

1. The indoor coil shall be of nonferrous construction with Slit fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.

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5. A condensate pan and drain shall be provided under the coil.
 6. The fins of coil are coated hydrophilic paints.
 7. Both refrigerant lines to the indoor units shall be insulated.

F. Electrical:

The system shall be capable of satisfactory operation within voltage limits of 198-264volts.

G. Controls:

1. This unit shall use controls provided by Trane to perform functions necessary to operate the system. Please refer to Part 2 of this guide specification for details on controllers and other control options.
2. Units to be equipped with default wireless remote controller. Units shall be equipped with provision to use wired remote controller.
3. The units shall provide a powerful mode for rapid cooling or heating by open two air outlet at the same time.

Part 2 – Controls

2.1 Overview

The TVR Controls Network Solution shall be capable of supporting remote controllers, schedule timers, system controllers, centralized controllers, an integrated web based interface, graphical user workstation, and system integration to Building Management Systems via BACnet ®, LonWorks ® and Modbus .

2.1.1 Electrical

Characteristics General:

The TVR II Controls Solution shall operate at 12VDC. Controller power and communications shall be via a common non-polar communications bus.

Wiring:

Control wiring shall be installed in a system daisy chain configuration from the indoor unit to wired remote controller to indoor units, and to outdoor unit. Control wiring to wired remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

Control wiring for schedule timers, system controllers, and centralized controllers shall be installed in a daisy chain configuration from interface module to interface module, to system controllers, to the power supply. Network wiring shall be R232-R485 connection.

2.1.2 Control Network Solution

The TVR Control Network Solution consists of remote controllers, schedule timers, system controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The TVR II Control Network Solution shall support operation monitoring, scheduling, error monitor, power distribution, personal browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces, Modbus. The below figure illustrates a sample TVR Control Network Solution System Configuration.

2.1.3 Individual Control System

A. Wireless Controller TCONTR05A

1. General

The TCONTR05A can control all kinds of indoor units and shall be white in color with a background light.

2. Function

The TCONTR05A shall:

Can control the indoor unit operations: On/Off, Operation Mode (auto, cool, heat, dry, and fan), temperature set point, fan speed setting, and airflow direction setting, Timer operation, setting indoor address function.

B. Wired Controller TCONTKJR12B

1. General

The TCONTKJR12B shall be capable of controlling each indoor unit independently.

2. Dimensions

The TCONTKJR12B shall 120*120mm in size and grey in color with LCD display.

3. Function

The TCONTKJR12B shall control the following operations:

- On/Off, Operation Mode (auto, cool, heat, dry, and fan), temperature set point, fan speed setting, and airflow direction setting.
- Support a timer on/off, follow me function, economy function.

C. Weekly Timer TCONTCCM04A

1. General

The TCONTCCM04A shall be capable of controlling 1 indoor unit 7-day scheduler.

2. Dimensions

The TCONTCCM04A shall be approximately 120*120mm in size and with a LCD display.

3. Function

The TCONTCCM04A shall control the following operations:

- On/Off, Operation Mode (auto, cool, heat, dry, and fan), temperature set point, and fan speed setting.
- The TCONTCCM04A shall support Weekly Schedule Controller switch indication
- The TCONTCCM04A shall display an error code in the event of system abnormality/error.
- The TCONTCCM04A also have temperature indication, date indication, time indication, period indication, Lock indication, Week indication.
- When a weekly schedule controller is needed, a small 2-cores wire and 3-cores wire should be added. Connect with same color.

2.1.4 Central Control Monitor

A. TCONTCCM03A

1. Connection

The TCONTCCM03A shall be capable of controlling up to 64 indoor units.

2. Dimensions

The TCONTCCM03A shall be approximately 179*119mm in size and white and grey in color with background-light LCD display.

3. Function

- Group control On/Off, Operation Mode (cool, heat, fan), temperature set point, fan speed setting. The centralized controller is a multifunctional device that can control up to 64 indoor units within a maximum connection length of 1,200m. The device

connects to the master outdoor units of TVR newly designed products to simplify and centralize the wiring configuration.

- The centralized controller displays indoor units' working status and error codes.

B. TCONTCCM09A

1. Connection

The TCONTCCM09A shall be capable of controlling up to 64 indoor units.

2. Dimensions

The TCONTCCM09A shall be approximately 179*119mm in size and white and black in color with background-light LCD display.

3. Function

- The TCONTCCM09A shall control the following grouped operations: On/Off, Operation Mode (cool, heat, fan), temperature set point, fan speed setting.
- The TCONTCCM09A can include up to 64 indoor units in the weekly schedule. Users can set up to 4 periods per day, and select the desired running mode and room temperature. The operating object can be a single indoor unit or all the indoor units.
- Centralized controller TCONTCCM09A provides a superior way to manage the indoor units. Users are able to make their own choice from locking the wireless controller, locking the running mode or lock the TCONTCCM09A's keyboard as they wish.
- The control object can be either a single unit or all units, which vastly simplifies the control process. Operation signal feedback ensures that all units are working in the correct mode.
- TCONTCCM09A displays indoor units' working status and error codes so users can easily identify faults via checking the error codes table in the user's manual before contacting a service engineer.

C. TCONTCCM02A

1. Connection

The TCONTCCM02A shall be capable of controlling up to 8 systems; max.32 outdoor units can be centralized monitored.

(1) Central Control Monitor can realize the central control and data query to outdoor units. One outdoor CCM can connect max. 32 outdoor units. And it adopts wire-connecting method communication to realize central control to the outdoor units in the same network.

(2) CCM can communicate with PC through RS485/RS232 converter. One PC can connect max.16 outdoor CCM and 16 indoor CCM. And PC can realize central control to

outdoor units, central control to indoor units, central control to indoor units and outdoor units, management, status query and so on.

(3) The CCM and outdoor units, PC and CCM adopt main-auxiliary response communication. In the network of CCM and outdoor units, CCM is the main unit and outdoor units are the auxiliary units.

2. Dimensions

The TCONTCCM02A shall be approximately 120*120mm in size and white and black in color with background-light LCD display

3. Function

1) QUERY BUTTON

2) PREVIOUS BUTTON

On the query state, push it to query in default the running states of other online air-conditioners.

3) NEXT BUTTON

On the query state, push it to query in default the running states of other online air-conditioners.

Push it to enter into the query state

4) PAGE UP BUTTON

Pushing the PAGE UP button when choosing a online air-conditioner on the query state can display the

Parameters in previous page and this can be cycled

5) PAGE DOWN BUTTON

Pushing the PAGE DOWN button when choosing a online air-conditioner on the query state can display

The parameters in next page and this can be circled.

6) SET BUTTON

Press SET button to enter into Set Page.

7) MODE BUTTON

Pressing MODE button to enter into MODE set, and select circularly between Forced Cooling and OFF state.

8) OK BUTTON

Pressing OK button to confirm all settings and send to the corresponding air-conditioners.

9) LOCK BUTTON

All the other button will not be on controlled anytime when pushing the button, and unlock happens when Push it again.

10) ADDRESS SET BUTTON

In set page, pressing the SET button repeatedly, the address will be increased one by one. When the address is equal 31 and you press once more, the address will restart from 16.

2.1.5 Trane Integrated Management System

1. General

TVR network control software, designed specifically to control TVR systems, is based on a centralized format and dedicated to the complete control and monitoring of all the system's functions. It can be used as a flexible multi-purpose system and applied to a variety of needs, according to the scale, purpose and control method of each building.

2. Function

1. Annual schedule control

2. Up to 4 M-interfaces, 64 refrigerant systems, 1,024 indoor units, and 256 outdoor units can be controlled by one PC.

3. Web Access

4. User friendly operation

5. Central building monitoring and control

6. Lock control (individual controllers)

7. Set temperature limit

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8. Proportional power distribution
 9. Low-load operation indicate
 10. Generate operational history reports (daily, weekly, and monthly)
 11. Fault display & Warning message
 12. Filter replacement reminder
 13. Emergency stop and Alarm signal output

2.1.6 BMS gateway

A. New Lon-works

The new Lonworks gateway has been compliance with LonMark standard. It can connect up to 64 indoor units to the BMS. It realize non-polarity communication, and also the application can be download online.

B. TCONTCCM08A

Contains 4 groups of RS-485 communication ports and be able to connect up to 256 indoor units or 128 outdoor units to the BMS. Be free to connect to the BMS or not. TCONTCCM08A allows users to track units' operational status and change their running parameters on Internet Explorer for maximum control convenience.