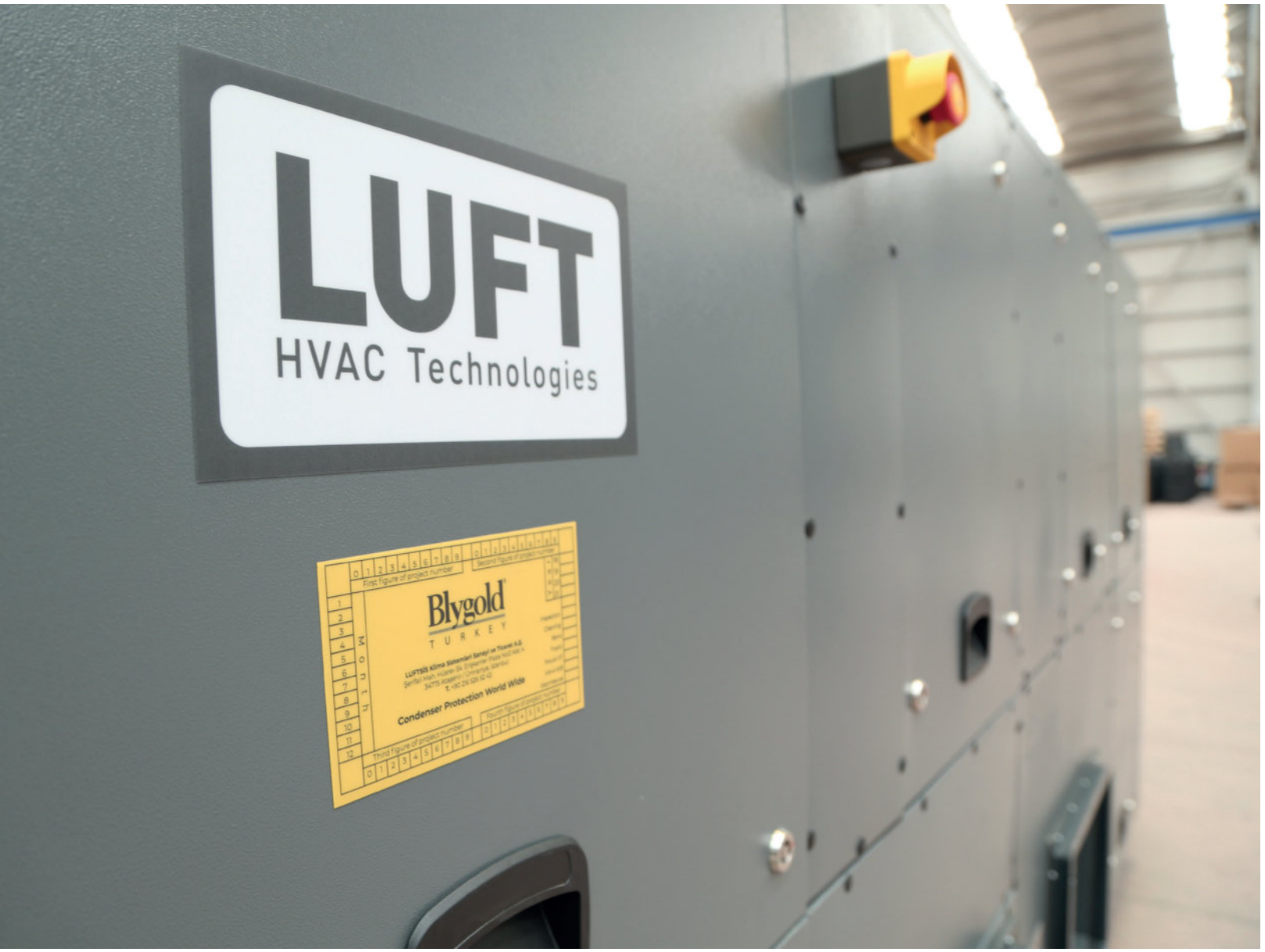
LUFT
HVAC Technologies

LUFT
V-ROOFTOP

VRF Based Rooftop Packaged Airconditioner

25-250 KW
(T1) European and (T3) Middle East Design

www.**luftsis**.com


LUFT
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Condenser Protection World Wide

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About **LUFT**

LUFTSİS A.Ş. manufactures V-ROOFTOP unit and systems under the "LUFT" brand at high technology and in conformance with international standards at its plant in Balıkesir, Turkey with an enclosed manufacturing space of 25,000 m^2 and its R&D center. Utility models and patents of all product designs are registered to Luftsis AŞ.

LUFT V-ROOFTOP unit are designed with innovative technologies and manufacturing standards, on the basis of the "EN 1886 Ventilation for buildings. Air handling units" standard.

The designs were based on the EN 13053, EN 13779 standards, the requirements of "ECO-DESIGN in ventilation units" of the European Union energy commission, and on EUROVENT criteria.

Luftsis A.Ş. is the main implementation distributor of the BLYGOLD corrosion prevension systems of Dutch origin, and has embraced as its vision the manufacturing of durable units with high corrosion resistance for all its products and services.

The software, hardware, and platforms required for LUFT automation and IOT - Internet of Things systems are manufactured by the company in-house. The control and calibration of IOT and Automation systems are carried out by TESTO Ltd. within the framework of the 2020 Strategic collaboration agreement between the two companies.

- **Comfort, Hygiene, and Industrial Modular Air Handling Units**
- Compact Air Handling Units
- **Industrial Paint Shop Air Handling Units**
- Heat Recovery Units
- **Kitchen Ecology Units**
- Packaged Pool De-Humidifier Units

The Lean Manufacturing Method

LUFT V-ROOFTOP unit are manufactured at our Bandırma factory with an indoor area of 25,000 m², based on Lean Manufacturing Techniques. Lean Manufacturing is a manufacturing philosophy which aims to systematically eliminate those activities that consume time and resources during manufacturing processes, but generate no added value in exchange. In the lean manufacturing philosophy, all operations without added value are considered wasteful.

The aim is to eliminate or minimalise this waste. In general terms, these wasteful operations can include defective manufacturing, over-production, inventory, unnecessary work, transportation, motion, and waiting.

According to lean philosophy, all work that does not create value for the customer, or in other words, all work that the customer does not want to pay for should be eliminated or minimised.

__LUFT__ V-ROOFTOP unit manufacturing methods include manufacturing processes planned on the basis of the __Lean Manufacturing Method__. This enables the manufacture of products __that fully meet the customer's requirements__, that are delivered on time, and that have a __maximum price/performance__ value to be manufactured with a minimum waste objective.

Trouble-Free Manufacturing

The objective is to manufacture products without any problems. Defective manufacturing and/or repair of products is wasteful. When a manufactured product does not conform to technical specifications, it must be scrapped. In case of defective manufacturing, the product requires repair. Both result in loss of time and money for companies.

Order-Based Manufacturing

Manufacturing more than the required quantity of products or manufacturing products earlier than needed is wasteful. Manufacturing more than customer demand leads to increasing stocks. Furthermore, more information and documents than are needed, that do not create value for the customer are also a waste of manufacturing.

Minimum Stock

Anything stored in larger quantities than needed for manufacturing is a waste. Stocks of excess raw materials, semi-finished products, and products cause costs to increase due to storage operations, as well as a failure to detect errors in time. Collection of semi-finished products in work stations, and discovering them to be faulty in the subsequent work station causes loss of time and money.

Efficient Operations

The objective is to maintain high efficiency in each work step. Work steps that do not create added value and/or transactions that do not add value for the customer are wasteful. All work carried out during the process of manufacturing the unit and delivering it to the customer should be cleared of unnecessary operations. The complexity of processes should be eliminated as well as excessive control and approval steps.

Minimum Transportation

Transport of unnecessary equipment, raw materials, semi-finished products, and products is wasteful. Unnecessary conveyance of materials and information between locations, excessive transport distances caused by incorrect design of manufacturing space, and circulation of documents frequently and over long distances are among significant items of waste.

Planned Motion

Unnecessary movement of people that are caused by a poorly organized work environment is wasteful. Keeping frequently used materials far from the work space, actions that are not included in the work description, and searching for misplaced files and tools needed in the office environment are a waste of motion.

Zero Waiting Time

Waiting for the machine to finish its task and/or waiting for repairs is wasteful. It is also wasteful to wait for information or wait for a person. The preparation times prior to start of manufacturing are also examples of wasteful waiting.

LUFT V-ROOFTOP unit manufacturing methods include manufacturing processes planned on the basis of the Lean Manufacturing Method. This enables the manufacture of products that fully meet the customer's requirements, that are delivered on time, and that have a maximum price/performance value to be manufactured with a minimum waste objective.

Quality Policy

The **LUFT** V-ROOFTOP unit factory and all manufacturing processes have been certified as meeting all current requirements of ISO 9001 – 2015.

The ISO 9001 standard is the norm regulating the conditions that must be implemented while establishing the Quality Management System, where the enterprise implementing its processes in conformance with the specified conditions are subjected to certification audits.

The ISO 9001 system is reviewed by ISO (The International Organization for Standardization) every 5 years. After the parties reach a decision based on thoughts, opinions, and needs, the standard is published once again with the necessary revisions.

The ISO 14001 Environmental Management System

All products manufactured at the LUFT V-ROOFTOP unit factory are ISO 14001 certified as minimising environmental damage, reducing consumption of natural resources, and constantly improving environmental performance in manufacturing operations within the framework of compliance requirements.

Benefits of the ISO 14001 Environmental Management System:

- Increasing compliance with national and/or international legislation
- Improving environmental performance
- Providing benefits for competition in internal markets
- Improving the company's reputation and market share
- Reducing costs and increasing efficiency through development of cost control
- Reducing events which result in liability through preparedness in the face of emergencies and accidents
- Taking pollution under control starting from the source
- Facilitating the process of acquiring permits and authorizations
- Ensuring acceptance in the global market, since ISO 4001 is a common language that is known and used in the whole world
- The environmental impact of the company's operations and environmental risks can be determined and kept under control, thus reducing factors which have a detrimental effect on the environment.
- Costs resulting from environmental impacts are reduced.
- Compliance with relevant laws and legislation is achieved.
- Environmental effects that can occur during emergencies are reduced or completely eliminated.
- The environmental management system can be demonstrated to be compliant with legislation and regulations to legal authorities by virtue of the ISO 14001 Certificate.
- Environmental awareness of employees increases through training.
- Resources are used efficiently.

ISO 18001 OHSAS

ISO 18001 OHSAS (Occupational Health and Safety System) is used as a tool to systematically address and constantly improve occupational health and safety operations in manufacturing processes of products manufactured in the LUFT air handling unit factory, in accordance with our company's general strategies. With the OHS system, the responsibilities of our employees, management, and auditors have been clearly identified, and the participation of employees was achieved. LUFT has fulfilled these requirements and been awarded ISO 18001 OHSAS certification.

Benefits of the OHSAS 18001 Occupational Health and Safety Management System

- Provides a framework for the management of Occupational Health and Occupational Safety responsibilities
- Employees are trained on occupational health and safety and their awareness of the subjects is raised
- Authorities and responsibilities within the company are identified
- Ensures your compliance with relevant labor laws
- Identifies areas of risks which impact health and safety in your company
- Reduces work accidents, creates a safe work environment
- Plans and procedures are developed for emergencies
- Ensures constant improvement
- Has an international management system
- Provides a better work environment
- Raises efficiency
- Enables demonstrating the company's awareness of occupational safety to authorities

LUFT-Q Quality Brand

All manufacturing processes for LUFT V-ROOFTOP unit are secured under quality processes which can be monitored. The process begins with raw material controls, and concludes with a Field Quality Control performed after the products have been installed on site. Products in projects which have successfully completed this process fulfill the requirements of the LUFT-Q Quality Brand, and are placed within the scope of a full scale warranty for 5 years.

LUFT-Q Quality System

Input Quality Control

All materials used in the manufacturing of LUFT V-ROOFTOP unit have Technical Specifications that meet the requirements of the LUFT-Q Quality Brand. These specifications stipulate all Technical Specifications of the products that are covered by the 5 Year Warranty. Products that do not meet these criteria are not used in LUFT V-ROOFTOP unit. All products are subjected to Input Quality Control on an individual basis before entering the warehouse. Products that fail to meet criteria can not enter the factory.

Input Quality Control Points:

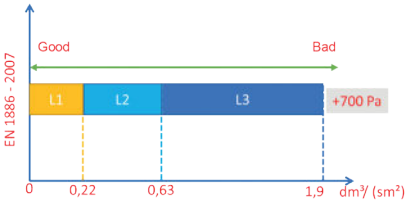
- Check of whether the ordered product has arrived
- Check of whether all of the product's technical specifications have been met
- Quantity check
- Check of physical damage
- Check of mechanical damage
- Check of bill

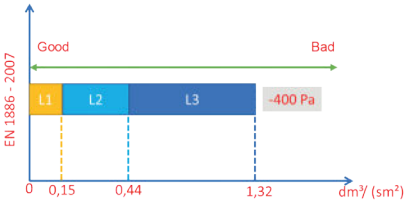
Mechanical Performance Specifications of V-ROOFTOP unit According to EN 1886

Mechanical Strength of Casing

Mechanical strength of the air handling unit frame is measured in terms of deflection (mm/m) at design conditions. This test measures permanent deformation. Products are classified as D1<4<D2<10<D3 (mm/m) according to measured results. D1 is the best class.

Casing Air Leakage

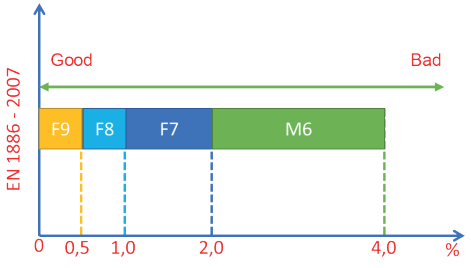




These are tests where the amount of possible air leakage from the air handling unit casing under 400 Pa negative and 700 Pa positive pressure is determined and classified. The classes are L1<0.15<L2<0.44<L3<1.32 (l/sm²) under 400 Pa negative pressure, and L1<0.22<L2<0.63<L3<1.90 (l/sm²) under +700 Pa positive pressure. L1 is the best class.

Filter Bypass Leakage

Classification is made on the basis of the percentage of the air flow passing unfiltered from the air handling unit filter frame under 400 Pa positive pressure to total air flow. The classes are F9<0,5<F8<1<F7<2<F6<4<F5<6 (%k). F9 is the best class.

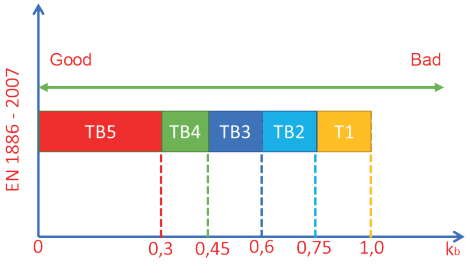


Thermal Transmittance Test

This is the test and classification for determining the thermal transmittance of the air handling unit casing and panel structure. Tests are carried out by maintaining a temperature difference of 20 K between the air handling unit interior and exterior, and a 0.1 m/s air velocity over the exterior surface. The classes are T1<0.5<T2<1<T3<1,4<T4<2<T5. T1 is the best class.

Thermal Bridging Test

This is a test which determines and classifies thermal bridges that may occur between the interior and exterior environment of the air handling unit casing. The calculation is based on those points with the highest temperature on the exterior surface where the temperature difference between the internal and external environment is 20 K. A good class indicates a low condensation risk on the air handling unit casing. The classes are TB5<0.3<TB4<0.45<T- B3<0.6<TB2<0.75<TB1<1. TB1 is the best class.



Process Quality Control

LUFT V-ROOFTOP unit manufacturing stages comprise three main stages which are the Raw Materials Handling Process, Intermediate Product Preparation Process, and the Final Assembly Manufacturing Process. Process Quality Control Procedures have been defined for all these main stages, and their subordinate stages, with controls being implemented at each stage, which prevent the product from entering a subsequent stage in case of any failure to meet criteria. In this way, the manufacturing is completed by achieving the optimum point in the Quality - Time - Cost triangle as the process reaches the end product.

Process Quality Control Points:

- Check of whether sheet metal parts have been manufactured within tolerance limits
- Check of whether semi-finished products have been manufactured within tolerance limits
- Check of whether the fan-motor assembly has been manufactured within tolerance limits
- Check of whether V-ROOFTOP unit sections have been manufactured within tolerance limits
- Check of whether sections have been manufactured in compliance with the directions and technical specifications stated with the order.

Final Quality Control

Products that pass through the Input Quality Control and Process Quality Control points without any problems are checked while they are in operation at the Final Quality Control point. These operational tests check the following points.

- Mechanical checks are conducted on the Fan Motor block.
- Working pressure values are formed, and the current drawn by the air handling unit is checked.
- Vibration balance controls are performed.
- Mechanical checks are conducted on the filter mechanisms.
- V-ROOFTOP unit sections are placed under positive and negative pressure, and checked for air leaks using smoke tests.
- The product's brand and labels are checked.

Process Quality Control

As per the standards of the 5 year warranty of the LUFT-Q Quality Brand, on site installation of all LUFT V-ROOFTOP unit are performed by LUFTSİS A.Ş. teams or teams authorized by LUFTSİS A.Ş. After the installation, both the air handling unit, and the air handling unit support systems installation are checked. Products that complete all these processes without problems are given the LUFT-Q Quality Brand and are covered by a 5 year full range warranty. Field Quality Control Points:

- Check of adequate maintenance clearances required for servicing the unit
- Check of assembly clearances required for air ducts to be connected to air intake and discharge points
- Check of whether the pipework for the conditioned water supplied to heating and cooling systems have been connected properly
- Check of whether the floor on which the unit will be installed is level
- Check of suitability of the system supplying the V-ROOFTOP unit with power
- Check of suitability of the control unit of the V-ROOFTOP unit automation system
- If the unit is equipped with an Electrical Heater, check of whether the suitable safety measures have been taken in the supply system

Operation Process Quality Control

Quality Control Procedures that are to be performed during operational processes must proceed without problems for LUFT-Q 5 year full warranty to continue. The most important point in this process is the timely execution of periodical maintenance, and the spare parts that meet technical values specified in the LUFT-Q Quality Brand.

Unit data are constantly relayed to LUFT IOT platforms over the LUFT Automation and the IOT system, and reports are tracked.

Furthermore, periodical maintenance data are logged on the chip equipped service cards found on unit, and automatic reporting is performed for imminent service times and equipment which need replacing.

Factory Acceptance Test (FAT)

LUFT guarantees that LUFT V-ROOFTOP unit shall be manufactured to meet all customer requests and all project details. To this end, the FAT test is carried out for products when requested, to ensure customer satisfaction. Detailed tests are performed under the following headings as part of the FAT test, and the results are reported.

- Air Flow Rate - External Pressure Test
- Vibration Test
- Test of Materials According to Design and Selection Outputs
- Test of Dimensions of Units According to the Approval File
- Run Test
- Checks of Warning, Information, and Directional Labels
- Packaging and Shipping Checks
- Checks of Accessories and Special Customer Requirements
- Automation System Checks

LUFT V-ROOFTOP

DESIGN DETAILS

LUFT HVAC Technologies

LUFT V-ROOFTOP

DESIGN DETAILS

V-ROOFTOP packaged airconditioners have been design for high efficiency and performance with VRF outdoor unit - AHU - Automation system combination.

Casing Details (EN 18862)

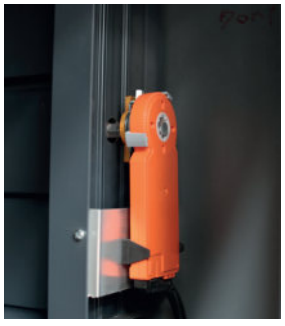
Casing Mechanical Strength	D1
Casing Air Leakage	L1
Filter Bypass Leakage	F9
Thermal Transmittance	T3 (Optional T2)
Thermal Bridging of Casing	TB3 (Optional TB2)
Working Conditions	-25 °C / +52 °C (T1) Europe -25 °C / +55 °C (T3) Middle Eeast

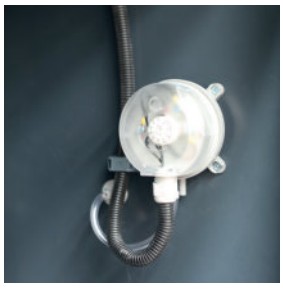
Casing Details Design Features

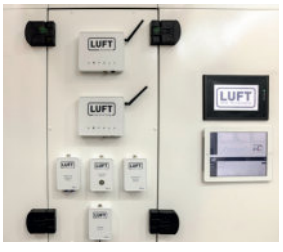
Without Thermal Bridge
Steel Profile Carcass Design
PVC Profile (Optional)
60 mm Panel Thickness
70 kg/m³ Rockwool Insulation

V-ROOFTOP Design Features

Europe (T1) and Middle East (T3) Design
High Cooling EER / Heating COP
High Working Conditions -25°C / +55°C
Vapour Injected DC Inverter Scroll Compressors
Adjustable Evaporation Temperature System
User Friendly Defrost System
Dynamic Oil Control System
2 Stage Sub-Cooling System
Wide Voltage range (± %15)
Automatic Restart Feature
Inverter driven Condenser Fans
Low Noise Nigh mode Feature at condenser fans
80 Pa Available Static Pressure at Condenser Fans
Standard 600 Pa External Static Pressure Supply Fans
F4-H14 Class Wide Range Filters
IOT Internet of Things Sensors and Modules Standard
Remote Wired Controller
Danfoss Frequency Inverters
Siemens Automation System
Siemens 7 inch Touch Screen Control
ModBus ve BacNET Connection
Additional VRF Indoor Units Connection







V-ROOFTOP Design Features

High EER

V-ROOFTOP standard and tropical series have excellent efficiency in cooling and heating T1 and T3 Conditions

180° Sine Wave Control

DC inverter compressor users 180° sine wave vector can-trol technique makes motor operate smooth and increas-es the efficiency. significantly compared with traditional sawtooth wave. it alsa can lower the noise level.

High Efficient Heat Exchanger

Optimized 2 to 1 refrigerant circuit design, increase !he heat exchanging efficiency and enhance !he ratio of liquid which flow !o !he evaporator.

2-stage Sub-cooling Technology

The first stage sub-cooling process due to optimized refrigerant circuit and "Inverse fin type" window fin design.

Wide Operation Range

No matter in hol summer or cold winter, V-ROOFTOP can supply comfortable environment far users.

Wide Voltage Design

In Country with unstable voltage, V-ROOFTOP system stili could run stably.

Changeable ESP

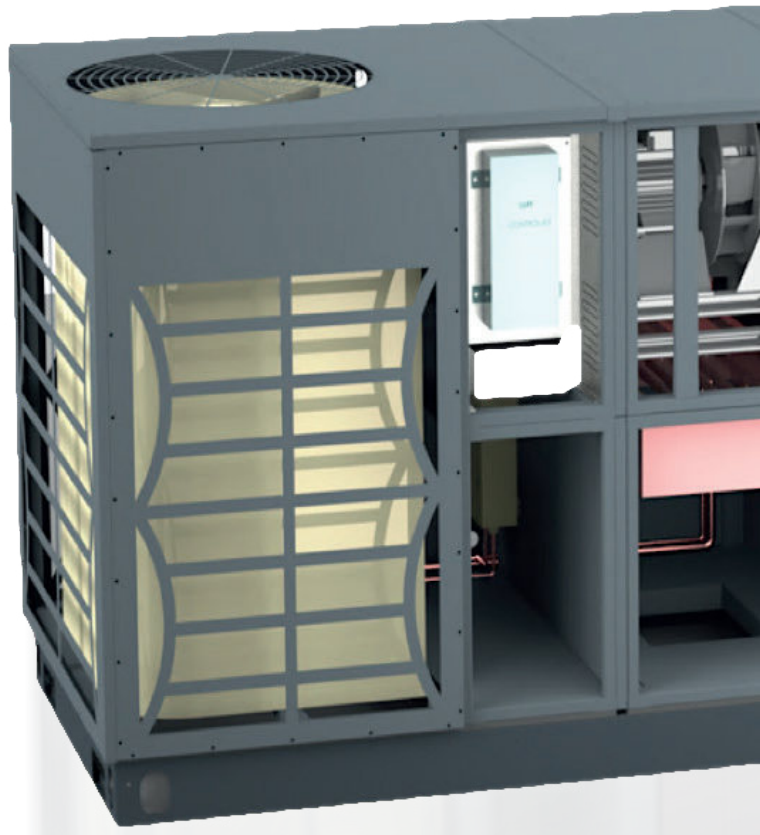
Optimized fan provide outdoor unit up to 80Pa static pres-sure. Units can be installed in !he service floor or facility room.

Silence Operation

By using optimized fan blades and the CFD (computational Fluid Dynamics) technology, the product is equipped with the night low-noise operation function. Provide more quiet operation during the night.

DC Brushless Fan Motor

DC brushless motor adjusts the fan speed according to the system pressure,and running load to enhance the ef-ficiency by 45%. The super aero fan provides a larger air volume and higher static pressure.



Fast Warm Up And Cool Down

The DC Inverter Compressor system reaches full load rapidly providing less temperature fluctuation and an im-proved living environment, bring great user experience.

Precise Temperature Control

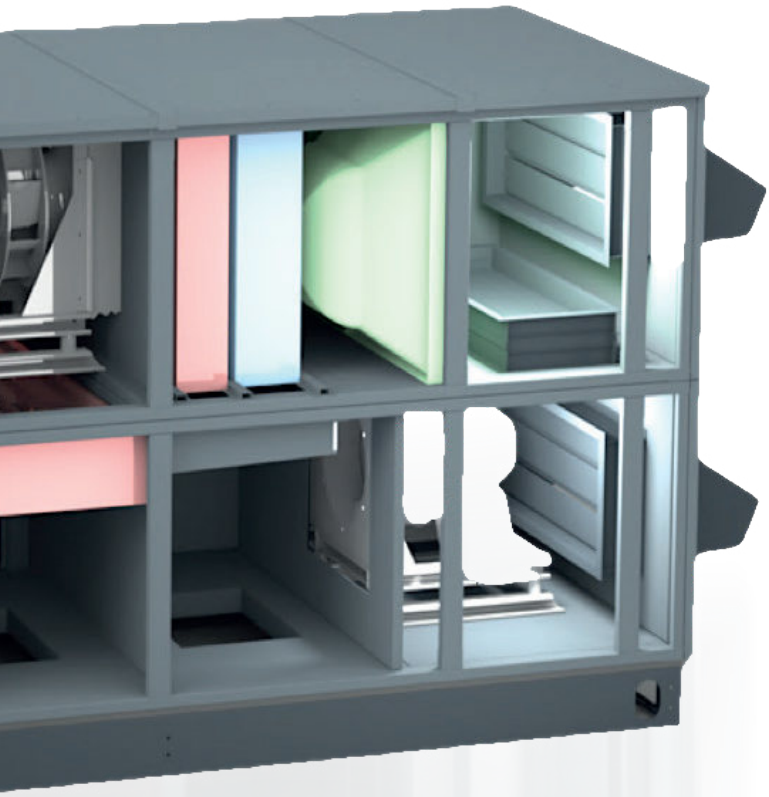
LUFT composite temperature control technology, through the indoor/outdoor operation condition detection, adjust outdoor power output, optimize the indoor air distribution, achieve the high precision adjustment of 0.5° C.

Auto Restart Function

The AC can automatically memorize the operation setting when power is cut off accidentally. It can return to previous setting when power resumes.
Recover the former operation state when power is restored, no need restart the unit manually.

Double Skin Casing Design

60 mm thickness double skin casing design is standard insulaton is 70 kg/m3 density Rockwool. Outer skin is 100 micron powder painted inner skin powder painting is optional.



Filter Section

All type of filters are avaiable (Panel, Bag, Hepa Filters) Filter frame leakage class is F9.

Backup Function

In case of any fail on condenser VRF moduls, other moduls are continue to work as normal.

Auto Snow-Dust Removal

Auto Snow-Dust Removal function is optional far LUFT Tropical series, the outdoor fan can rotate in opposite direction to remove the snow-dust on heat exchanger to ensure the heat exchange performance and the system can operate steadily in severe environment without manual cleaning.

Black BOX Function

Using aviation grade Black BOX technique, memorizing operation parameters before the failure, finding fault information quickly, as an accurate, efficient maintenance services to provide valuable information, maintenance more convenient.

Heatrecovery Section

All Type of Heatrecovery sections could be adopted (Crossflow, Wheel, Heat Pipe, Runaround coil) as optional.

Rain Hoods and Back Draft Damper

Rain Hoods and back draft dampers could be adopted as optional.

Economiser Modul

3 Dampers + Servo motors Thermal or Enthalpy economisers could beadopted as optional.

Functional Wired Remote Controller

Functional wired remote controller is standard with the unit..

Gas Heating

LPG or Natural gas heater is optional between 25 - 250 kW capacity

Side Duct Flange / RoofCurb

Botton and Side duct flanges are standard Roofcurb is optional connection.

High Efficiency Plug Fans

High efficiency plug fans are standard on supply fan, return fan and exhaust fan. Also Danfoss Frequency inverters available as option.

Performance

Model	Unit	LRFT 10	LRFT 12	LRFT 14	LRFT 16	LRFT 18	LRFT 20	LRFT 22	LRFT 24	LRFT 28	LRFT 30	LRFT 32	LRFT 34	LRFT 36	LRFT 38
Nominal NET Cooling Capacity (1)	kW	27	32	38	43	48	54	59	65	77	82	87	92	97	102
	Ton	7,7	9,1	10,9	12,3	13,7	15,3	16,8	18,3	21,8	23,3	24,6	26,2	27,7	29,1
Nominal Current Cooling (11)	A	21	29	34	39	43	50	61	57	67	72	78	84	95	100
Nominal Power Input (Cooling) (2)	kW	8,1	10,8	12,9	14,9	16,3	19,1	23,3	21,5	25,6	27,4	29,8	32,0	36,2	38,1
Cooling EER (3)		4,58	3,95	4,04	3,81	3,99	3,65	3,25	3,95	4,04	3,91	3,81	3,80	3,52	3,47
Total Unit EER (4)		3,35	2,97	2,98	2,90	2,96	2,82	2,54	3,00	2,99	2,98	2,91	2,88	2,69	2,69
Nominal NET Heating Capacity (5)	kW	29	35	42	47	52	58	64	69	83	88	93	100	106	111
	Ton	8,3	9,9	11,8	13,3	14,9	16,5	18,2	19,7	23,6	25,0	26,5	28,3	30,0	31,4
Nominal Current (Heating) (6) (11)	A	18,9	23,0	29,5	33,9	40,5	46,3	52,1	45,5	58,8	62,5	67,6	75,9	81,9	85,8
Nominal Power Input (Heating) (7)	kW	7,2	8,7	11,2	12,9	15,4	17,6	19,8	17,3	22,3	23,7	25,7	28,8	31,1	32,6
Total Unit COP (8)		4,05	3,98	3,71	3,62	3,40	3,30	3,23	4,02	3,72	3,71	3,64	3,46	3,39	3,39
Unit Power Supply		380~415V/3Ph/50Hz													
Amount of Refrigerant	kg	10,5	14,7	14,7	14,7	16,8	16,8	16,8	29,4	29,4	29,4	29,4	31,5	31,5	31,5
Number of Compressors	QTY	1	1	1	1	2	2	2	2	2	2	2	3	3	3
Compressor Type		Vapor Injected DC SCROLL INVERTER													
Number of Supply Fan	QTY	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supply Fan Type		Plug Fan													
Nominal Supply Fan Air Flow (10)	m³/h	5000	6000	7000	8000	8850	9850	11000	11750	13750	15000	15750	16650	17750	18650
Supply Fan external Static Pressure	Pa	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Supply Fan Motor Power	kW	3	4	4	4	5,5	5,5	5,5	5,5	7,5	7,5	7,5	11	11	11
Number of Condenser Fan	QTY	1	1	2	2	2	2	2	2	4	4	4	4	4	4
Condenser Fan Type		DC Axial Fan													
Condenser Fan Air Flow	m³/h	12000	12000	14000	14000	16000	16000	16000	24000	28000	28000	28000	30000	30000	30000
Condenser Fan Motor Power	W	950	950	550x2	550x2	550x2	550x2	550x2	950x2	550x4	550x4	550x4	550x4	550x4	550x4
Length	mm	5250	5250	5275	5350	5500	5175	5175	5225	5575	5550	5550	5750	5675	5650
Width	mm	1038	1038	1344	1344	1344	1650	1650	1956	1956	1956	1956	1956	1956	2262
Height	mm	2136	2136	2136	2136	2136	2136	2136	2136	2136	2748	2748	2748	2748	2748
Net Weight	kg	1815	1830	2115	2115	2280	2430	2430	2860	3030	3230	3230	3495	3495	3695
Sound Pressure Level (9)	dB(A)	61	61	64	64	66	66	66	61	64	64	64	66	66	66

*(1) Indoor Temperature 27 °C DB / 19 °C WB; Ambient Temperature 35 °C DB / 24 °C WB conditions apply. Supply fan heat gains added.
*(2) *(4) It is the sum of VRF condensing unit Compressor Power + Condenser fan motor + Supply fan power at nominal (1) values.
*(3) At nominal (1) values, VRF is the outdoor unit EER Value.
*(5) Indoor Temperature 20 °C DB; Outdoor Temperature 7 °C DB/ 6 °C WB conditions apply. Supply fan heat gains added.
*(6) *(7) It is the sum of VRF condensing unit Compressor Power + Condenser fan motor + Supply Air fan power at nominal (5) values.
*(8) At nominal (5) values, it is the total COP value of the unit.
*(9) It is the dB(A) value at maximum capacity and load at rated conditions. Night mode sound level is -3 dB(A).
*(10) Nominal air flow can be adjusted between 70-110% with the Frequency Inverter option.
*(11) The rated current values are specified for 380 V. In case of 415 V use, the current values are 8.4% lower.

Performance

Model	Birim	LRFT 40	LRFT 44	LRFT 48	LRFT 50	LRFT 52	LRFT 56	LRFT 60	LRFT 62	LRFT 66	LRFT 68	LRFT 70	LRFT 74	LRFT 78	LRFT 82	LRFT 88
Nominal NET Cooling Capacity (1)	kW	108	118	130	135	140	151	161	166	177	183	189	199	203	220	235
	Ton	30,6	33,6	36,9	38,3	39,8	42,8	45,7	47,3	50,2	51,9	53,6	56,5	57,7	62,4	66,8
Nominal Current Cooling (11)	A	101	123	118	122	131	136	166	164	187	173	184	193	201	228	251
Nominal Power Input (Cooling) (2)	kW	38,5	46,6	44,7	46,3	49,8	51,6	62,9	62,5	71,0	65,8	70,0	73,5	76,5	86,7	95,2
Cooling EER (3)		3,65	3,25	3,81	3,87	3,75	3,86	3,39	3,50	3,25	3,76	3,65	3,59	3,63	3,35	3,25
Total Unit EER (4)		2,80	2,54	2,90	2,91	2,81	2,92	2,55	2,66	2,49	2,78	2,69	2,71	2,65	2,53	2,47
Nominal NET Heating Capacity (5)	kW	116	128	140	146	152	163	175	181	192	199	206	216	223	239	257
	Ton	33,0	36,3	39,8	41,5	43,2	46,3	49,8	51,3	54,7	56,6	58,6	61,4	63,3	68,0	72,9
Nominal Current (Heating) (6) (11)	A	93,4	104,3	101,6	108,6	116,4	126,8	141,9	147,3	159,6	153,0	162,5	169,6	180,4	195,4	214,1
Nominal Power Input (Heating) (7)	kW	35,5	39,6	38,6	41,3	44,2	48,2	53,9	56,0	60,7	58,1	61,8	64,4	68,6	74,3	81,4
Total Unit COP (8)		3,28	3,22	3,63	3,53	3,44	3,38	3,25	3,23	3,17	3,43	3,34	3,35	3,25	3,22	3,16
Unit Power Supply		380~415V/3Ph/50Hz														
Amount of Refrigerant	kg	33,6	33,6	44,1	46,2	46,2	50,4	48,3	50,4	50,4	60,9	63	63	65,1	65,1	67,2
Number of Compressors	QTY	4	4	3	4	4	6	5	6	6	5	6	6	7	7	8
Compressor Type		Vapor Injected DC SCROLL INVERTER														
Number of Supply Fan	QTY	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Supply Fan Type		Plug Fan														
Nominal Supply Fan Air Flow (10)	m³/h	19750	21500	23500	24500	25500	27500	29500	30500	32300	33250	34500	36500	38250	40250	43000
Supply Fan external Static Pressure	Pa	600	600	600	600	600	600	600	600	600	600	600	600	600	600	600
Supply Fan Motor Power	kW	11	11	15	15	15	15	15	18,5	18,5	18,5	18,5	22	22	30	30
Number of Condenser Fan	Adet	4	4	6	6	6	6	6	6	6	8	8	8	8	8	8
Condenser Fan Type		DC Axial Fan														
Condenser Fan Air Flow	m³/h	32000	32000	42000	44000	44000	48000	46000	48000	48000	58000	60000	60000	62000	62000	64000
Condenser Fan Motor Power	W	550x4	550x4	550x6	550x6	550x6	550x6	550x6	550x6	550x6	550x8	550x8	550x8	550x8	550x8	550x8
Length	mm	5650	5675	5725	7050	7050	7000	7100	7050	7100	7100	7100	7100	7200	7275	7200
Width	mm	2262	2262	2568	2568	2568	2262	2568	2568	2568	2874	2874	2874	3180	3180	2874
Height	mm	2748	2748	2748	2748	2748	3360	3360	3360	3360	3360	3360	3360	3360	3360	3972
Net Weight	kg	3760	3760	4245	4810	4810	4940	5375	5440	5440	5975	6040	6100	6455	6505	6570
Sound Pressure Level (9)	dB(A)	66	64	61	64	64	66	66	66	66	61	64	64	64	66	66

Luftsis A.Ş. due to its R&D policy, it reserves the right to change the design and technical features of the devices without prior notice.

*(1) Indoor Temperature 27 °C DB / 19 °C WB; Ambient Temperature 35 °C DB / 24 °C WB conditions apply. Supply fan heat gains added.
*(2) *(4) It is the sum of VRF condensing unit Compressor Power + Condenser fan motor + Supply fan power at nominal (1) values.
*(3) At nominal (1) values, VRF is the outdoor unit EER Value.
*(5) Indoor Temperature 20 °C DB; Outdoor Temperature 7 °C DB/ 6 °C WB conditions apply. Supply fan heat gains added.
*(6) *(7) It is the sum of VRF condensing unit Compressor Power + Condenser fan motor + Supply Air fan power at nominal (5) values.
*(8) At nominal (5) values, it is the total COP value of the unit.
*(9) It is the dB(A) value at maximum capacity and load at rated conditions. Night mode sound level is -3 dB(A).
*(10) Nominal air flow can be adjusted between 70-110% with the Frequency Inverter option.
*(11) The rated current values are specified for 380 V. In case of 415 V use, the current values are 8.4% lower.

LUFT V-ROOFTOP

SECTION DETAILS

LUFT HVAC Technologies

SECTION DETAILS

Plug Fan Section

The fan section that is formed by combining the Motor, Plug Fan, and Frequen cy Inverter. It does not require a system such as conventional belt and wheel systems for transmission of power from the motor to the fan. The motor is connected directly to the fan bearing. In this way, power transmission losses that occur around 15-20% in conventional belt and wheel systems are reduced to 1-3%.

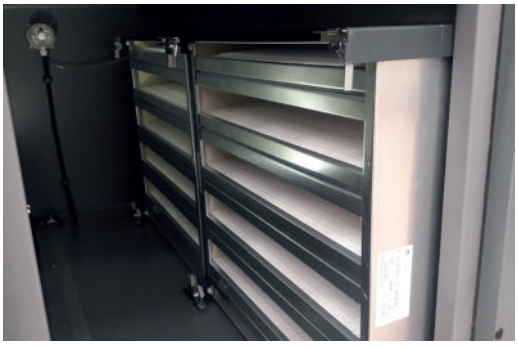
In belt and wheel systems, the proportion of motor rpm to fan rpm can be adjusted via bearing measurements, however, since the motor shaft of plug fan systems is directly coupled to the fan bearing, the motor's rpm is equal to that of the fan. Rpm control is performed by adjusting motor rpm through a frequency inverter.

EC Plug fans ha ve v aried applications such as in general ventilation, comfort air handling units, hygiene air handling units, and industrial air conditioners. They are certainly preferred particularly for hygiene applications where pre-ci-se control and being easy to clean are requirements.

Filter Section

Used for pre-filtration in the V-ROOFTOP unit named as G4 according to the EN 779 standard. Standard filter cross section measurements are 592x592 mm (Full Filter) and 592x287 mm (Half Filter). It has who alternatives with a thick-ness of 48 mm. Care should be taken to ensure that the panel filter has been installed before the air handling unit is commissioned, and the panel filter should be replaced after additional commissioning. The pressure loss calcu-lation is performed as below in accordance with the updated filter standard. Which-ever is the lower of the two values found as a result of the following calculations is accepted as the final pressure loss value of the bag filter.

All type of filters G4 - H14 bag, rigid bag, carbon, hepa filters are avaiable.



The DX / Cooling and Heating Coil Section

The section on units units where heating, cooling, and de-humidification are performed. The structural properties of coils can be listed as the casing, fin surface, collector, exchanger geometry, the number of rows and circuits, and pitch.

VRF Condenser Section

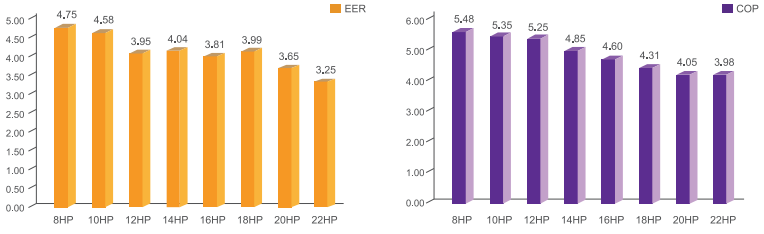
V-ROOFTOP devices; It is designed to operate with high performance, uninterrupted and proportional capacity control in the temperature range of -25 °C / +55 °C. To be able to provide comfort without loss in challenging conditions; It is due to the correctly designed cooling cycle and the high efficiency and high technology of all equipment used.

Since the condenser group is VRF-based, it also carries the features of both high performance and user-friendliness of the VRF system, flexible and easy to use. **V-ROOFTOP Heating capacity is constant and stable in the range of + 7°C / -9.5 °C.**

Condenser Type	High Efficiency Air Cooled U Type
Compressor Type	Vapour Injected DC Inverter Scroll Compressors
Refrigerant	R410A
Capacity Control	Proportional Control %1 each steps (%20-100)
Design Type	Europe (T1) and Middle East (T3) Design
Heat Pump	Standard
Adjustable Evaporating Temp.	Adjustable : Basic, High Efficiency and Turbo
Defrost System	Minimum Time type, without Heating Break
Oil Control System	Dynamic Oil System
SubCooling	2 Stage
Power Input Tolerance	(+-) %15
Automatic Restart	Standard

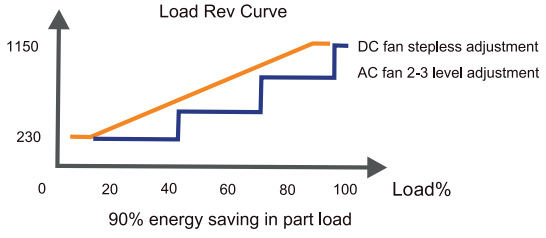
LUFT V-Rooftop VRF-based condenser groups have high heating and cooling efficiency.

EER> 4,75 / COP> 5,48



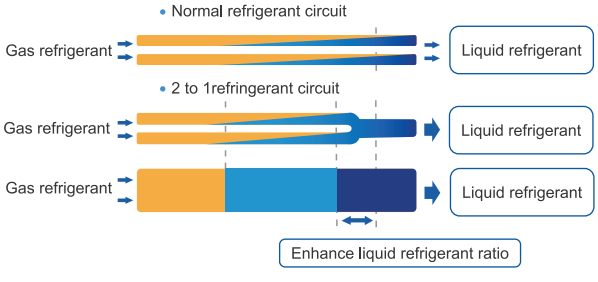
DC Brushless Fan Motor

DC brushless motor adjusts the fan speed according to the system pressure and running load to enhance the efficiency by 45%. The super aero fan provides a larger air volume and higher static pressure.



High Efficient Heat Exchanger

Optimized 2 to 1 refrigerant circuit design, increase the heat exchanging efficiency and enhance the ratio of liquid which flow to the evaporator.



Vapor Injected DC Inverter SCROLL Compressors

Pressure relief valve structure

Improving the partial load efficiency, adap! to thet-ransformer ratio working condition, improving the compressor performance.

Dynamic oil balance structure

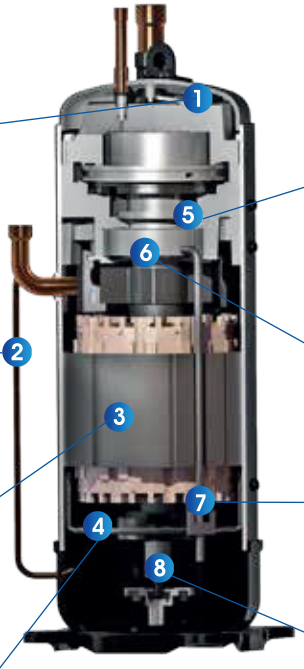
Oil balance tube implementation parallel compres-sor and oil quantity dynamic equilibrium, ensuring the reliability of several paralleled compressors.

High efficiency motor configuration

Using high quality material concentrated stator, cooperate with neodymium magnet rotor, having outstanding efficiency.

High pressure cavity structure

Large exhaust buffer volume,reducing the air flow noise and vibration of the runtime.



The intermediate pressure servo mechanism

According to the operation pressure among dynamic adjusting middle pressure, has realized the axial flexible, optimization of dynamic vortex disk meshing, improve product performance.

High reliability of the bearing

Adopt cylinder bearing and self-aligning ball bearing bearing group, improving the reliability of the compressor.

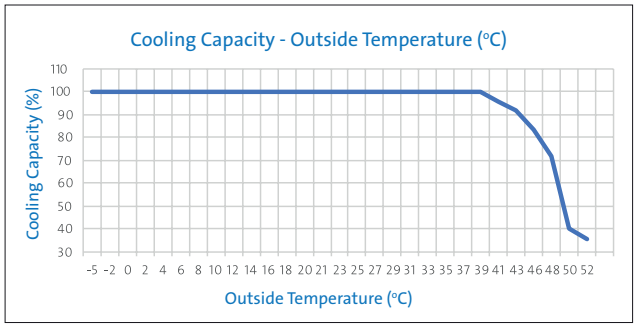
Internal oil circulation structure

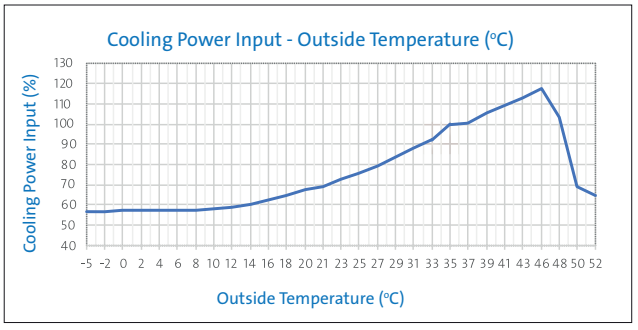
Lubricating oil to achieve internal circulation, reducing heat loss, decreasing the rate of spitting oil, improve the efficiency and reliability.

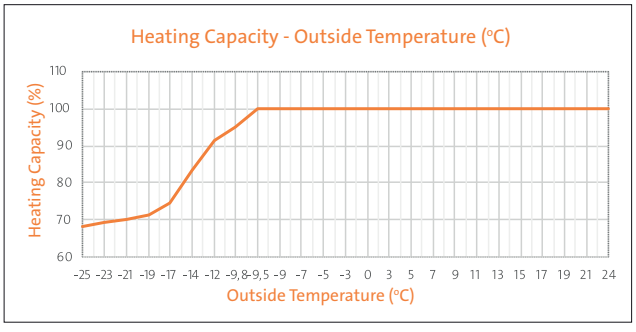
Positive displacement gear oil pump

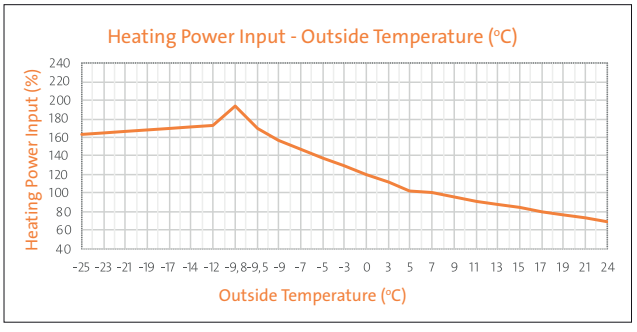
Positive displacement gear oil pump to ensure the high and low frequency can satisfy the oil supply, improving the reliability of the compressor.

High Cooling and Heating Stabile Performance

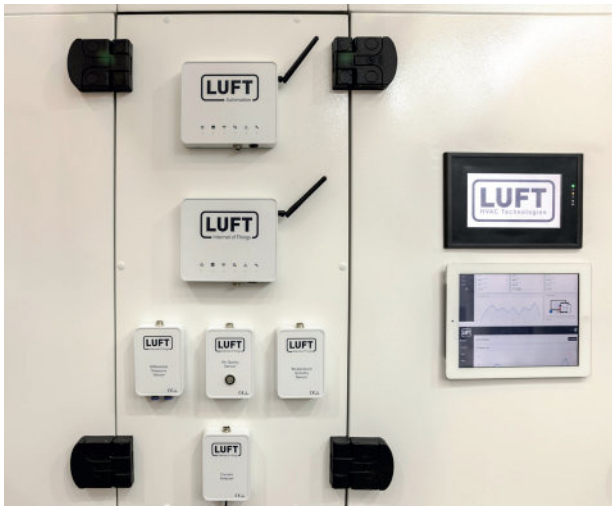








LUFT IOT (Internet of Things) Control and Reporting System



LUFT-IOT Control systems; They are package control systems that include fully controlled automation systems in order to provide the desired environmental conditions in the most efficient way. V-ROOFTOP is produced with LUFT-IOT Control systems according to usage types. It is possible to perform the following controls with LUFT-IOT Control systems. All working data can be followed instantly by connecting to LUFT Automation and IOT devices via bluetooth via smart phones.

- Humidity and Temperature control
- Constant, Variable airflow control
- Filter pollution control
- Proportional capacity control, Fan control
- Timed operation control
- Damper control
- Air quality control
- Fan failure alarm, Engine failure alarm, Filter contamination alarm, Fire alarm, Freeze alarm, Electric heater failure alarm, Vibration alarm
- Defrost Control

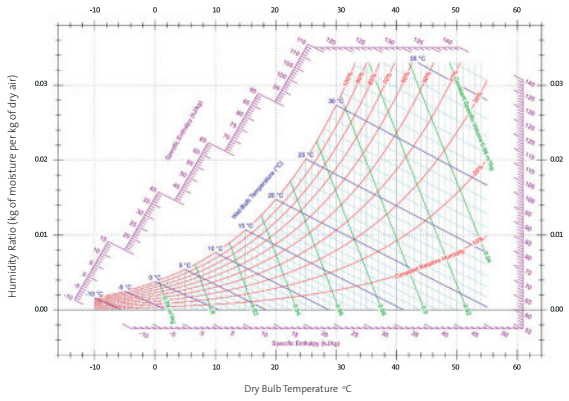
Warranty Conditions

Thanks to the high-performance materials used in the design of V-ROOFTOP products, they have a user-friendly design that will not disrupt the working continuity. Especially with the unique Blygold application used in its materials, high corrosion resistance is very important in terms of both performance and durability of the product.

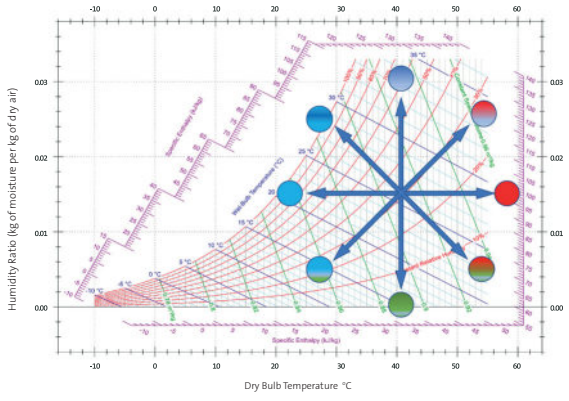
STANDARD UNIT WARRANTY	**2 YEARS**
COMPRESSOR WARRANTY	**5 YEARS**
COROSION WARRANTY	**5 YEARS** (With optional Blygold coating)

Options and Accessories

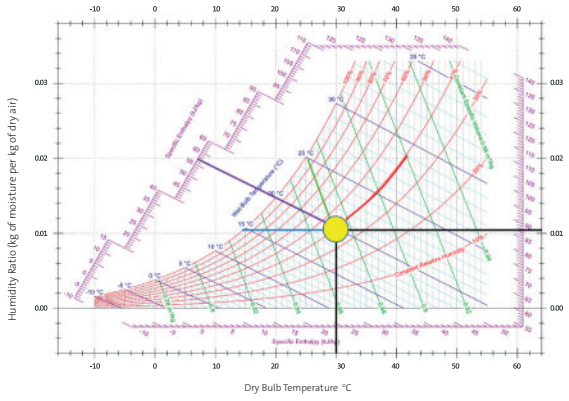
CASING	Double Skin 60 mm Rockwool Insulation	Standard
	Galvanised Sheet + Electrostatic Paint Inner Skin	Option
	Galvanised Sheet + Electrostatic Paint Outter Skin	Standard
	LUFTBOND Cataphoressis Corrosion Protection System	Option
	304 / 316 Stainless Steel Inner and Outter Skin	Option
FILTER	G4 Panel Filter	Standard
	F5 Bag Filter	Option
	F7 Bag Filter	Option
	F9 Bag Filter	Option
	H13 Hepa Filter	Option
	H14 Hepa Filter	Option
COILS	Additional Electric Heater Coil	Option
	Additional Hot Water Heating Coil	Option
	Additional Chilled Water Coil	Option
	LPG-Natural Gas Burner Heater	Option
	Ultraviolet Lamb for Hygiene Applications	Option
	Blygold C5-M Corrosion Protection Coating on Evaporator and Condenser	Option
	Blygold C5-M Corrosion Protection Coating on Metallic Surfaces	Option
	Droplet Eliminator (ABS)	Option
	Droplet Eliminator (Aluminium)	Option
	A304 Stainless Steel Drain Pan	Standart
HEAT RECOVERY	Cross Flow Heatrecovey Section (%45-50 Efficiency)	Option
	Wheel Type (Enthalpy - Sorption) Heatrecovey Section (%60-75 Efficiency)	Option
	Runaround Coil Type Heatrecovery Section (Hygiene Application, Efficiency %45-50) (Pump and Piping are Included)	Option
	3 Dampers + 3 Servomotors Economiser	Option
	3 Dampers + 3 Servomotors Enthalpy Economiser	Option
FAN	Supply Plug Fan + IE3 Motor	Standart
	High Eff. IE3 / IE4 Siemens Electric Motors for Supply / Return Air	Option
	Return Plug Fan (%100)	Option
	Exhaust Plug Fan (%20)	Option
	Proportional Controlled EBM EC Fans	Option
DUCT CONNECTION	Side Duct Kit Connection	Standard
	Bottom Duct Kit Connection	Standard
	Roofcurb	Option
	Rain Hoods	Option
	Back Draft Damper	Option
AUTOMATION	Wired Remote Control	Standard
	Siemens PLC Control and Remote Screen	Option
	Supply Fan Frequency Inverter	Option
	Return Fan Frequency Inverter	Option
	Supply Fan Pressure Control (Variable Air Volume)	Option
	Return Fan Pressure Control (Variable Air Volume)	Option
	Proportional Triac Control For Electric Heater Coil	Option
	Freeze Thermostat for Water Coils	Option
	Fan Vibration Sensor	Option
	Supply Air Temperature Sensor	Option
	Indoor Air Qualty Sensor	Option
	Smoke Sensor	Option
	Filter Differential Pressure Swich (Filter Dirty Alarm)	Standard
	Fan Differential Swich (Fan Working Alarm)	Option
	ModBUS/BacNET Building Automation System Connectivity	Option
	Siemens PLC Automation Panel	Option
	Siemens 7 inch Touchscreen Panel	Option
	Luft IOT Modul (Wifi and GSM Connection) and Sensors	Option



Relative Humidity (%) | Wet Bulb Temperature (oC) | Specific Humidity (kg/kg)
Specific Volume (m3/kg) | Enthalpy (kJ/kg) | Dry Bulb Temperature (oC)



Steam Humidification | Sensible Heating | De-humidification | Sensible Cooling
Heating + Humidification | Chemical Dehumidification | Cooling + Dehumidification | Water Humidifier

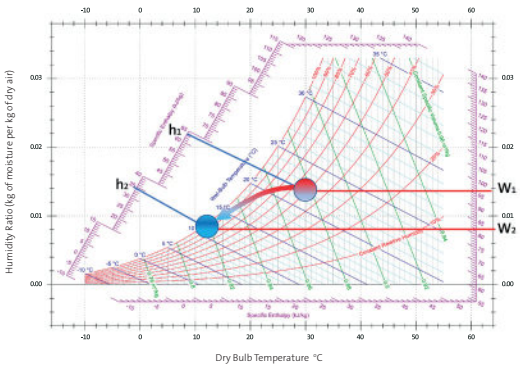


Point Analysis

Determining teh other properties of air using two given properties:

Wet Bulb Temperature= 30 °C
Wet Bulb Temperature= 20 °C

Values Read from the graph:
Relative Humidity= %39,2
Enthalpy= 56,81 kj/kg
Specific Humidity= 0,01042 kg/kg
Specific Volume= 0,873 m³/kg
Dew Point Tempature= 14,6 °C



Cooling Capacity

Q = V x ρ x Δh**W** = V x ρ x Δ**W**

Volumetric Air Flow Rate = 9000 m³/h
Outdoor Air Temperature and Relative Humidity = 30 °C, %50
Desired Discharge Temperature and Relative Humidity = 12,5 °C, %98

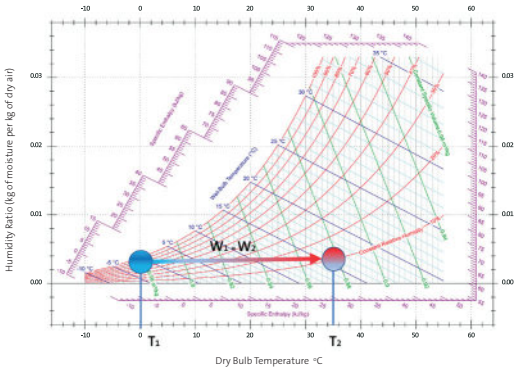
What is required:
- Total actual cooling power
- Actual amount of condensation

Point of Entry:
Enthalpy: 64,32 kj/kg
Specific Humidity: 13,37 g/kg
Specific Volume: 0,877 m³/kg

Point of Exit:
Enthalpy: 34,97 kj/kg
Specific Humidity: 8,88 g/kg

Q= [(9000/3600)/0,877] * (64,32-34,97)
= 83,6 kW Cooling Capacity

W= [(9000/0,877)/1000] * (13,37-8,88)
= 46 kg/h Moisture Removed (Drainage)



Sensible Heating Capacity

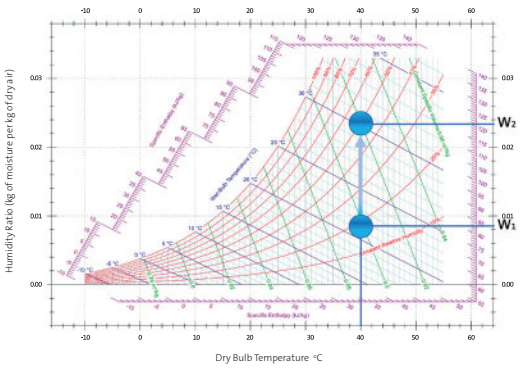
Qd = V x ρ x Cp x ΔT

Volumetric Air Flow Rate = 8000 m³/h
Outdoor Air Temperature and Relative Humidity = 0° C, %85
Desired Discharge Temperature and Relative Humidity = 35° C

What is required:
- Actual Sensible Heating Capacity

Point of Entry:
Specific Volume: 0,778 m³/kg

Qd= [(8000/(3600 * 0,778] * 1,005 * (35-0)
= 100,5 kW Heating Capacity



Steam Humidification

W = V x ρ x Δ**W**

Volumetric Air Flow Rate = 8000 m³/h (2,468 kg/s)
Outdoor Air Temperature and Relative Humidity = 40 °C, %20
Desired Discharge Temperature and Relative Humidity = 40 °C, %50

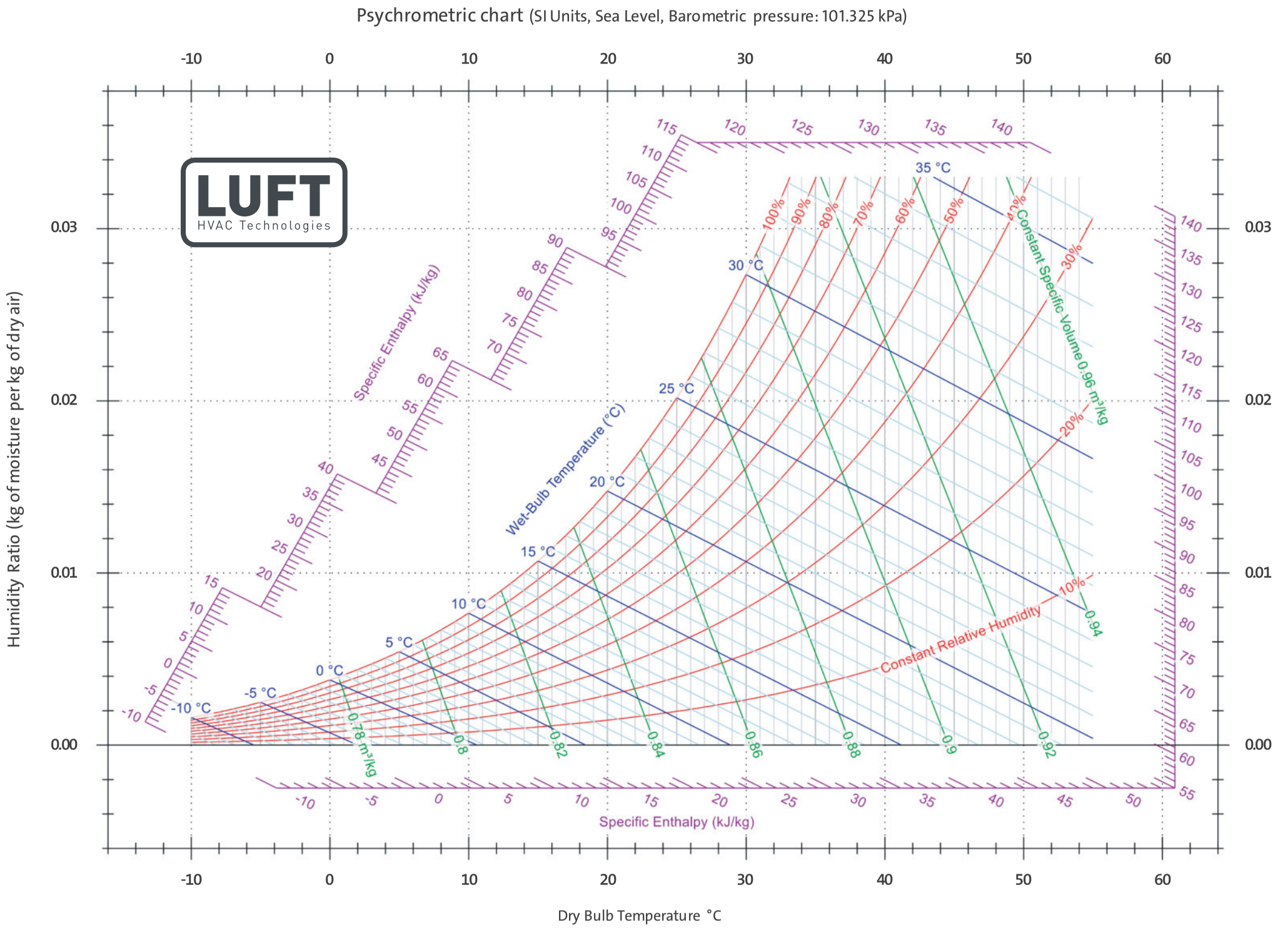
What is required:
- Actual total de-humidification capacity

Point of Entry:
Specific Humidity: 0.00924 kg/kg

Point of Exit:
Specific Humidity: 0,02362 kg/kg

W = 2,468 * 3600 * (0,02362 – 0,00924)

W = 127,76 kg/h Steam Requirement


Psychrometric chart (SI Units, Sea Level, Barometric pressure: 101.325 kPa)
LUFT
HVAC Technologies
Humidity Ratio (kg of moisture per kg of dry air)
Dry Bulb Temperature °C
Specific Enthalpy (kJ/kg)
Wet-Bulb Temperature (°C)
Constant Relative Humidity
Constant Specific Volume 0.96 m³/kg
0.78 m³/kg
-10 °C
-5 °C
0 °C
5 °C
10 °C
15 °C
20 °C
25 °C
30 °C
35 °C
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0.8
0.82
0.84
0.86
0.88
0.9
0.92
0.94

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