Refrigerating air dryer

ACT ES
20 - 500

EN - User's maintenance and spare parts manual

74MD0009B7-EN_00

CE

Dear Customer,

thank you for choosing our product. In order to get the best performances out of this product, please read this manual carefully.

To avoid incorrect operation of the equipment and possible physical risk to the operator, please read and strictly follow the instructions contained in this manual.

Note, these instructions are in addition to the safety rules that apply in the country where the dryer is installed.

Before packing for shipment each **ACT ES** series refrigerated air dryer undergoes a rigorous test to ensure the absence of any manufacturing faults and to demonstrate that the device can perform all the functions for which it has been designed.

Once the dryer has been properly installed according to the instructions in this manual, it will be ready for use without any further adjustment. The operation is fully automatic, and the maintenance is limited to few controls and some cleaning operations, as detailed in the following chapters.

This manual must be maintained available in any moment for future references and it has to be intended as inherent part of the relevant dryer.

Due to the continuous technical evolution, we reserve the right to introduce any necessary change without giving previous notice.

Should you experience any trouble, or for further information, please do not hesitate to contact us.

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1 Identification plate

The identification plate is located on the back of the dryer and shows all the primary data of the machine. This data should always be referred to when calling the manufacturer or distributor. The removal or alteration of the identification plate will void the warranty rights.

2 Warranty conditions

For 12 months from the installation date, but no longer than 14 months from the delivery date, the warranty covers eventual faulty parts, which will be repaired or replaced free of charge, except the travel, hotel and restaurant expenses of our engineer.

The warranty doesn’t cover any responsibility for direct or indirect damages to persons, animals or equipment caused by improper usage or maintenance, and it’s limited to manufacturing faults only.

The right to warranty repairs is subordinated to the strict compliance with the installation, use and maintenance instructions contained in this manual.

The warranty will be immediately voided in case of even small changes or alterations to the dryer. To require repairs during the warranty period, the data reported on the identification plate must be notified.

3 Safety rules

3.1 Definition of the conventional signs used in this manual

Carefully read instruction manual before attempting any service or maintenance procedures on the dryer.

Caution warning sign. Risk of danger or possibility of damage to equipment, if related text is not followed properly.

Electrical hazard. Warning message indicates practices or procedures that could result in personal injury or fatality if not followed correctly.

Danger hazard. Part or system under pressure.

Danger hazard. High temperature conditions exist during operation of system. Avoid contact until system or component has dissipated heat.

Danger hazard. Treated air is not suitable for breathing purposes; serious injury or fatality may result if precautions are not followed.

Danger hazard: In case of fire, use an approved fire extinguisher, water is not an acceptable means in cases of fire.

Danger hazard. Do not operate equipment with panels removed.

Maintenance or control operation to be performed by qualified personnel only [1].

Compressed air inlet connection point

Compressed air outlet connection point

Condensate drain connection point

Operations which can be performed by the operator of the machine, if qualified [1].

NOTE: Text that specifies items of note to be taken into account does not involve safety precautions.

In designing this unit a lot of care has been devoted to environmental protection:

- CFC free refrigerants
- CFC free insulation parts
- Energy saving design
- Limited acoustic emission
- Dryer and relevant packaging composed of recyclable materials

This symbol requests that the user heed environmental considerations and abide with suggestions annotated with this symbol.

[1] Experienced and trained personnel familiar with national and local codes, capable to perform the needed activities, identify and avoid possible dangerous situations while handling, installing, using and servicing the machine. Ensuring compliance to all statutory regulations.

3.2 Warnings

Compressed air is a highly hazardous energy source.
Never work on the dryer with pressure in the system.
Never point the compressed air or the condensate drain outlet hoses towards anybody.

The user is responsible for the proper installation of the dryer. Failure to follow instructions given in the “Installation” chapter will void the warranty. Improper installation can create dangerous situations for personnel and/or damages to the machine could occur.

Only qualified personnel are authorized to service electrically powered devices. Before attempting maintenance, the following conditions must be satisfied:

- Ensure that main power is off, machine is locked out, tagged for service and power cannot be restored during service operations.
- Ensure that valves are shut and the air circuit is at atmospheric pressure. De-pressurize the dryer.

These refrigerating air dryers contain R134a or R407C HFC type refrigerant fluid. Refer to the specific paragraph - maintenance operation on the refrigerating circuit.

Warranty does not apply to any unit damaged by accident, modification, misuse, negligence or misapplication. Unauthorized alterations will immediately void the warranty.

In case of fire, use an approved fire extinguisher, water is not an acceptable means in cases of electrical fire.

3.3 Proper use of the dryer

This dryer has been designed, manufactured and tested for the purpose of separating the humidity normally contained in compressed air. Any other use has to be considered improper.

The Manufacturer will not be responsible for any problem arising from improper use; the user will bear responsibility for any resulting damage.

Moreover, the correct use requires the adherence to the installation instructions, specifically:

- Voltage and frequency of the main power.
- Pressure, temperature and flow-rate of the inlet air.
- Ambient temperature.

This dryer is supplied tested and fully assembled. The only operation left to the user is the connection to the plant in compliance with the instructions given in the following chapters.

The purpose of the machine is the separation of water and eventual oil particles present in compressed air.

The dried air cannot be used for breathing purposes or for operations leading to direct contact with foodstuff.
This dryer is not suitable for the treatment of dirty air or of air containing solid particles.

3.4 Instructions for the use of pressure equipment according to PED directive 2014/68/EU

To ensure the safe operation of pressure equipment, the user must conform strictly to the above directive and the following:

1. The equipment must only be operated within the temperature and pressure limits stated on the manufacturer’s data nameplate.
2. Welding on heat-exchanger is not recommended.
3. The equipment must not be stored in badly ventilated spaces, near a heat source or inflammable substances.
4. Vibration must be eliminated from the equipment to prevent fatigue failure.
5. Automatic condensate drains should be checked for operation every day to prevent a build-up of condensate in the pressure equipment.
6. The maximum working pressure stated on the manufacturer’s data nameplate must not be exceeded. Prior to use, the user must fit safety / pressure relief devices.
7. All documentation supplied with the equipment (manual, declaration of conformity etc.) must be kept for future reference.
8. Do not apply weights or external loads on the vessel or its connecting piping.

TAMPERING, MODIFICATION AND IMPROPER USE OF THE PRESSURE EQUIPMENT ARE FORBIDDEN. Users of the equipment must comply with all local and national pressure equipment legislation in the country of installation.

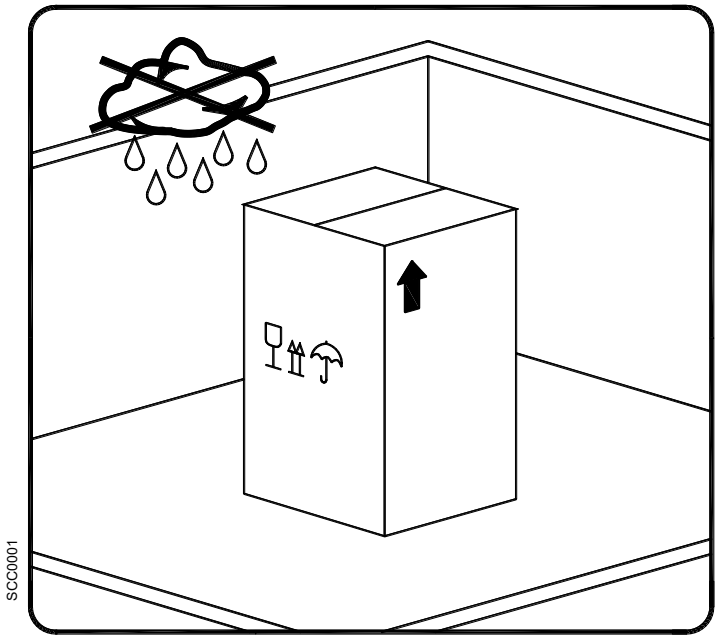
4 Installation

4.1 Transport

Check for visible loss or damage, if no visible damage is found place the unit near to the installation point and unpack the contents.

- To move the packaged unit we recommend using a suitable trolley or forklift truck. Hand carrying is not recommended.
- Always keep the dryer in the upright vertical position. Damage to components could result if unit is laid on its side or if placed upside down.
- Handle with care. Heavy blows could cause irreparable damage.

4.2 Storage



Even when packaged, keep the machine protected from severity of the weather.
Keep the dryer in vertical position, also when stored. Turning it upside down some parts could be irreparably damaged.
If not in use, the dryer can be stored in its packaging in a dust free and protected site at a temperature of +34°F (+1°C) … +122°F (+50°C), and a specific humidity not exceeding 90%. Should the stocking time exceed 12 months, please contact the manufacturer.

The packaging materials are recyclable. Dispose of material in compliance with the rules and regulations in force in the destination country.

4.3 Installation site

Failure to install dryer in the proper ambient conditions will affect the dryer's ability to condense refrigerant gas. This can cause higher loads on the compressor, loss of dryer efficiency and performance, overheated condenser fan motors, electrical component failure and dryer failure due to the following: compressor loss, fan motor failure and electrical component failure. Failures of this type will affect warranty considerations.

Do not install dryer in an environment of corrosive chemicals, explosive gasses, poisonous gasses; steam heat, areas of high ambient conditions or extreme dust and dirt.

In case of fire, use an approved fire extinguisher, water is not an acceptable means in cases of fire.

Minimum installation requirements:

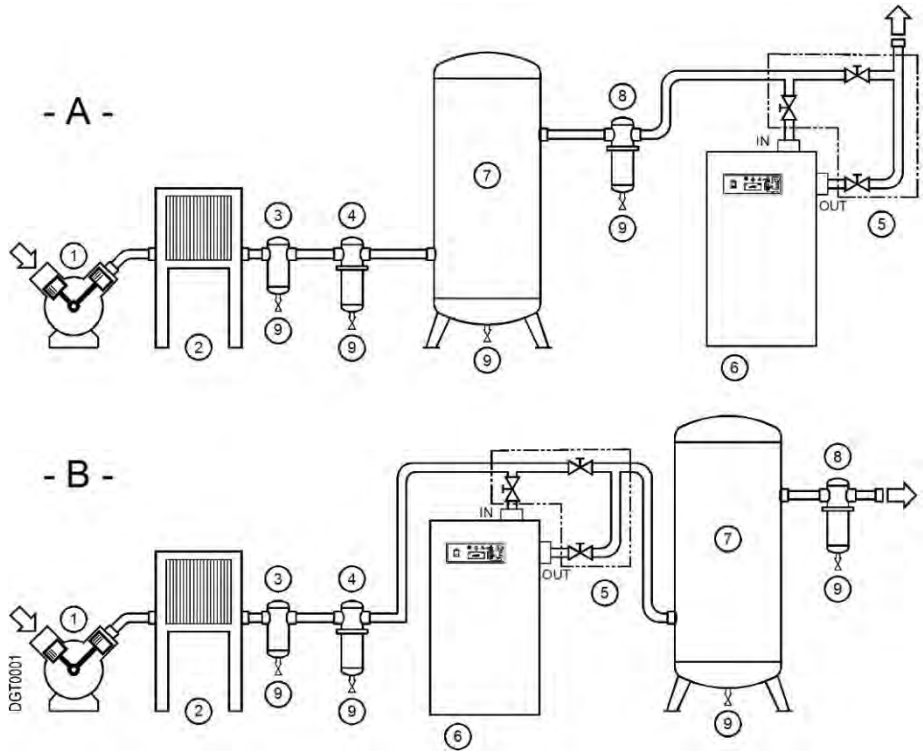
- Select a clean dry area, free from dust, and protected from atmospheric disturbances.
- The supporting area must be smooth, horizontal and able to hold the weight of the dryer.
- Minimum ambient temperature +34°F (+1°C).
- Maximum ambient temperature +122°F (+50°C).
- Ensure a proper cooling air replacement.
- Allow a sufficient clearance on each side of the dryer for proper ventilation and to facilitate maintenance operations.

The dryer does not require attachment to the floor surface.

Do not block, even partially, ventilation grid.
Avoid any possible re-circulation of the exhaust cooling air.
Protect the dryer from air drafts or forced cooling air conditions.

NOTE : Dryers models ACT ES 20 – 75 can be wall-mounted. See fixing dimensions on dimensional drawings in the attachment section.
The hanging mounting inevitably causes the obstruction of the ventilation grid positioned on the panel facing the wall fixing. This obstruction, in any case, does not prejudge the efficiency of the ventilation inside the dryer which is guaranteed by other grids on the other panels.

4.4 Installation layout



1 Air compressor
2 Aftercooler
3 Condensate separator
4 Pre-Filter (min. 5 micron)
5 By-pass group
6 Dryer
7 Compressed air tank
8 Final filter
9 Condensate drain

In case of heavily polluted inlet air (ISO 8573.1 class 3.-.3 or worse quality), we recommend the additional installation of a pre-filter (5 micron minimum) to prevent a clogging of the heat exchanger.

Type A installation is suggested when the compressor operates at reduced intermittence and the total consumption equals the compressor flow rate.

Type B installation is suggested when the air consumption can consistently change with peak values highly exceeding the flow rate of the compressors. The capacity of the tank must be sized in order to compensate eventual instantaneous demanding conditions (peak air consumption).

4.5 Correction factors

Correction factor for operating pressure changes:									
Inlet air pressure	psig	60	80	100	120	140	160	180	203
	barg	4	5.5	7	8	10	11	12	14
Factor (F1)		0.79	0.91	1.00	1.07	1.13	1.18	1.23	1.27

Correction factor for ambient temperature changes :									
Ambient temperature	ºF	≤ 80	90	95	100	105	110	115	122
	ºC	≤ 27	32	35	38	40	43	45	50
Factor (F2)		1.11	1.09	1.06	1.00	0.94	0.87	0.78	0.69

Correction factor for inlet air temperature changes:									
Air temperature	ºF	≤ 90	100	110	122	130	140	150	158
	ºC	≤ 32	38	43	50	55	60	65	70
Factor (F3)		1.16	1.00	0.82	0.68	0.61	0.52	0.45	0.40

Correction factor for DewPoint changes:					
DewPoint	ºF	38	41	45	50
	ºC	3	5	7	10
Factor (F4)		1.00	1.08	1.20	1.36

How to find the air flow capacity:

Air flow capacity = Nominal duty x Factor (F1) x Factor (F2) x Factor (F3) x Factor (F4)

Example:
An **ACT ES 75** has a nominal duty of 75 scfm (127 m³/h). What is the maximum allowable flow through the dryer under the following operating conditions:

Inlet air pressure = 120 psig (8 barg) — Factor (F1) = 1.07
Ambient temperature = 115°F (45°C) — Factor (F2) = 0.78
Inlet air temperature = 122°F (50°C) — Factor (F3) = 0.68
Pressure DewPoint = 50°F (10°C) — Factor (F4) = 1.36

Each item of data has a corresponding numerical factor which multiplied by the design air flow is as follows:

Air flow capacity = 75 x 1.07 x 0.78 x 0.68 x 1.36 = 58 scfm (99 m³/h)

58 scfm (99 m³/h) This is the maximum flow rate that the dryer can accept under these operating conditions.

How to select a suitable dryer for a given duty:

$$\textbf{Minimum std. air flow rate} = \frac{\textbf{Design air flow}}{\textbf{Factor (F1) x Factor (F2) x Factor (F3) x Factor (F4)}}$$

Example:
With the following operating parameters:

Design air flow = 100 scfm (170 m³/h)
Inlet air pressure = 120 psig (8 barg) — Factor (F1) = 1.07
Ambient temperature = 115°F (45°C) — Factor (F2) = 0.78
Inlet air temperature = 122°F (50°C) — Factor (F3) = 0.68
Pressure DewPoint = 50°F (10°C) — Factor (F4) = 1.36

In order to select the correct dryer model the required flow rate is to be divided by the correction factors relating to above mentioned parameters:

$$\textbf{Minimum std. air flow rate} = \frac{\textbf{100}}{\textbf{1.07 x 0.78 x 0.68 x 1.36}} = \textbf{130 scfm (221 m³/h)}$$

Therefore the model suitable for the conditions above is **ACT ES 150** (**150 scfm [255 m³/h]** - nominal duty).

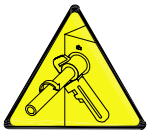
4.6 Connection to the compressed air system

Operations to be performed by qualified personnel only.
Never work on system under pressure.
The user is responsible to ensure that the dryer will never be operated with pressure exceeding the maximum pressure rating on the unit data tag.
Over-pressurizing the dryer could be dangerous for both the operator and the unit.

The air temperature and the flow entering the dryer must comply within the limits stated on the data nameplate. The system connecting piping must be kept free from dust, rust, chips and other impurities, and must be consistent with the flow-rate of the dryer. In case of treatment of air at particularly high temperature, the installation of a final refrigerator could result necessary. In order to perform maintenance operations, it is recommended to install a dryer by-pass system.

In case of heavily polluted inlet air (ISO 8573.1 class 3.-.3 or worse quality), we recommend the additional installation of a pre-filter (5 micron minimum) to prevent a clogging of the heat exchanger.

In realising the dryer, particular measures have been taken in order to limit the vibration which could occur during the operation. Therefore, we recommend to use connecting pipes able to insulate the dryer from possible vibrations originating from the line (flexible hoses, vibration damping fittings, etc.).



CAUTION:
PIPING THE DRYER, INLET/OUTLET CONNECTIONS MUST BE SUPPORTED AS SHOWN IN THE DIAGRAM.
FAILING WILL RESULT IN DAMAGE.

4.7 Electrical connections

Qualified personnel should carry out connecting unit to the main power.
Be sure to check the local codes in your area.

Before connecting the unit to the electrical supply, verify the data nameplate for the proper electrical information. Voltage tolerance is +/- 10%.
Dryer is supplied with power cord and plug (two poles and ground).
Be sure to provide the proper fuses or breakers based on the data information located on the nameplate.
A residual-current device (RCD) with I∆n =0.03A is suggested. The cross section of the power supply cables must comply with the consumption of the dryer, while keeping into account also the ambient temperature, the conditions of the mains installation, the length of the cables, and the requirements enforced by the local Power Provider.

Important: ensure that the dryer is earthed.

Do not use any socket adapters at the mains plug.

If the mains plug needs to be replaced, this must only be done by a qualified electrician.

4.8 Condensate drain

The condensate is discharge at the system pressure.
Drain line should be secured.

Never point the condensate drain line towards anybody.

The dryer comes already fitted with an electronic condensate drainer.
Connect and properly fasten the condensate drain to a collecting plant or container.
The drain cannot be connected to pressurized systems.

Don’t dispose the condensate in the environment.
The condensate collected in the dryer contains oil particles released in the air by the compressor.
Dispose the condensate in compliance with the local rules.
We recommend to install a water-oil separator where to convey all the condensate drain coming from compressors, dryers, tanks, filters, etc.

5 Start-up

5.1 Preliminary operation

Verify that the operating parameters match with the nominal values stated on the data nameplate of the dryer (voltage, frequency, air pressure, air temperature, ambient temperature, etc.).

This dryer has been thoroughly tested, packaged and inspected prior to shipment. Nevertheless, the unit could be damaged during transportation, check the integrity of the dryer during first start-up and monitor operation during the first hours of operation.

Qualified personnel must perform the first start-up.
When installing and operating this equipment, comply with all National Electrical Code and any applicable federal, state and local codes.

Who is operating the unit is responsible for the proper and safe operation of the dryer.
Never operate equipment with panels removed.

5.2 First start-up

This procedure should be followed on first start-up, after periods of extended shutdown or following maintenance procedures.Qualified personnel must perform the start-up.

Sequence of operations (refer to paragraph 7.1 Control Panel).

- Ensure that all the steps of the “Installation” chapter have been observed.
- Ensure that the connection to the compressed air system is correct and that the piping is suitably fixed and supported.
- Ensure that the condensate drain pipe is properly fastened and connected to a collection system or container.
- Ensure that the by-pass system (if installed) is closed and the dryer is isolated.
- Ensure that the manual valve of the condensate drain circuit is open.
- Remove any packaging and other material which could obstruct the area around the dryer.
- Activate the mains switch.
- **ACT ES 200-500 3phase** - Turn on the main switch - pos. A on the control panel.
- **ACT ES 200-500 3phase** - Wait at least two hours before starting the dryer (compressor crankcase heater must heat the oil of the compressor).
- Turn ON the switch - pos. 1 on the control panel.
- Ensure that electronic instrument is ON.
- If the temperature displayed on the electronic instrument is sufficiently high, verify that the refrigerating compressor starts within a few minutes. **NOTE!** – With low temperatures, the refrigerating compressor will remain OFF.
- Ensure the consumption matches with the values of the data plate.
- **ACT ES 200-500 3phase** - Check the rotation direction of the fan – wait for its first interventions.
- Allow the dryer temperature to stabilise at the pre-set value.
- Slowly open the air inlet valve.
- Slowly open the air outlet valve.
- Slowly close the central by-pass valve of the system (if installed).
- Check the piping for air leakage.
- Ensure the drain is regularly cycling - wait for its first interventions.

5.4 Start-up and shut down

ACT ES 200-500 3phase - For short periods of inactivity, (max 2-3 days) we recommend that power is maintained to the dryer and the control panel. Otherwise, before re-starting the dryer, it is necessary to wait at least 2 hours for the compressor crankcase heater to heat the oil of the compressor.

Start-up (refer to paragraph 7.1 Control Panel)

- Check the condenser for cleanliness.
- Turn ON the switch - pos. 1 on the control panel.
- Ensure that electronic instrument is ON.
- If the temperature displayed on the electronic instrument is sufficiently high, verify that the refrigerating compressor starts within a few minutes. **NOTE!** – With low temperatures, the refrigerating compressor will remain OFF.
- Wait a few minutes; verify that the DewPoint temperature displayed on electronic instrument is correct and that the condensate is regularly drained.
- Switch on the air compressor.

Shut down (refer to paragraph 7.1 Control Panel)

- Check that the DewPoint temperature indicated on the electronic instrument is within range.
- Shut down the air compressor.
- After a few minutes, turn OFF the switch - pos. 1 on the control panel.

ACT ES 200-500 3phase - Dryer remote control ON-OFF

- Remove jump on terminals 1 and 2 of the terminal strip and wire a dry contact – potential free (see electric diagram).
- Turn ON the switch - pos. 1 on the control panel.
- Close contact on terminal 1 and 2 switch ON the dryer
- Open contact on terminal 1 and 2 switch OFF the dryer

Use dry contacts only (potential free) suitable for 230 Vac. Assure an adequate isolation of potentially dangerous powered parts.

NOTE : A DewPoint within 32°F (0°C) e +50°F (+10°C) displayed on electronic instrument is correct according to the possible working conditions (flow-rate, temperature of the incoming air, ambient temperature, etc.).

In the ECO operating mode (Energy Saving, ESS=YES – see section 7.12.7), the refigerating compressor is switched ON and OFF by the electronic instrument, according to thermal load applied to the dryer. The dryer must remain ON during the full usage period of the compressed air, even if the air compressor works intermittently.

The number of starts/stops by pressing the ON-OFF switch - pos. 1 of control panel should be limited to 6 per hour.
The dryer must stop running for at least 5 minutes before being started up again.
Frequent starts may cause irreparable damage.
The user is responsible for compliance with these rules.

6 Technical data

6.1 Technical data ACT ES 20 – 200 1/115/60

MODEL ACT ES		20-UP	30-UP	50-UP	75-UP	100-UP	125-UP	150-UP	200-UP
Air flow rate at nominal condition (1)	[scfm]	20	30	50	75	100	125	150	200
	[m3/h]	34	51	85	127	170	212	255	340
	[l/min]	566	849	1415	2123	2830	3538	4245	5660
Pressure DewPoint at nominal condition (1)	[°F (°C)]	38 (3)							
Nominal ambient temperature	[°F (°C)]	100 (38)							
Min...Max ambient temperature	[°F (°C)]	34...122 (1...50)							
Nominal inlet air temperature	[°F (°C)]	100 (38) max.158 (70)							
Nominal inlet air pressure	[psig (barg)]	100 (7)							
Max. inlet air pressure	[psig (barg)]	230 (16)			203 (14)				
Air pressure drop - Δp	[psi (bar)]	0.4 (0.03)	1.0 (0.07)	2.2 (0.15)	2.2 (0.15)	2.0 (0.14)	2.6 (0.18)	3.3 (0.23)	1.7 (0.12)
Inlet - Outlet connections	[NPT-F]	1/2"			1"	1.1/4"			1.1/2"
Refrigerant type		R134.a					R407C		
Refrigerant quantity (2)	[oz (kg)]	6.3 (0.18)	8.1 (0.23)	9.9 (0.28)	12 (0.35)	13 (0.38)	20 (0.58)	21 (0.60)	32 (0.90)
Cooling air fan flow	[cfm (m3/h)]	180 (300)					350 (600)		530 (900)
Heat Rejection	[btu/hr (kW)]	1800 (0.53)	2290 (0.67)	4090 (1.20)	4810 (1.44)	6790 (1.99)	12900 (3.78)	13100 (3.84)	13500 (3.96)
Standard Power Supply (2)	[Ph/V/Hz]	1/115/60							
Nominal electric consumption	[kW]	0.26	0.27	0.39	0.48	0.58	1.00	1.05	1.10
	[A]	2.4	2.5	3.5	4.4	5.2	9.0	9.7	10.1
Full Load Amperage FLA	[A]	4.5		5.3	7.1	8.7	12.5		12.6
Max. noise level at 1 m	[dbA]	< 70							
Weight	[lb (kg)]	64 (29)	68 (31)	75 (34)	79 (36)	82 (37)	101 (46)	110 (50)	121 (55)

(1) The nominal condition refers to an ambient temperature of 100°F (38°C) with inlet air at 100 psig (7 barg) and 100°F (38°C).
(2) Check the data shown on the identification plate.

MODEL ACT ES		20-UE	30-UE	50-UE	75-UE	100-UE	125-UE	150-UE	200-UE	250-UE	300-UE	350-UE	400-UE	500-UE
Air flow rate at nominal condition (1)	[scfm]	20	30	50	75	100	125	150	200	250	300	350	400	500
	[m3/h]	34	51	85	127	170	212	255	340	425	509	594	679	849
	[l/min]	566	849	1415	2123	2830	3538	4245	5660	7075	8490	9905	11320	14150
Pressure DewPoint at nominal condition (1)	[°F (°C)]	38 (3)												
Nominal ambient temperature	[°F (°C)]	100 (38)												
Min...Max ambient temperature	[°F (°C)]	34...122 (1...50)												
Nominal inlet air temperature	[°F (°C)]	100 (38) max.158 (70)												
Nominal inlet air pressure	[psig (barg)]	100 (7)												
Max. inlet air pressure	[psig (barg)]	230 (16)			203 (14)									
Air pressure drop - Δp	[psi (bar)]	0.4 (0.03)	1.0 (0.07)	2.2 (0.15)	2.2 (0.15)	2.0 (0.14)	2.6 (0.18)	3.3 (0.23)	1.7 (0.12)	3.6 (0.25)	1.5 (0.10)	1.9 (0.13)	1.0 (0.07)	1.5 (0.10)
Inlet - Outlet connections	[NPT-F]	1/2"			1"	1.1/4"			1.1/2"		2"		2 1/2"	
Refrigerant type		R134.a					R407C							
Refrigerant quantity (2)	[oz (kg)]	6.3 (0.18)	8.1 (0.23)	9.9 (0.28)	12 (0.35)	13 (0.38)	20 (0.58)	21 (0.60)	32 (0.90)	37 (1.05)	55 (1.55)	56 (1.60)	92 (2.60)	
Cooling air fan flow	[cfm (m3/h)]	180 (300)		240 (400)			350 (600)		530 (900)		1500 (2500)	1550 (2600)	2100 (3500)	
Heat Rejection	[btu/hr (kW)]	1800 (0.53)	2490 (0.73)	3200 (0.94)	4100 (1.20)	6690 (1.96)	12800 (3.75)	13000 (3.81)	13200 (3.87)	17200 (5.04)	20300 (5.95)	26600 (7.80)	27300 (8.00)	27500 (8.06)
Standard Power Supply (2)	[Ph/V/Hz]	1/230/60												
Nominal electric consumption	[kW]	0.19	0.26	0.39	0.48	0.58	1.00	1.05	1.10	1.39	1.64	2.19	2.48	2.50
	[A]	1.1	1.3	2.1	2.7	3.4	4.5	4.8	5.1	6.4	7.6	10.0	11.3	11.4
Full Load Amperage FLA	[A]	1.6	2.3	2.7	3.6	4.9	7.3		7.4	8.3	10.3	14.0	15.0	
Max. noise level at 1 m	[dbA]	< 70												
Weight	[lb (kg)]	62 (28)	64 (29)	75 (34)	79 (36)	82 (37)	101 (46)	110 (50)	121 (55)	139 (63)	203 (92)	207 (94)	331 (150)	355 (161)

(1) The nominal condition refers to an ambient temperature of 100°F (38°C) with inlet air at 100 psig (7 barg) and 100°F (38°C).

(2) Check the data shown on the identification plate.

6.3 Technical data ACT ES 200 – 500 3phase 3/460/60

MODEL ACT ES		200-UR	250-UR	300-UR	350-UR	400-UR	500-UR
Air flow rate at nominal condition (1)	[scfm]	200	250	300	350	400	500
	[m3/h]	340	425	509	594	679	849
	[l/min]	5660	7075	8490	9905	11320	14150
Pressure DewPoint at nominal condition (1)	[°F (°C)]	38 (3)					
Nominal ambient temperature	[°F (°C)]	100 (38)					
Min...Max ambient temperature	[°F (°C)]	34...122 (1...50)					
Nominal inlet air temperature	[°F (°C)]	100 (38) max.158 (70)					
Nominal inlet air pressure	[psig (barg)]	100 (7)					
Max. inlet air pressure	[psig (barg)]	203 (14)					
Air pressure drop - Δp	[psi (bar)]	1.7 (0.12)	3.6 (0.25)	1.5 (0.10)	1.9 (0.13)	1.0 (0.07)	1.5 (0.10)
Inlet - Outlet connections	[NPT-F]	1.1/2"		2"		2.1/2"	
Refrigerant type		R134.a				R407C	
Refrigerant quantity (2)	[oz (kg)]	37 (1.05)	41 (1.15)	60 (1.70)	63 (1.80)	74 (2.10)	81 (2.30)
Cooling air fan flow	[cfm (m3/h)]	1500 (2500)	1650 (2800)		1700 (2900)	2100 (3600)	2200 (3700)
Heat Rejection	[btu/hr (kW)]	13700 (4.02)	14200 (4.16)	14900 (4.37)	18200 (5.33)	24900 (7.30)	32300 (9.47)
Standard Power Supply (2)	[Ph/V/Hz]	3/460/60					
Nominal electric consumption	[kW]	1.22	1.38	1.41	1.80	2.70	2.97
	[A]	1.9	2.1	2.2	2.8	4.2	4.5
Full Load Amperage FLA	[A]	2.8			4.5	6.4	7.4
Max. noise level at 1 m	[dbA]	< 70					
Weight	[lb (kg)]	159 (72)	176 (80)	238 (108)	243 (110)	353 (160)	375 (170)

(1) The nominal condition refers to an ambient temperature of 100°F (38°C) with inlet air at 100 psig (7 barg) and 100°F (38°C).
(2) Check the data shown on the identification plate.

MODEL ACT ES		200-UQ	250-UQ	300-UQ	350-UQ	400-UQ	500-UQ
Air flow rate at nominal condition (1)	[scfm]	200	250	300	350	400	500
	[m3/h]	340	425	509	594	679	849
	[l/min]	5660	7075	8490	9905	11320	14150
Pressure DewPoint at nominal condition (1)	[°F (°C)]	38 (3)					
Nominal ambient temperature	[°F (°C)]	100 (38)					
Min...Max ambient temperature	[°F (°C)]	34...122 (1...50)					
Nominal inlet air temperature	[°F (°C)]	100 (38) max.158 (70)					
Nominal inlet air pressure	[psig (barg)]	100 (7)					
Max. inlet air pressure	[psig (barg)]	203 (14)					
Air pressure drop - Δp	[psi (bar)]	1.7 (0.12)	3.6 (0.25)	1.5 (0.10)	1.9 (0.13)	1.0 (0.07)	1.5 (0.10)
Inlet - Outlet connections	[NPT-F]	1.1/2"		2"		2.1/2"	
Refrigerant type		R134.a				R407C	
Refrigerant quantity (2)	[oz (kg)]	37 (1.05)	41 (1.15)	60 (1.70)	63 (1.80)	74 (2.10)	81 (2.30)
Cooling air fan flow	[cfm (m3/h)]	1500 (2500)	1650 (2800)		1700 (2900)	2100 (3600)	2200 (3700)
Heat Rejection	[btu/hr (kW)]	13700 (4.02)	14200 (4.16)	14900 (4.37)	18200 (5.33)	24900 (7.30)	32300 (9.47)
Standard Power Supply (2)	[Ph/V/Hz]	3/575/60					
Nominal electric consumption	[kW]	1.22	1.38	1.41	1.80	2.70	2.97
	[A]	1.5	1.7	1.8	2.2	3.4	3.6
Full Load Amperage FLA	[A]	2.2			3.6	5.1	5.9
Max. noise level at 1 m	[dbA]	< 70					
Weight	[lb (kg)]	159 (72)	176 (80)	238 (108)	243 (110)	353 (160)	375 (170)

(1) The nominal condition refers to an ambient temperature of 100°F (38°C) with inlet air at 100 psig (7 barg) and 100°F (38°C).

(2) Check the data shown on the identification plate.

7 Technical description

7.1 Control panel

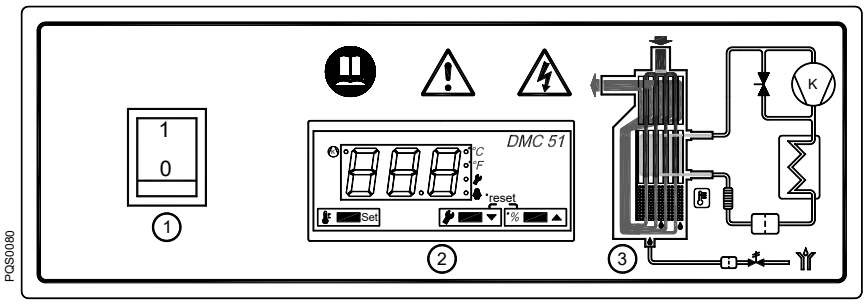
The control panel illustrated below is the only dryer-operator interface.

ACT ES 20 – 100

1 ON-OFF switch

2 Electronic instrument

3 Air and refrigerant gas flow chart

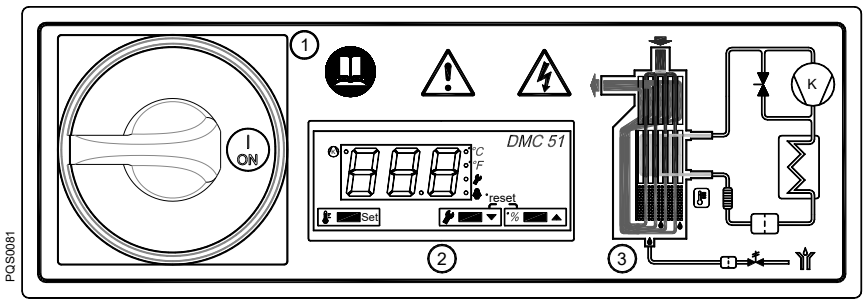


ACT ES 125 – 500

1 ON-OFF switch

2 Electronic instrument

3 Air and refrigerant gas flow chart



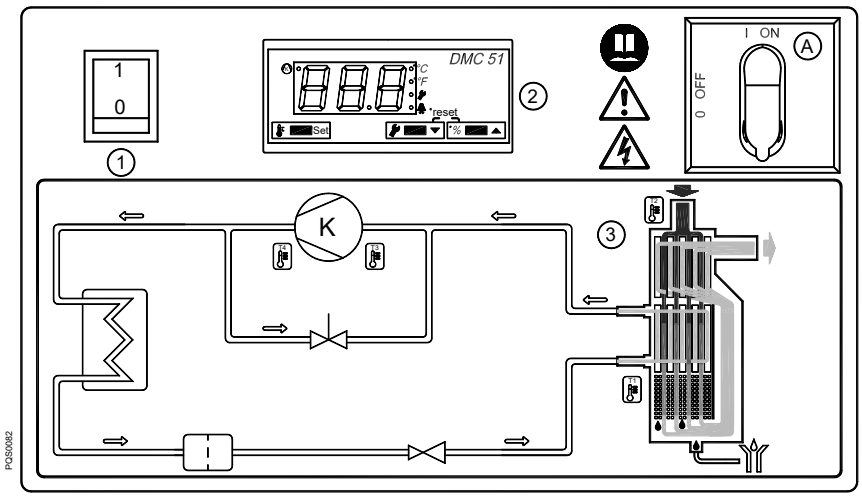
ACT ES 200 – 500 3phase

A Main switch

1 ON-OFF switch

2 Electronic instrument

3 Air and refrigerant gas flow chart



7.2 Operation

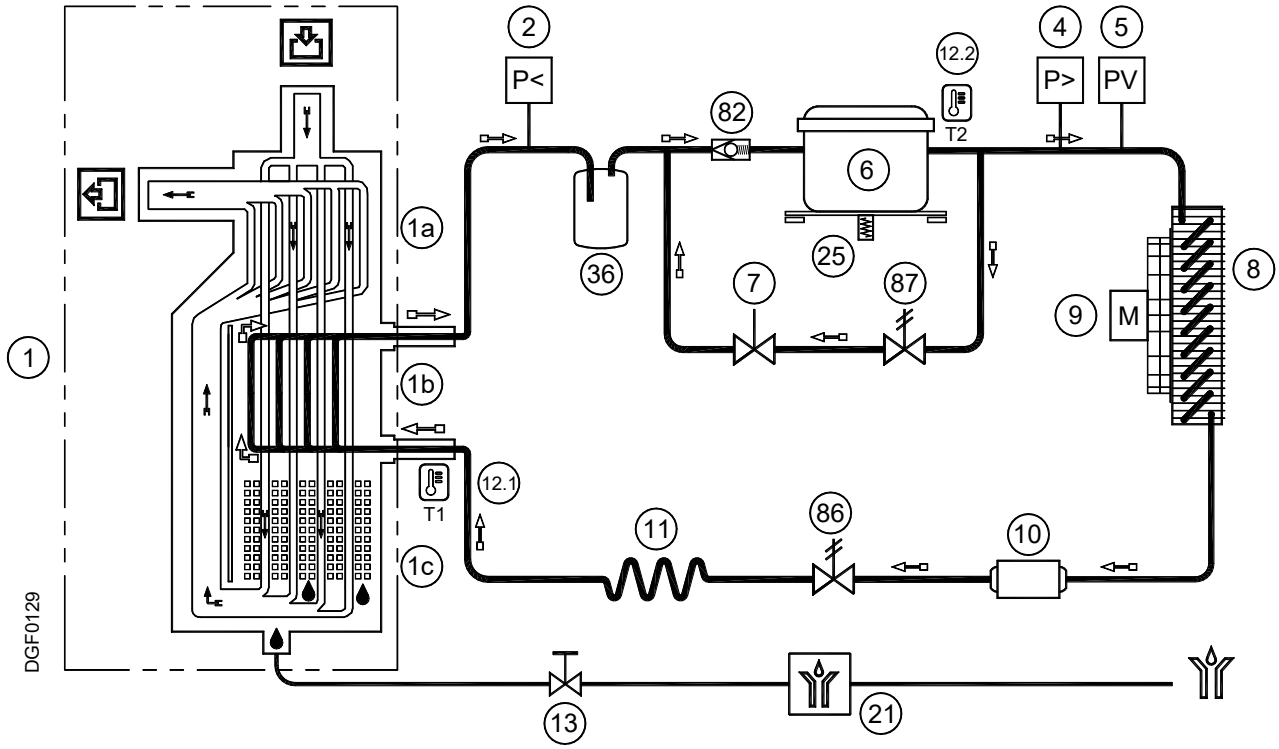
Operating principle - The dryer models described in this manual operate all on the same principle. The hot moisture laden air enters an air to air heat exchanger. The air then goes through the evaporator, also known as the air to refrigerant heat exchanger. The temperature of the air is reduced to approximately 36°F (2°C), causing water vapor to condense to liquid. The liquid is continuously coalesced and collected in the separator for removal by the condensate drain. The cool moisture free air then passes back through the air to air heat exchanger to be reheated to within 46°F (8°C) of the incoming air temperature as it exits the dryer.

Refrigerant circuit - Refrigerant gas is cycled through the compressor and exits at high pressure to a condenser where heat is removed causing the refrigerant to condense to a high-pressure liquid state. The liquid is forced through a capillary tube where the resulting pressure drop allows the refrigerant to boil off at a predetermined temperature. Low-pressure liquid refrigerant enters the heat exchanger where heat from the incoming air is transferred causing the refrigerant to boil; the resulting phase change produces a low pressure, low temperature gas. The low-pressure gas is returned to the compressor, where it is re-compressed and begins the cycle again.

Operation in eco (cycling) mode (Energy Saving, ESS=YES – see section 7.12.7) – The DMC51 electronic controller constantly monitors the temperature of the DewPoint. In low load conditions, the temperature of the DewPoint tends to fall close to the freezing point, at this point the DMC51 controls the switching off of the compressor.
The compressor will be started again when the DewPoint temperature rises above a target value. To avoid an excessive number of cycles, DMC51 keeps the compressor on for a minimum time (about 6 minutes) within which, if necessary, will activate a solenoid valve EVH that enables the operation of the hot gas by-pass valve. In this way the compressor cannot make more than 10 cycles per hour. The solenoid valve EVL and the check valve CHV (where installed) help to extend the off time of the compressor and avoid the immediate balancing of high and low pressures of the refrigerant circuit. The solenoid valve EVL is activated before the compressor to balance the pressures and is kept active for the entire time during which the compressor is on.
With these dryers, the energy consumption will be adjusted closely proportional to the thermal load applied to the dryer itself, allowing considerable energy savings in the majority of applications.

Operation in hot gas by-pass mode (NO Energy Saving, ESS=NO – see section 7.12.7) – The DMC51 electronic controller constantly keep activated the compressor, the solenoid valve EVH and the solenoid valve EVL. In cases of a reduced compressed-air load, the excess refrigerant is bypassed automatically to the compressor via the hot gas bypass valve

7.3 Flow diagram



1 Alu-Dry module
1a Air-to-air heat exchanger
1b Air-to-refrigerant heat exchanger
1c Condensate separator
2 Refrigerant pressure switch LPS (ACT ES 300-500 & ACT ES 200-500 3phase)
4 Refrigerant pressure switch HPS (ACT ES 300-500 & ACT ES 200-500 3phase)
5 Refrigerant pressure switch PV
6 Compressor
7 Hot gas by-pass valve
8 Condenser
9 Condenser fan
10 Filter dryer
11 Capillary tube
12.1 Temperature probe T1 – DewPoint
12.2 Temperature probe T2 Compressor discharge (ACT ES 125-500)
13 Condensate drain service valve
21 Electronic drainer
25 Compressor crankcase heater (ACT ES 200-500 3ph)
36 Suction refrigerant separator
82 Check valve CHV
86 Liquid solenoid valve EVL
87 Hot gas solenoid valve EVH

Compressed air flow direction

Refrigerant gas flow direction

7.4 Refrigerating compressor

The refrigerating compressor is the pump in the system, gas coming from the evaporator (low pressure side) is compressed up to the condensation pressure (high pressure side). The compressors utilized are manufactured by leading manufacturers and are designed for applications where high compression ratios and wide temperature changes are present.
The hermetically sealed construction is perfectly gas tight, ensuring high-energy efficiency and long, useful life. Dumping springs support the pumping unit in order to reduce the acoustic emission and the vibration diffusion. The aspirated refrigerant gas, flowing through the coils before reaching the compression cylinders cools the electric motor. The thermal protection protects the compressor from overheating and over currents. The protection is automatically restored as soon as the nominal temperature conditions are reached.

7.5 Condenser

The condenser is the component in which the gas coming from the compressor is cooled down and condensed becoming a liquid. Mechanically, a serpentine copper tubing circuit (with the gas flowing inside) is encapsulated in an aluminium fin package.
The cooling operation occurs via a high efficiency fan, creating airflow within the dryer, moving air through the fin package. It's mandatory that the ambient air temperature does not exceed the nominal values. It is also important to keep the condenser unit free from dust and other impurities.

7.6 Filter dryer

Traces of humidity and slag can accumulate inside the refrigerant circuit. Long periods of use can also produce sludge. This can limit the lubrication efficiency of the compressor and clog the expansion valve or capillary tube. The function of the filter drier, located before the capillary tubing, is to eliminate any impurities from circulating through the system.

7.7 Capillary tube

It consists of a piece of reduced cross section copper tubing located between the condenser and the evaporator, acting as a metering device to reduce the pressure of the refrigerant. Reduction of pressure is a design function to achieve optimum temperature reached within the evaporator: the smaller the capillary tube outlet pressure, the lower the evaporation temperature.
The length and interior diameter of the capillary tubing is accurately sized to establish the performance of the dryer; no maintenance or adjustment is necessary.

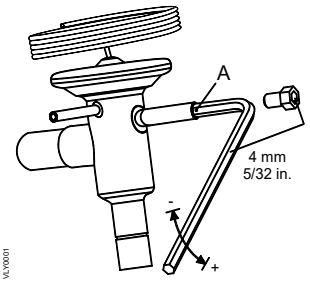
7.8 Alu-Dry module

The heat exchanger module houses the air-to-air, the air-to-refrigerant heat exchangers and the demister type condensate separator. The counter flow of compressed air in the air-to-air heat exchanger ensures maximum heat transfer. The generous cross section of flow channel within the heat exchanger module leads to low velocities and reduced power requirements. The generous dimensions of the air-to-refrigerant heat exchanger plus the counter flow gas flow allows full and complete evaporation of the refrigerant (preventing liquid return to the compressor). The high efficiency condensate separator is located within the heat exchanger module. No maintenance is required and the coalescing effect results in a high degree of moisture separation.

7.9 Hot gas by-pass valve

This valve injects part of the hot gas (taken from the discharge side of the compressor) in the pipe between the evaporator and the suction side of the compressor, keeping the evaporation temperature/pressure constant at approx. +2 °C. This injection prevents the formation of ice inside the dryer evaporator at every load condition.

ADJUSTMENT
The hot gas by-pass valve is adjusted during the manufacturing testing phase. As a rule no adjustment is required; anyway if it is necessary the operation must be carried out by an experienced refrigerating engineer.



WARNING
the use of ¼" Schrader service valves must be justified by a real malfunction of the refrigerating system. Each time a pressure gauge is connected, a part of refrigerant is exhausted.
Without compressed air flow through the dryer, rotate the adjusting screw (position A on the drawing) until the following value is reached:

Hot gas setting:
R134.a pressure 31.9 psig (+ 1.45 / -0 psi) [2.2 barg (+0.1 / -0 bar)]
R407C pressure 68.2 psig (+1.45 / -0 psi) [4.7 barg (+0.1 / -0 bar)]

7.10 Refrigerant pressure switches LPS – HPS – PV

As operation safety and protection of the dryer a series of pressure switches are installed in the gas circuit.

LPS : Low-pressure protection device on the suction side of the compressor, trips if the pressure drops below the pre-set value. The values are automatically reset when the nominal conditions are restored.

Calibrated pressure :	R 134.a	Stop 10.2 psig (0.7 barg) - Restart 24.7 psig (1.7 barg)
	R 407 C	Stop 24.7 psig (1.7 barg) - Restart 39.2 psig (2.7 barg)

HPS : This high-pressure controller device, located on the discharge side on the compressor, is activated when the pressure exceeds the pre-set value. It features a manual-resetting button mounted on the controller itself.

Calibrated pressure :	R 134.a	Stop 290 psig (20 barg) - Manual reset P<203 psi (P<14 bar)
	R 407 C	Stop 435 psig (30 barg) - Manual reset P<334 psi (P<23 bar)

PV : Fan control pressure switch located at the discharge side of compressor. It keeps the condensing temperature/pressure constant within preset limits.

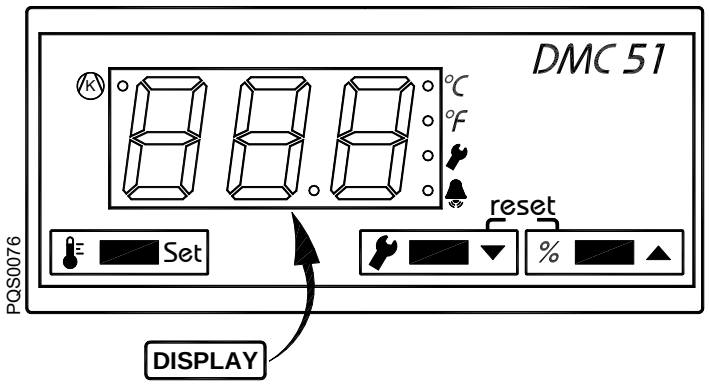
Calibrated pressure :	R 134.a	Start 160 psig (+7.25 / -0 psi) [11 barg (+0.5 / -0 bar)] Stop 116 psig (+0 / -7.25 psi) [8 barg (+0 / -0.5 bar)]
	R 407 C	Start 261 psig (+7.25 / -0 psi) [18 barg (+0.5 / -0 bar)] Stop 203 psig (+0 / -7.25 psi) [14 barg (+0 / -0.5 bar)]

7.11 Compressor crankcase heater

At low temperatures oil can more easily be mixed with the refrigerant gas. So, when the compressor starts, oil can be drawn into the refrigeration circuit and liquid hammering could occur.
To prevent this, an electrical resistance heater is installed in the suction side of the compressor. When the system is powered and the compressor is not running, this heater keeps the oil at the correct temperature.
This heater is controlled by a thermo-switch which prevents overheating the oil.

ACT ES 200-500 3phase - For short periods of inactivity, (max 2-3 days) we recommend that power is maintained to the dryer and the control panel. Otherwise, before re-starting the dryer, it is necessary to wait at least 2 hours for the compressor crankcase heater to heat the oil of the compressor.

7.12 Electronic instrument DMC51



°C	Led - temperature in °C
°F	Led - temperature in °F
K	Led - compressor ON
	Led – Alarm
	Led - service warning
Set	Button – access configuration menu / Discharge temp.
	Button – decrease / service
%	Button – increase / % energy saved

The DMC51 controls the alarms and the settings of the dryer operations.

7.12.1 How to switch on the dryer

Power the dryer and switch it on using the ON-OFF switch (pos. 1 paragraph 7.1).

7.12.2 How to switch off the dryer

Switch it off using the ON-OFF switch (pos. 1 paragraph 7.1).

7.12.3 How to display the operating parameters

During normal operation, the display shows the dew point temperature (in °C or °F).

Led K shows that the compressor is ON.

Press the Set button and keep it pressed to display the compressor discharge temperature (probe T2 if installed).

Press the button and keep it pressed to display the hours remaining until the next maintenance.

Press the Set + buttons simultaneously and keep them pressed to display the total number of operating hours of the dryer (i.e. when dryer is powered).

Press the % button and keep it pressed to display the % of energy saved.

Note: The temperatures are indicated in °C or °F (LED °C or °F is on).
The total operating hours and the hours until the next maintenance is indicated in the field 0...999 hours, and in thousand hours from 1.0 hours onwards (example: when the display shows 35, this means 35 hours and when the display shows 3.5, this means 3,500 hours).
The % of energy saved is calculated considering the running hours of the compressor against the operating hours of the dryer (example: during 10 hours of powered dryer, compressor has run for 4 hours, display shows 60% of energy saved).

7.12.4 How a service warning is displayed

A service warning is an exceptional event and requires the attention of the operator/service technician. <u>The dryer will not be stopped.</u>

When a service warning is active, the Led flashes.

When a service warning is no longer active but not reset yet (so it has been stored) Led is continuously on.
In both cases the display shows the dew point temperature and the service warnings which are active or which are no longer active but not yet reset.
Service warnings are NOT automatically reset.

To **RESET** the service warning, the Led must be continuously on (not flashing), keep pressed simultaneously % + buttons for three seconds. Only the stored service warning will be reset. Service warnings which are still active continue to be indicated by the Led flashing.

NOTE: the operator/service technician must check the dryer and eliminate the problem that caused the service warning.

Service warning	Description
HdP	HdP – High dew point: dew point too high, higher than the adjusted HdS value
LdP	LdP – Low dew point: dew point too low Setting T1< -1°C (30°F) delay five minutes / reset T1> -0.5°C (31°F)
SrU	SrV - Service: maintenance service time expired SrV

7.12.5 How an alarm is displayed

An alarm is an exceptional event which, to avert damage from to the machine and the operator, always leads to the dryer stop.

When an alarm is active, the LED flashes.

When an alarm is no longer active but not reset yet (so it has been stored) Led is continuously on (in any case, the dryer remains OFF).

In both cases the display shows oFF and the alarms which are active or which are no longer active but not yet reset. Alarms are NOT automatically reset.

To **RESET** the alarm, the Led must be continuously on (not flashing), keep pressed simultaneously + buttons for three seconds. Only the stored alarm will be reset. Alarms which are still active continue to be indicated by the Led flashing.

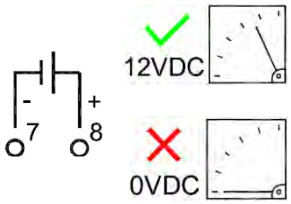
The dryer will start automatically subsequent to the reset of the alarms.

NOTE: the operator/service technician must check the dryer and eliminate the problem that caused the alarm.

Alarm	Description
LP	LP – Low pressure: the refrigerant low-pressure switch LPS has tripped.
Hdt	Hdt – High outlet temperature: compressor outlet temperature outside the safety limit Setting T2> 110°C (230°F) delay one minute / reset T2< 90°C (194°F)
ICE	ICE - ICE / Icing: Temperature in the exchanger (probe T1) is too low and leads to icing of the condensate. Setting T1< -2°C (28°F) delay one minute / reset T1> 0°C (32°F)
toC	toC – Too many Cycles: compressor has been cycled ON/OFF unusually too often (stopped more than 5 times before reaching its minimum ON time)
PF1	PF1 – Probe 1 failure: failure probe T1
PF2	PF2 – Probe 2 failure: failure probe T2

7.12.6 Operation of the service warning / alarm signal

The DMC 51 is equipped with a 12Vdc signal (max 15 mA) to indicate service warning or alarm conditions.



Dryer is switched on; no service warning and no alarm (active and not yet reset) are indicated.

Dryer is off or a service warning or an alarm (active and not yet reset) is indicated.

7.12.7 How to change the operating parameters – SETUP menu

The setup menu can be used to change the dryer's operating parameters.

Only qualified personnel must be allowed to access to the setup menu. The manufacturer is not responsible for malfunctioning or failure due to modification to the operating parameters.

With dryer ON simultaneously press buttons [Set] + [% ▲] for at least 5 seconds to enter the setup menu.

Access to the menu is confirmed by message HdS on the display (first parameter of menu).

Keep [Set] pressed to display the value of the selected parameter and use arrows [▼] and [% ▲] to change the value. Release the button [Set] to confirm the value and skip to following parameter.

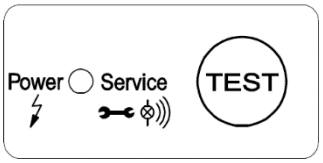
Press [▼] + [% ▲] to exit setup menu (if no button is pressed after 30 seconds the menu is exited automatically).

ID	Description	Limits	Resolution	Standard setup
HdS	HdS - High DewPoint Setting: service warning threshold for a high DewPoint (the service warning disappears when the temperature drop 0.5°C / 1°F below set point)	0.0…25.0 °C or 32 … 77 °F	0.5 °C or 1 °F	20 or 68
Hdd	Hdd - High DewPoint Delay : high DewPoint service warning enable delay	00 … 20 minutes	1 min	15
SrU	SrV - Service Setting: setting of service warning timer. 0.0 = service warning timer disabled.	0.0 … 9.0 (x 1000) hours	0.1 (x1000) hours	8.0
SCL	SCL - Scale: display scale of temperatures.	°C … °F	-	°C or °F
ESS	ESS – Energy Saving Set: selection if dryer run in energy saving cycle. YES = Energy saving mode is active (cycling mode). nO = Energy saving mode is not active (Hot Gas by-pass system)	YES…nO	-	YES

7.13 Electronic drainer

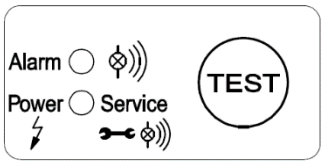
This drainer consists of a condensate accumulator where a capacitive sensor continuously checking liquid level is placed: as soon as the accumulator is filled, the sensor passes a signal to the electronic control and a diaphragm solenoid valve will open to discharge the condensate. For a complete condensate discharge the valve opening time will be adjusted exactly for each single drain operation. No condensate strainers are installed. No adjusting is required. A service valve is installed before the electronic drain in order to make check and maintenance easily. **At dryer start-up verify that this valve is open.**

Control panel for dryers ACT ES 20 – 350 and ACT ES 200 – 350 3phase



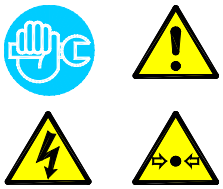
Power / Service Led	Green ON - ready to work / supplied Green blinking – maintenance required Orange ON – Circuit board defect
TEST Button	Discharge test (keep pushed for 2 seconds)

Control panel for dryers ACT ES 400 – 500 and ACT ES 400 – 500 3phase



Power / Service Led (green)	ON - ready to work / supplied Blinking – maintenance required
Alarm Led (red)	Blinking – alarm condition
Power + Alarm Led	ON - circuit board defect
TEST Button	Discharge test (keep pushed for 2 seconds)

Troubleshooting



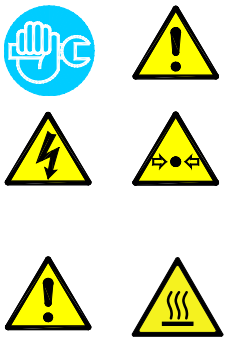
Only qualified personnel should perform troubleshooting and or maintenance operations.
Prior to performing any maintenance or service, be sure that :

- **no part of the machine is powered and that it cannot be connected to the mains supply.**
- **no part of the machine is under pressure and that it cannot be connected to the compressed air system.**
- **maintenance personnel have read and understand the safety and operation instructions in this manual.**

PLEASE REFER TO INSTRUCTION MANUAL OF ELECTRONIC DRAINER

8 Maintenance, troubleshooting, spare parts and dismantling

8.1 Checks and maintenance



Only qualified personnel should perform troubleshooting and or maintenance operations. Prior to performing any maintenance or service, be sure that :

- **no part of the machine is powered and that it cannot be connected to the mains supply.**
- **no part of the machine is under pressure and that it cannot be connected to the compressed air system.**
- **maintenance personnel have read and understand the safety and operation instructions in this manual.**

Before attempting any maintenance operation on the dryer, shut it down and wait at least 30 minutes. Some components can reach high temperature during operation. Avoid contact until system or component has dissipated heat.

Daily

- Verify that the DewPoint displayed on the electronic instrument is correct.
- Check the proper operation of the condensate drain systems.
- Verify the condenser for cleanliness.

Every 200 hours or monthly

- With an air jet (max. 2 bar / 30 psig) blowing from inside towards outside clean the condenser; repeat this operation blowing in the opposite way; be careful not to damage the aluminium fins of the cooling package

- Close the manual condensate drain valve, unscrew the strainer (if installed) and clean it with compressed air and brush. Reinstall the strainer properly tight, and then open the manual valve.
- At the end, check the operation of the machine

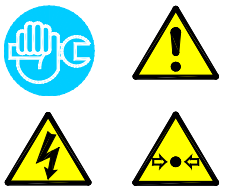
Every 1000 hours or yearly

- Verify for tightness all the screws of the electric system and that all the “Disconnects-Tabs” type connections are in their proper position inspect unit for broken, cracked or bare wires.
- Inspect refrigerating circuit for signs of oil and refrigerant leakage.
- Measure and record amperage. Verify that readings are within acceptable parameters as listed in specification table.
- Inspect flexible hoses, and replace if necessary.
- At the end, check the operation of the machine.

Every 8000 hours

- Replace Electronic drainer service unit

8.2 Troubleshooting



Only qualified personnel should perform troubleshooting and or maintenance operations. Prior to performing any maintenance or service, be sure that:

- **no part of the machine is powered and that it cannot be connected to the mains supply.**
- **no part of the machine is under pressure and that it cannot be connected to the compressed air system.**
- **maintenance personnel have read and understand the safety and operation instructions in this manual.**

Before attempting any maintenance operation on the dryer, shut it down and wait at least 30 minutes. Some components can reach high temperature during operation. Avoid contact until system or component has dissipated heat.

SYMPTOM	POSSIBLE CAUSE - SUGGESTED ACTION
◆ The display of DMC51 is not lit	⇨ Verify that the system is powered. ⇨ Verify the electric wiring. ⇨ If installed – HPS pressure switch has been activated – see specific point ⇨ **ACT ES 200-500 3phase** - Blow of fuse (FU2 on the electric diagram) of the auxiliary circuit - replace it and check the proper operation of the dryer. ⇨ **ACT ES 200-500 3phase** – The remote control is OFF (see contact on terminals 1-2 on electric diagram)
◆ The compressor does not work.	⇨ If ESS=YES (see section 7.12.7) – the Dew Point displayed on DMC51 is sufficiently low, the led is OFF, so the compressor is not active – wait that the temperature becomes higher. ⇨ Activation of the compressor internal thermal protection – wait 30 minutes and then retry. ⇨ Verify the electric wiring. ⇨ If installed – the KC relay is faulty – replace it ⇨ If installed – replace the internal thermal protection and/or the start-up relay and/or the start-up capacitor and/or the working capacitor. ⇨ DMC51 – The led is ON – see specific point. ⇨ If the compressor still does not work, replace it.
◆ If ESS=YES (see section 7.12.7) - The compressor remains OFF unexpected short time.	⇨ The OFF time of the compressor is related to the actual dryer thermal load. If dryer is running in low or no-load conditions and at mild/low ambient temperatures, and the compressor remains OFF for too short time (less than 3-5 minutes), check which of the following reasons is creating the malfunction: 1. The DewPoint probe T1 doesn't correctly detect the temperature - ensure the sensor is pushed into the bottom of probe well. 2. The thermal insulation of DewPoint probe T1 is damaged – restore the thermal insulation 3. The ambient temperature is too high or the room aeration is insufficient - provide proper ventilation. 4. The solenoid valve EVL is not operating correctly - see specific point. 5. If installed - The check valve CHV is jammed (open) - replace it.
◆ The fan of the condenser does not work	⇨ Verify the electric wiring. ⇨ PV pressure switch is faulty - replace it. ⇨ **ACT ES 200-500 3phase** - Blow of fuse (FU1-FU2 on the electric diagram) - replace it and check the proper operation of the dryer. ⇨ There is a leak in the refrigerant circuit – contact a refrigeration engineer. ⇨ If the fan still does not work, replace it.
◆ Dew point too high.	⇨ The compressor does not work – see specific point. ⇨ The DewPoint probe T1 doesn't correctly detect the temperature - ensure the sensor is pushed into the bottom of probe well. ⇨ The ambient temperature is too high or the room aeration is insufficient - provide proper ventilation. ⇨ The inlet air is too hot – restore nominal conditions. ⇨ The inlet air pressure is too low – restore nominal conditions. ⇨ The inlet air flow rate is higher than the rate of the dryer - reduce the flow rate - restore nominal conditions. ⇨ The condenser is dirty – clean it. ⇨ The condenser fan does not work – see specific point. ⇨ The dryer does not drain the condensate – see specific point. ⇨ If ESS=NO (see section 7.12.7) – The hot gas bypass valve is out of setting – contact a refrigeration engineer to restore nominal setting. ⇨ If ESS=YES (see section 7.12.7) – DewPoint on this type of dryer is fluctuating (the compressor turns ON and OFF) and for some periods can reach values higher than normal - wait for the compressor start and the DewPoint will drop to lower temperature. ⇨ The solenoid valve EVL is not operating correctly - see specific point. ⇨ There is a leak in the refrigerant circuit – contact a refrigeration engineer.

SYMPTOM	POSSIBLE CAUSE - SUGGESTED ACTION
◆ Dew point too low with parameter ESS=NO (see sect. 7.12.7)	⇨ The fan is always ON – verify the electric wiring, check the setting of PV pressure switch or PV pressure switch is faulty – replace it. ⇨ The ambient temperature is too low – restore nominal conditions. ⇨ The hot gas bypass valve is out of setting – contact a refrigeration engineer to restore nominal setting.
◆ Dew point too low with parameter ESS=YES (see sect. 7.12.7)	⇨ DewPoint on this type of dryer is fluctuating (the compressor turns ON and OFF) and for some periods can reach values lower than normal - wait until the DewPoint rise to normal temperature. ⇨ The refrigerating compressor is always ON, even though the led OK is OFF – verify the electric wiring or KC relay (if installed) is faulty – replace it.
◆ Excessive pressure drop within the dryer.	⇨ The dryer does not drain the condensate – see specific point. ⇨ The dew point is too low – the condensate is frozen and blocks the air – see specific point. ⇨ If ESS=YES (see section 7.12.7) – The DewPoint probe T1 doesn't correctly detect the temperature and the condensate freeze– ensure the sensor is pushed into the bottom of probe well. ⇨ Check for throttling the flexible connection hoses.
◆ The dryer does not drain the condensate.	⇨ The condensate drain service valve is closed – open it. ⇨ Verify the electric wiring. ⇨ The dew point is too low – the condensate is frozen and blocks the air – see specific point. ⇨ Inlet compressed air pressure is too low and the condensate is not drained – restore nominal conditions ⇨ Electronic drainer is not operating correctly (see paragraph 7.13).
◆ The dryer continuously drains the condensate.	⇨ Electronic drainer is dirty (see paragraph 7.13).
◆ Water within the line.	⇨ If installed - untreated air flows through the bypass unit – close the bypass. ⇨ The dryer does not drain condensate – see specific point. ⇨ Dew point too high – see specific point. ⇨ The compressed air pipeline downstream of the dryer are located at a very low ambient temperature and the remaining humidity in the compressed air is condensing: is required to review the plant compressed air distribution system. ⇨ If ESS=YES (see section 7.12.7) – DewPoint on this type of dryer is fluctuating (the compressor turns ON and OFF). In low ambient temperature condition (winter season) the remaining humidity in the compressed air is condensing. Set ESS=NO (see section 7.12.7)
◆ The internal heat protection of the compressor has been activated	⇨ Check which of the following reasons has caused the activation: 1. Excessive thermal load – restore the standard operating conditions. 2. The inlet air is too hot – restore the nominal conditions. 3. The ambient temperature is too high or the room aeration is insufficient – provide proper ventilation. 4. The condenser unit is dirty – clean it. 5. The fan does not work – see specific point. 6. If ESS=NO (see section 7.12.7) – The hot gas bypass valve is out of setting – contact a refrigeration engineer to restore nominal setting. 7. The solenoid valve EVL is not operating correctly - see specific point. 8. There is a leak in the refrigerant circuit – contact a refrigeration engineer. ⇨ wait 30 minutes and then retry.
◆ The solenoid valve EVL or EVH doesn't operate correctly	⇨ The solenoid valve is not activated and there is no voltage to the coil – verify the electric wiring. ⇨ The solenoid valve is not activated and there is no voltage to the coil – the internal relay of DMC51 is faulty – replace DMC51. ⇨ The solenoid valve is not activated and there is voltage to the coil – the coil is faulty – replace it. ⇨ The solenoid valve is not activated and there is voltage to the coil – the solenoid valve is jammed - contact a refrigeration engineer for the replacement. ⇨ The solenoid valve is always activated and there is always voltage to the coil – verify the electric wiring ⇨ The solenoid valve is always activated and there is always voltage to the coil – the internal relay of DMC51 is faulty – replace DMC51. ⇨ The solenoid valve is always activated and there is no voltage to the coil – the solenoid valve is jammed - contact a refrigeration engineer for the replacement.

SYMPTOM	POSSIBLE CAUSE - SUGGESTED ACTION
◆ If installed: the HPS high-pressure switch has been activated.	⇨ Check which of the following reasons has caused the activation: 1. The ambient temperature is too high or the room aeration is insufficient – provide proper ventilation. 2. The condenser is dirty – clean it. 3. The fan does not work – see specific point. 4. The solenoid valve EVL is not operating correctly - see specific point ⇨ Reset the pressure switch by pressing the button on the switch itself – check the proper operation of the dryer. The HPS pressure switch is faulty – contact a refrigeration engineer for the replacement.
◆ If installed: the LPS low-pressure switch has been activated.	⇨ There is a leak in the refrigerant circuit – contact a refrigeration engineer. ⇨ The solenoid valve EVL is not operating correctly - see specific point ⇨ The solenoid valve EVH is not operating correctly - see specific point ⇨ The hot-gas bypass valve is faulty – contact a refrigeration engineer for the replacement ⇨ The pressure switch reset automatically when normal conditions are restored – check the proper operation of the dryer.
◆ If T2 installed: the alarm HdE (Hdt) compressor outlet temperature too high – has been triggered.	⇨ Check which of the following reasons has caused the alarm: 1. Excessive thermal load – restore the standard operating conditions. 2. The inlet air is too hot – restore the nominal conditions. 3. The ambient temperature is too high or the room aeration is insufficient – provide proper ventilation. 4. The condenser unit is dirty – clean it. 5. The fan does not work – see specific point. 6. The fan is always ON – verify the electric wiring, verify the setting of PV pressure switch or the PV pressure switch is faulty – contact a refrigeration engineer to replace it 7. The T2 sensor is faulty – replace it 8. If ESS=NO (see section 7.12.7) – The hot gas bypass valve is out of setting – contact a refrigeration engineer to restore nominal setting. 9. The solenoid valve EVL is not operating correctly - see specific point ⇨ There is a leak in the refrigerant circuit – contact a refrigeration engineer.
◆ The alarm toC (toC), - ON/OFF cycles of the compressor too frequent – has been triggered	⇨ If ESS=YES (see section 7.12.7) - The refrigerating compressor must remain ON for a minimum time (approx. 6 minutes) within which, if necessary, DMC51 will activate the solenoid EVH that enables the operation of the hot gas by-pass valve. To avoid freezing, if the DewPoint drops too low in despite the hot gas by-pass valve is in operation, the compressor is switched OFF before its minimum ON time (approx. 6 minutes). If this happens too many times the alarm toC (TOC) is activated to avoid damaging the compressor. ⇨ Check which of the following reasons has caused the alarm: 1. The inlet air is too cold – restore the nominal conditions. 2. The ambient temperature is too low - restore the nominal conditions. 3. The hot gas bypass valve is out of setting – contact a refrigeration engineer to restore nominal setting. ⇨ The solenoid valve EVH is not operating correctly - see specific point.
◆ The alarm ICE (ICE) has been triggered	⇨ Check which of the following reasons has caused the alarm: 1. The inlet air is too cold – restore the nominal conditions. 2. The ambient temperature is too low - restore the nominal conditions. ⇨ The refrigerating compressor is always ON, even though the led OK is OFF – verify the electric wiring or KC relay (if installed) is faulty – replace it.

SYMPTOM	POSSIBLE CAUSE - SUGGESTED ACTION
◆ DMC51 - The LED is ON or flashing	⇨ With LED flashing: one or more alarms are active and the display shows oFF and the active alarms. ⇨ With LED lit: one or more alarms are waiting to be reset and the display shows oFF and the alarms that are no longer active but not yet reset. ⇨ The alarms are displayed by the following messages: 1. LP : LP - LPS pressure switch activated (low pressure) – see specific paragraph. 2. HdE : Hdt - Compressor discharge temperature too high (probe T2) – see specific paragraph. 3. ICE : ICE - Temperature inside the exchanger too low (probe T1) – the dew point is too low – see specific paragraph. 4. toC: toC – ON/OFF cycles of the compressor too frequent – Compressor has been repeatedly switched OFF before its minimum ON time (approx. 6 minutes) - see specific paragraph. 5. PF1 : PF1 - Failure temperature probe T1 (DewPoint) – verify electric wiring and/or replace probe. 6. PF2: PF2 – Failure temperature probe T2 (compressor outlet) – If probe T2 installed : verify electric wiring and/or replace probe; If probe T2 not installed : verify electric wiring and/or replace the resistor R. **NOTE: after solving the problem, the alarms must be reset (simultaneously press the % ▲ and ▼ buttons for three seconds).**
◆ DMC51 - The LED is ON or flashing	⇨ With LED flashing, one or more service warnings are active. ⇨ With LED lit: one or more service warnings are waiting to be reset. The display shows the dew point temperature and the active or not reset service warning. ⇨ The service warnings are displayed by the following messages: 1. HdP : Hdp - Dew point too high (higher than the set HdS value) – see specific paragraph. 2. LdP : Ldp - Dew point too low – see specific paragraph. 3. SrU : SrV - Service - maintenance notification time expired (parameter SrV) – carry out the scheduled maintenance and reset the hour meter. ⇨ **NOTE: after solving the problem, the service warnings must be reset (simultaneously press the % ▲ + ▼ buttons for three seconds)**.

8.4 Spare parts

The suggested spare parts list will enable you to promptly intervene in case of abnormal operation, so avoiding to wait for the spares delivery. In case of failure of other parts, for example inside the refrigerating circuit, the replacement must be worked out by a refrigerating systems specialist or in our factory.

NOTE: To order the suggested spare parts or any other part, it's necessary to quote the data reported on the identification plate.

ID N.		DESCRIPTION	ACT ES												
			20	30	50	75	100	125	150	200	250	300	350	400	500
2	LPS	Pressure switch										1	1	1	1
4	HPS	Pressure switch										1	1	1	1
5	PV	Pressure switch	1	1	1	1	1	1	1	1	1	1	1	1	1
6	MC	Compressor	1	1	1	1	1	1	1	1	1	1	1	1	1
7		Hot gas by-pass valve	1	1	1	1	1	1	1	1	1	1	1	1	1
9	MV	Complete fan										1	1	1	1
9.1	MV	Fan motor	1	1	1	1	1	1	1	1	1				
9.2		Fan blade	1	1	1	1	1	1	1	1	1				
9.3		Fan grid			1	1	1	1	1	1	1				
10		Filter drier	1	1	1	1	1	1	1	1	1	1	1	1	1
12	BT	Temperature probe	1	1	1	1	1	2	2	2	2	2	2	2	2
17	DMC51	Display module	1	1	1	1	1	1	1	1	1	1	1	1	1
		Main module	1	1	1	1	1	1	1	1	1	1	1	1	1
		Cable main module to display	1	1	1	1	1	1	1	1	1	1	1	1	1
21	ELD	Electronic drainer	1	1	1	1	1	1	1	1	1	1	1	1	1
		Service unit for electronic drainer	1	1	1	1	1	1	1	1	1	1	1	1	1
22	S1	Lighted switch	1	1	1	1	1								
	QS	Main switch						1	1	1	1	1	1	1	1
82	CHV	Check valve						1	1	1	1	1	1	1	1
86	EVL	Liquid solenoid valve	1	1	1	1	1	1	1	1	1	1	1	1	1
		Coil for liquid solenoid valve	1	1	1	1	1	1	1	1	1	1	1	1	1
87	EVH	Hot gas solenoid valve	1	1	1	1	1	1	1	1	1	1	1	1	1
		Coil for hot gas solenoid valve	1	1	1	1	1	1	1	1	1	1	1	1	1
	KC	Relay						1	1	1	1	1	1	1	1

ID N.		DESCRIPTION	ACT ES 3ph					
			200	250	300	350	400	500
2	LPS	Pressure switch	1	1	1	1	1	1
4	HPS	Pressure switch	1	1	1	1	1	1
5	PV	Pressure switch	1	1	1	1	1	1
6	MC	Compressor	1	1	1	1	1	1
7		Hot gas by-pass valve	1	1	1	1	1	1
9	MV	Complete fan	1	1	1	1	1	1
10		Filter drier	1	1	1	1	1	1
12	BT	Temperature probe	2	2	2	2	2	2
17	DMC51	Display module	1	1	1	1	1	1
		Main module	1	1	1	1	1	1
		Cable main module to display	1	1	1	1	1	1
21	ELD	Electronic drainer	1	1	1	1	1	1
		Service unit for electronic drainer	1	1	1	1	1	1
22	S1	Lighted switch	1	1	1	1	1	1
	QS	Main switch	1	1	1	1	1	1
86	EVL	Liquid solenoid valve	1	1	1	1	1	1
		Coil for liquid solenoid valve	1	1	1	1	1	1
87	EVH	Hot gas solenoid valve	1	1	1	1	1	1
		Coil for hot gas solenoid valve	1	1	1	1	1	1
60	FU	Fuse kit	1	1	1	1	1	1
	KC1	Contactor	1	1	1	1	1	1
	TF	Transformer	1	1	1	1	1	1

8.5 Maintenance operation on the refrigeration circuit

Maintenance and service on refrigerating systems must be carried out only by certified refrigerating engineers only, according to local rules.
All the refrigerant of the system must be recovered for its recycling, reclamation or destruction.
Do not dispose the refrigerant fluid in the environment.

This dryer comes ready to operate and filled with R134a or R407C type refrigerant fluid.

In case of refrigerant leak contact a certified refrigerating engineer. Room is to be aired before any intervention.
If is required to re-fill the refrigerating circuit, contact a certified refrigerating engineer.
Refer to the dryer nameplate for refrigerant type and quantity.

Characteristics of refrigerants used:

Refrigerant	Chemical formula	TLV	GWP
R134a - HFC	CH2FCF3	1000 ppm	1430
R407C - HFC	R32/125/134a (23/25/52) CHF2CF3/CH2F2/CH2FCF3	1000 ppm	1773.85

8.6 Dismantling of the dryer

If the dryer is to be dismantled, it has to be split into homogeneous groups of materials.

Part	Material
Refrigerant fluid	R407C, R134a, Oil
Canopy and supports	Carbon steel, Epoxy paint
Refrigerating compressor	Steel, Copper, Aluminium, Oil
Alu-Dry Module	Aluminium
Condenser Unit	Aluminium, Copper, Carbon steel
Pipe	Copper
Fan	Aluminium, Copper, Steel
Valve	Brass, Steel
Electronic Level Drain	PVC, Aluminium, Steel
Insulation Material	Synthetic rubber without CFC, Polystyrene, Polyurethane
Electric cable	Copper, PVC
Electric Parts	PVC, Copper, Brass

We recommend to comply with the safety rules in force for the disposal of each type of material.
Refrigerant contains droplets of lubrication oil released by the refrigerating compressor.
Do not dispose this fluid in the environment. Is has to be discharged from the dryer with a suitable device and then delivered to a collection centre where it will be processed to make it reusable.

9 Attachments

Exploded views – List of components

1	Alu-Dry module
1.1	Insulation material
2	Refrigerant pressure switch LPS
4	Refrigerant pressure switch HPS
5	Refrigerant pressure switch PV
6	Compressor
7	Hot-gas bypass valve
8	Condenser
9	Condenser fan
9.1	Motor
9.2	Blade
9.3	Grid
10	Filter dryer
11	Capillary tube
12	Temperature probe
13	Condensate drain service valve
17	Electronic instrument
21	Electronic drainer
22	Main switch
36	Liquid separator
51	Front panel
52	Back panel
53	Right lateral panel
54	Left lateral panel
55	Cover
56	Base plate
57	Upper plate
58	Support beam
59	Support bracket
60	Control panel
61	Electric connecting plug
62	Electric box
66	QE door
81	Flow diagram sticker
82	Check valve CHV
83	Service valve – High pressure side
84	Service valve – Low pressure side
86	Liquid solenoid valve EVL
87	Hot gas solenoid valve EVH
100	Autotransformer

Electric diagrams – List of components

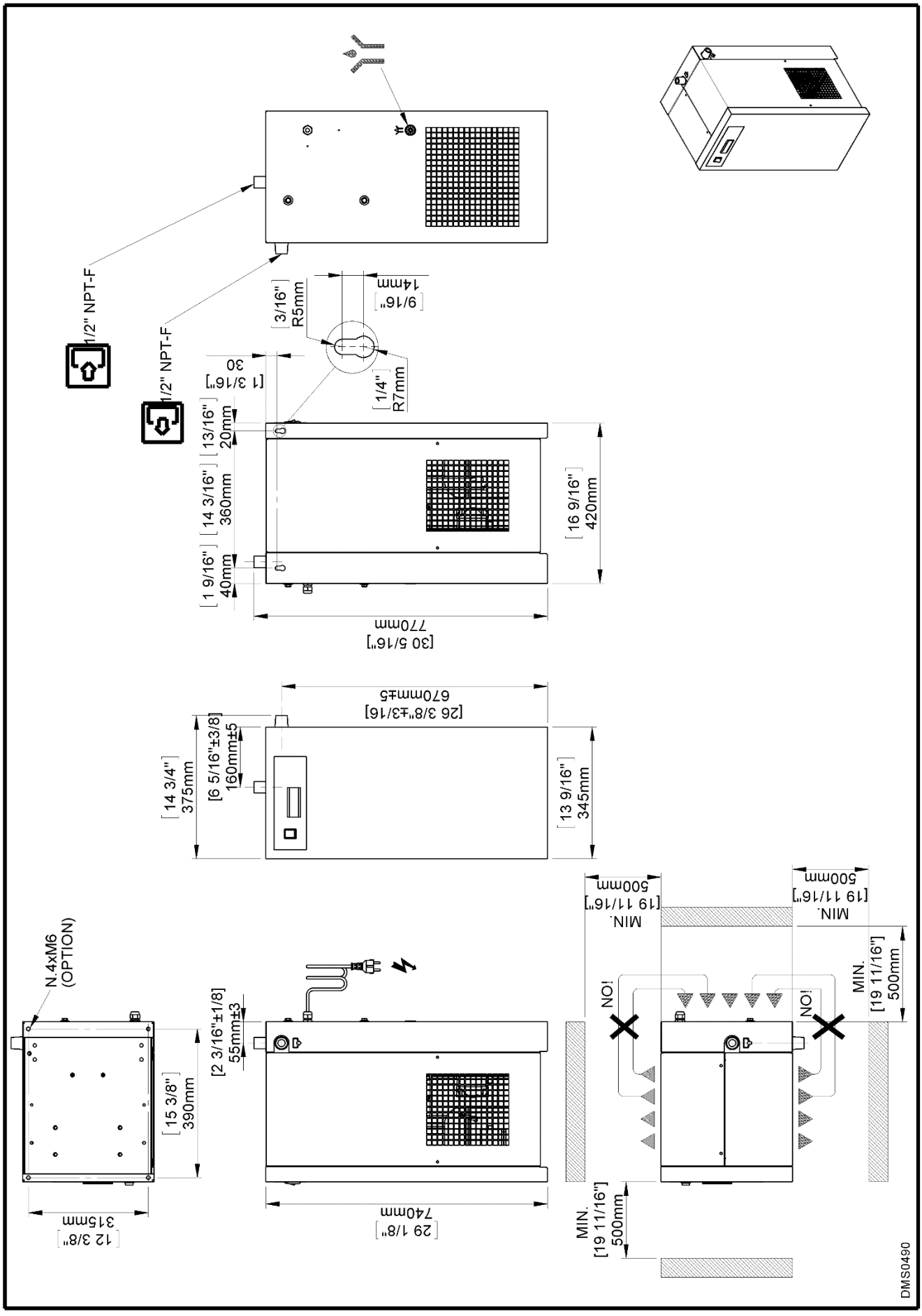
MC1	Compressor
KT	Compressor thermal protection
KR	Compressor starting relay
CS	Compressor starting capacitor
CR	Compressor operating capacitor
MV1	Condenser fan
CV	Fan starting capacitor
DMC51	Electronic instrument
BT1-2	Temperature probes
EVH	Hot gas solenoid valve
EVL	Liquid solenoid valve
KC	Compressor operating relay
LPS	Low pressure switch
HPS	High pressure switch
PV	Pressure switch – fan control
ELD	Electronic drainer
S1	ON-OFF switch
QS	Main switch with door block
RC	Compressor crankcase heater
BOX	Electrical box

NT4	Provided and wired by customer
NT5	Limit of equipment

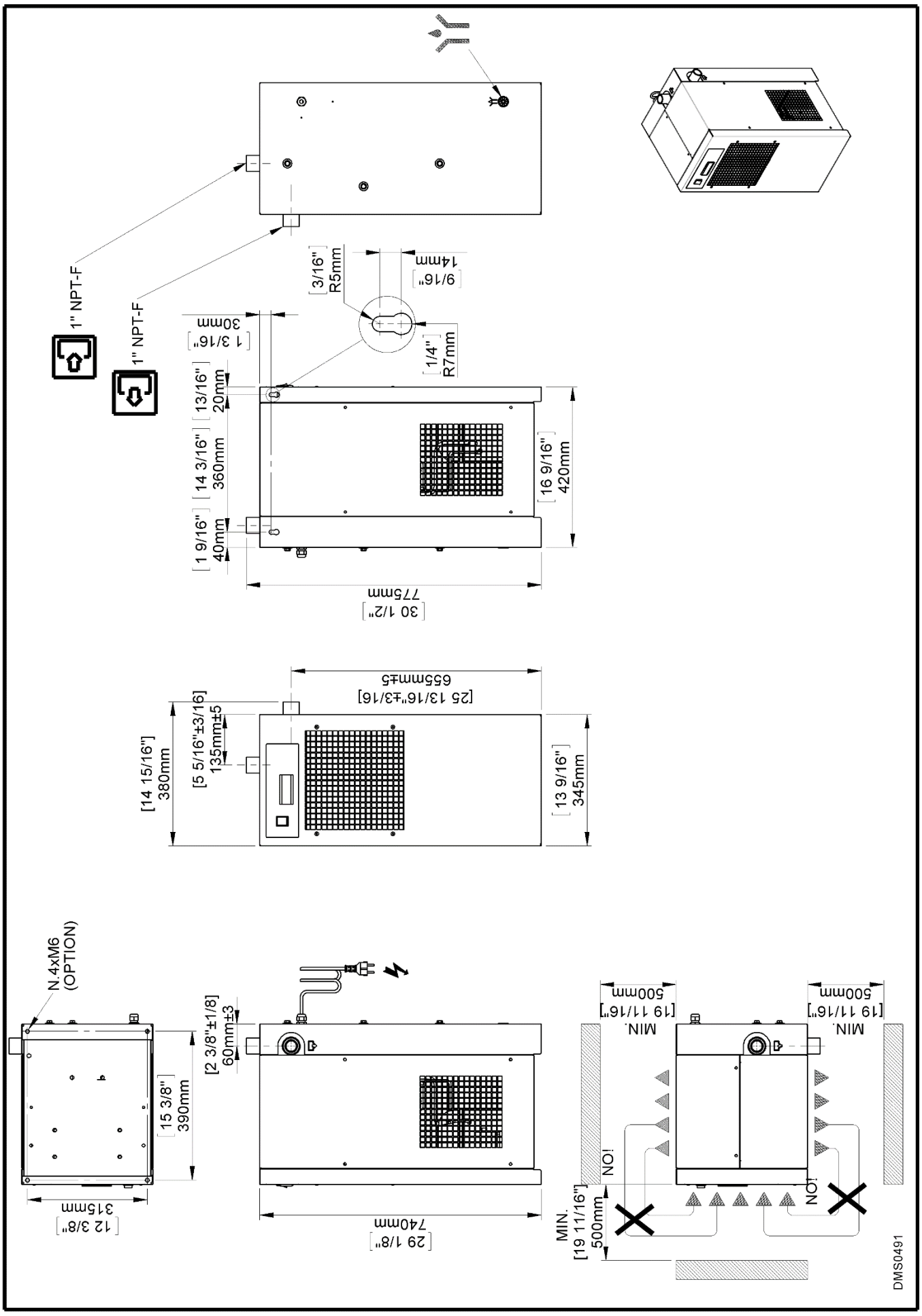
BN	Brown
BU	Blue
BK	Black
YG	Yellow / Green
OR	Orange
RD	Red
WH	White
WH/BK	White / Black

9.1 Dryer's dimensions

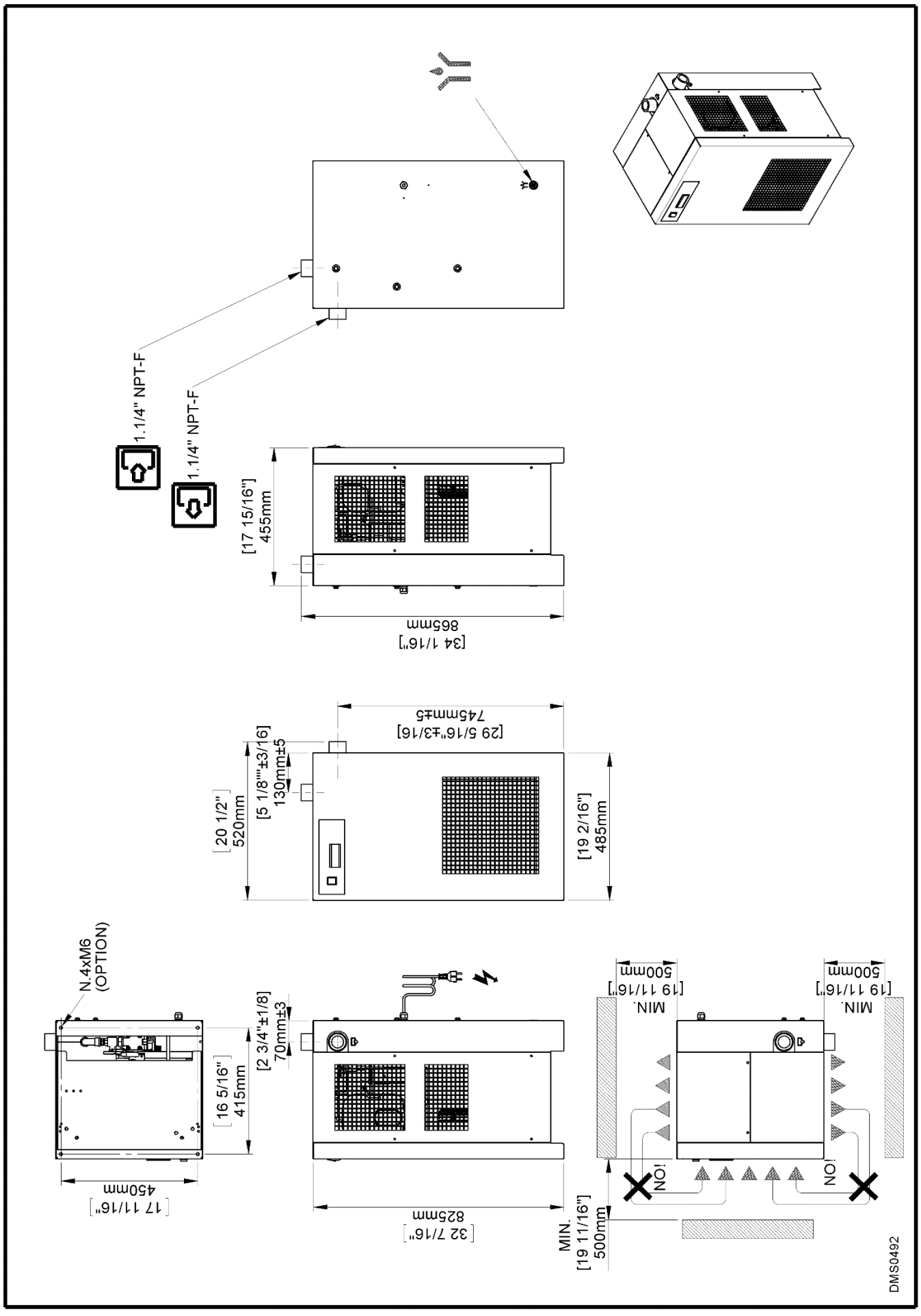
9.1.1 ACT ES 20 – 50



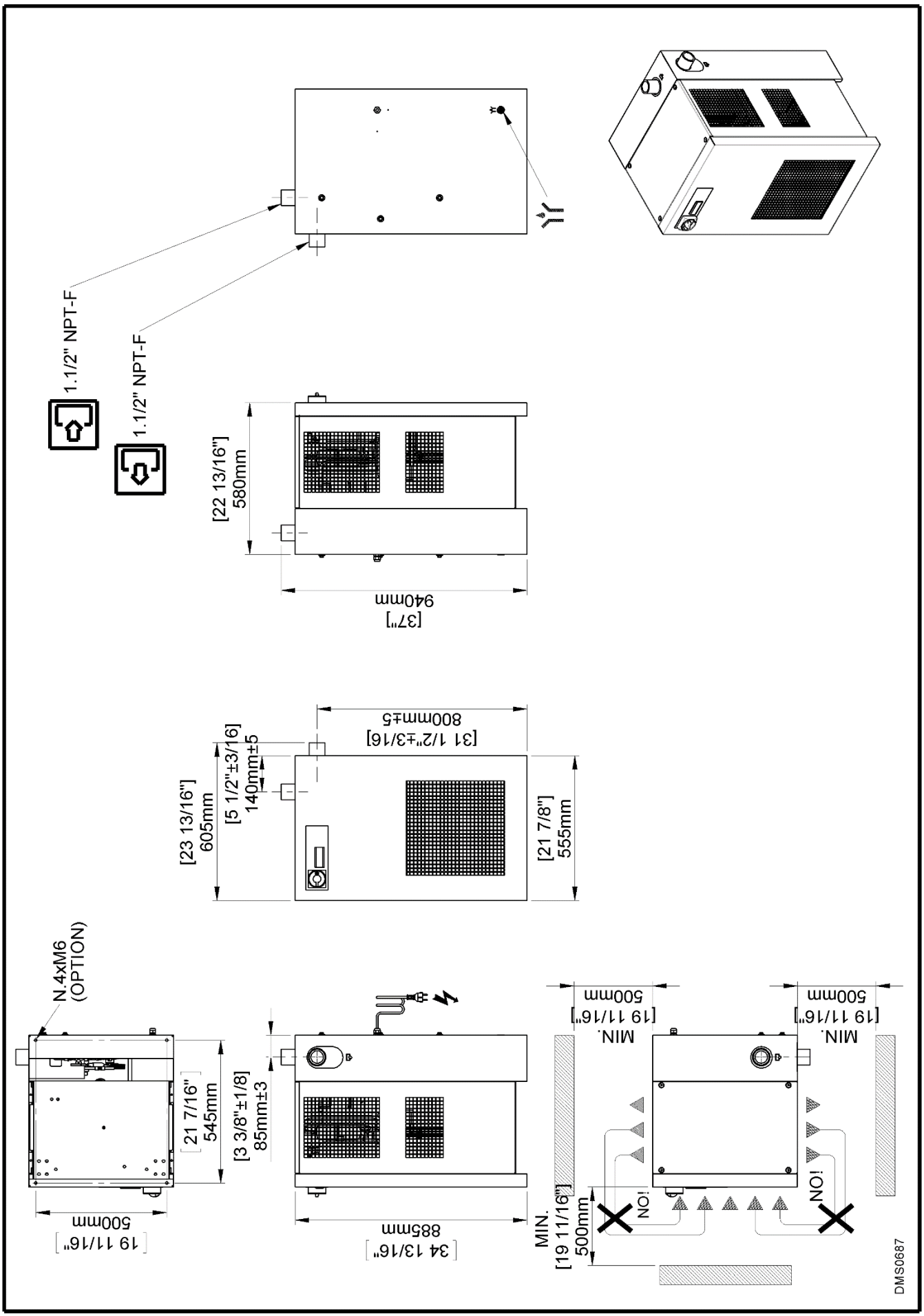
9.1.2 ACT ES 75


1" NPT-F
1" NPT-F
[3/16" R5mm
14mm [9/16"]
30mm [1 3/16"]
[1/4" R7mm
[13/16" 20mm
[14 3/16" 360mm
[1 9/16" 40mm
[16 9/16" 420mm
775mm [30 1/2"]
655mm±5 [25 13/16"±3/16]
[14 15/16"] 380mm
[5 5/16"±3/16] 135mm±5
[13 9/16"] 345mm
N.4xM6 (OPTION)
[2 3/8"±1/8] 60mm±3
[15 3/8"] 390mm
315mm [12 3/8"]
740mm [29 1/8"]
MIN. [19 11/16"] 500mm
MIN. [19 11/16"] 500mm
NO!
NO!
MIN. [19 11/16"] 500mm
DMS0491

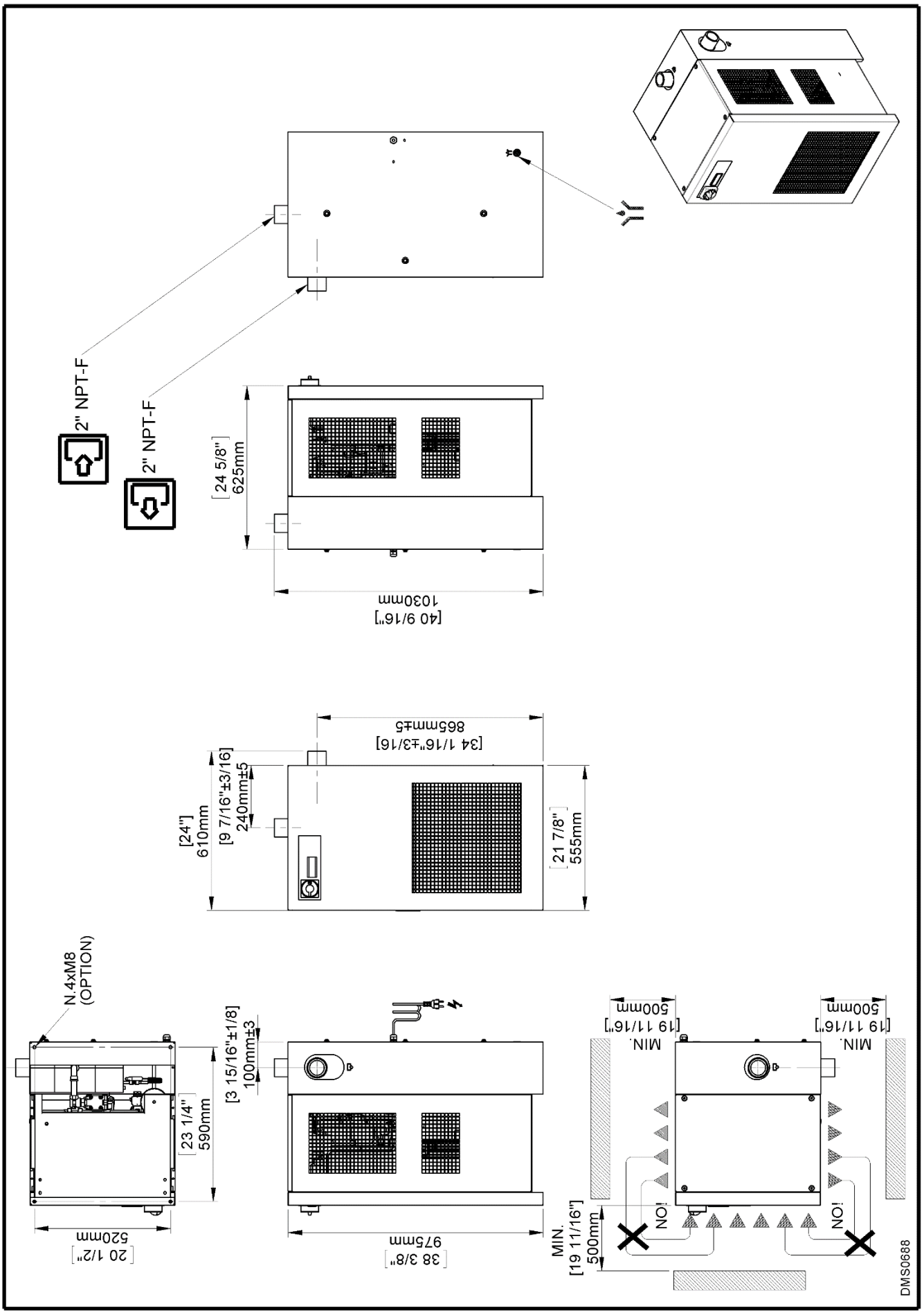
9.1.3 ACT ES 100 – 150



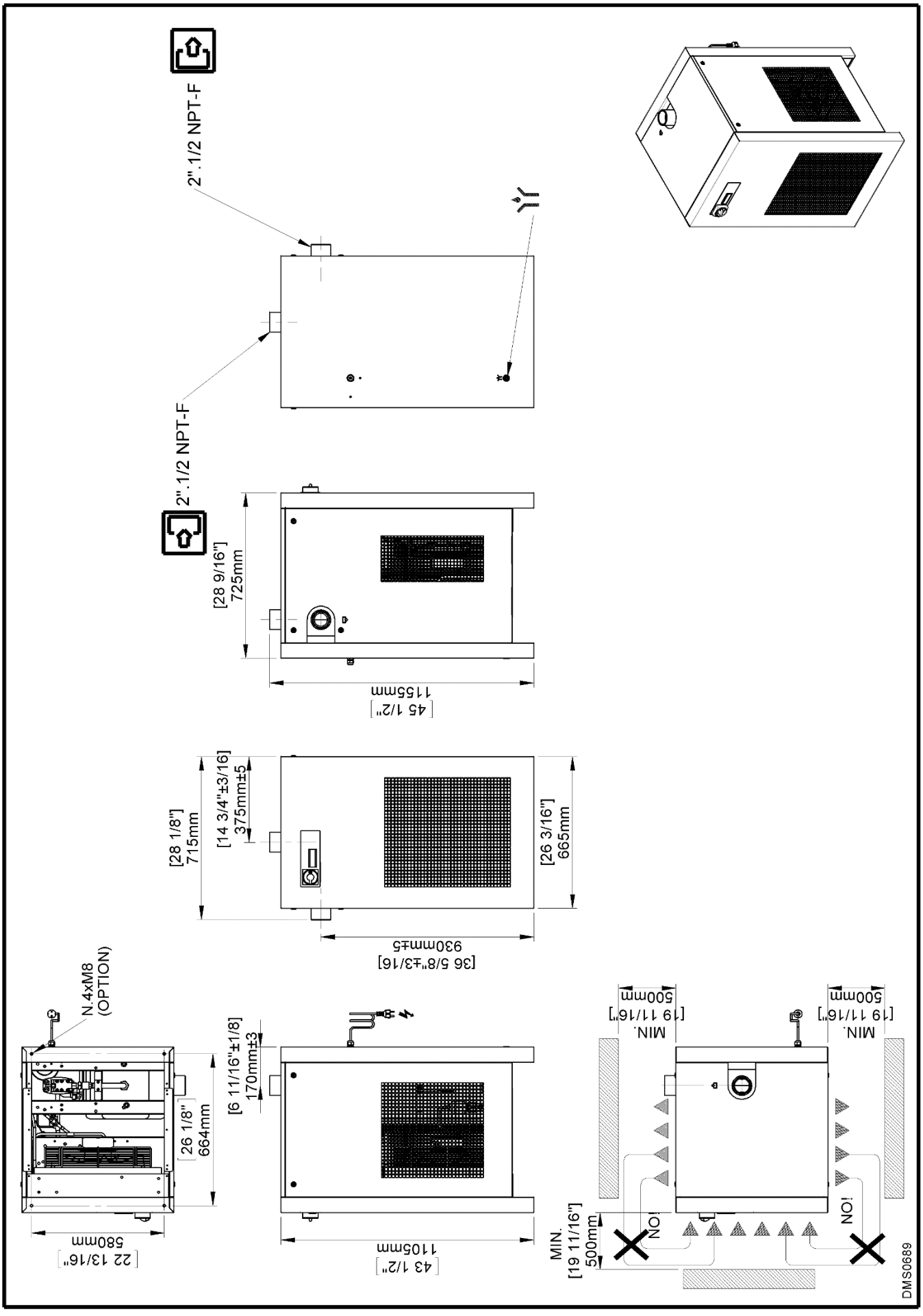
9.1.4 ACT ES 200 – 250



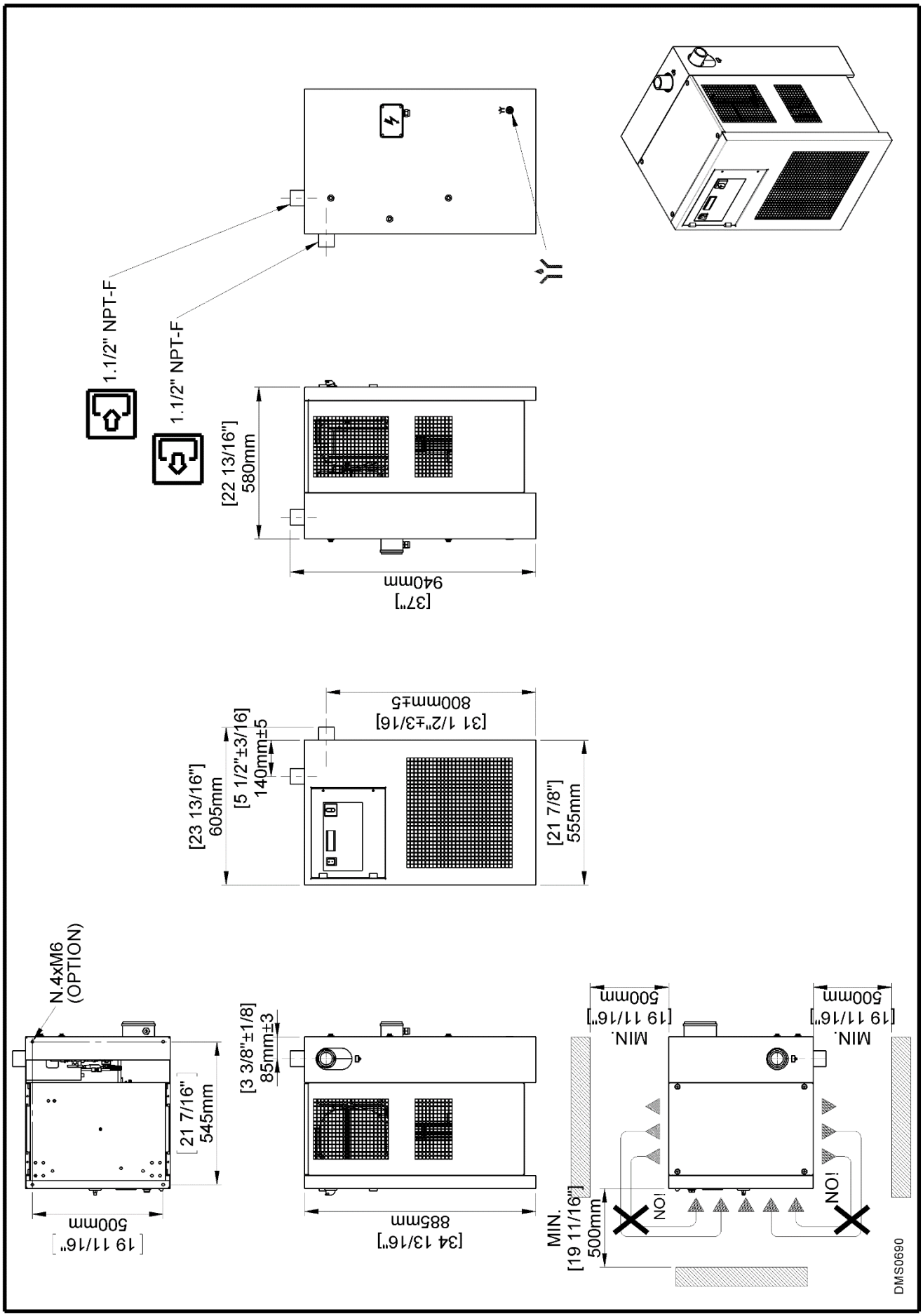
9.1.5 ACT ES 300 – 350



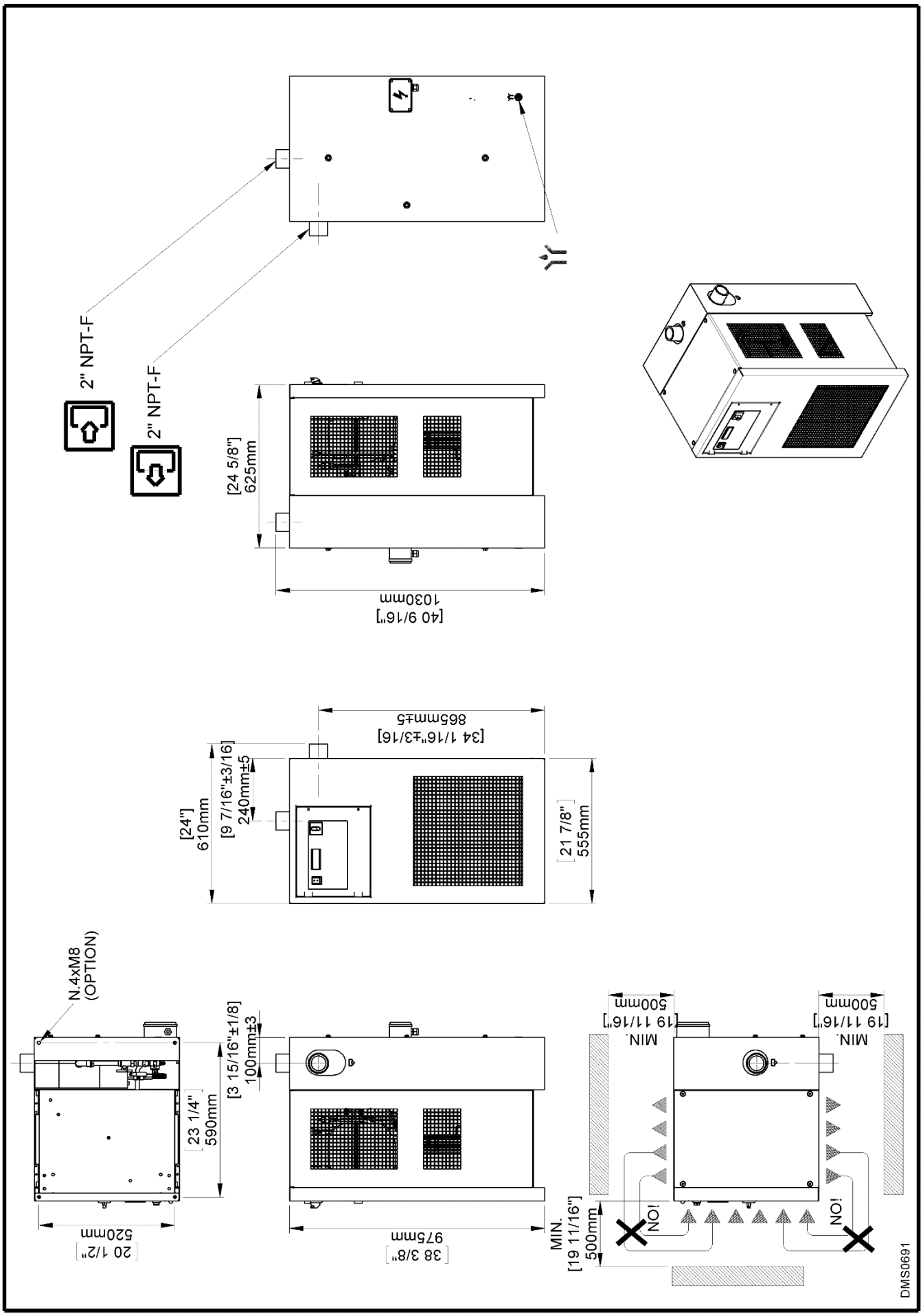
9.1.6 ACT ES 400 – 500



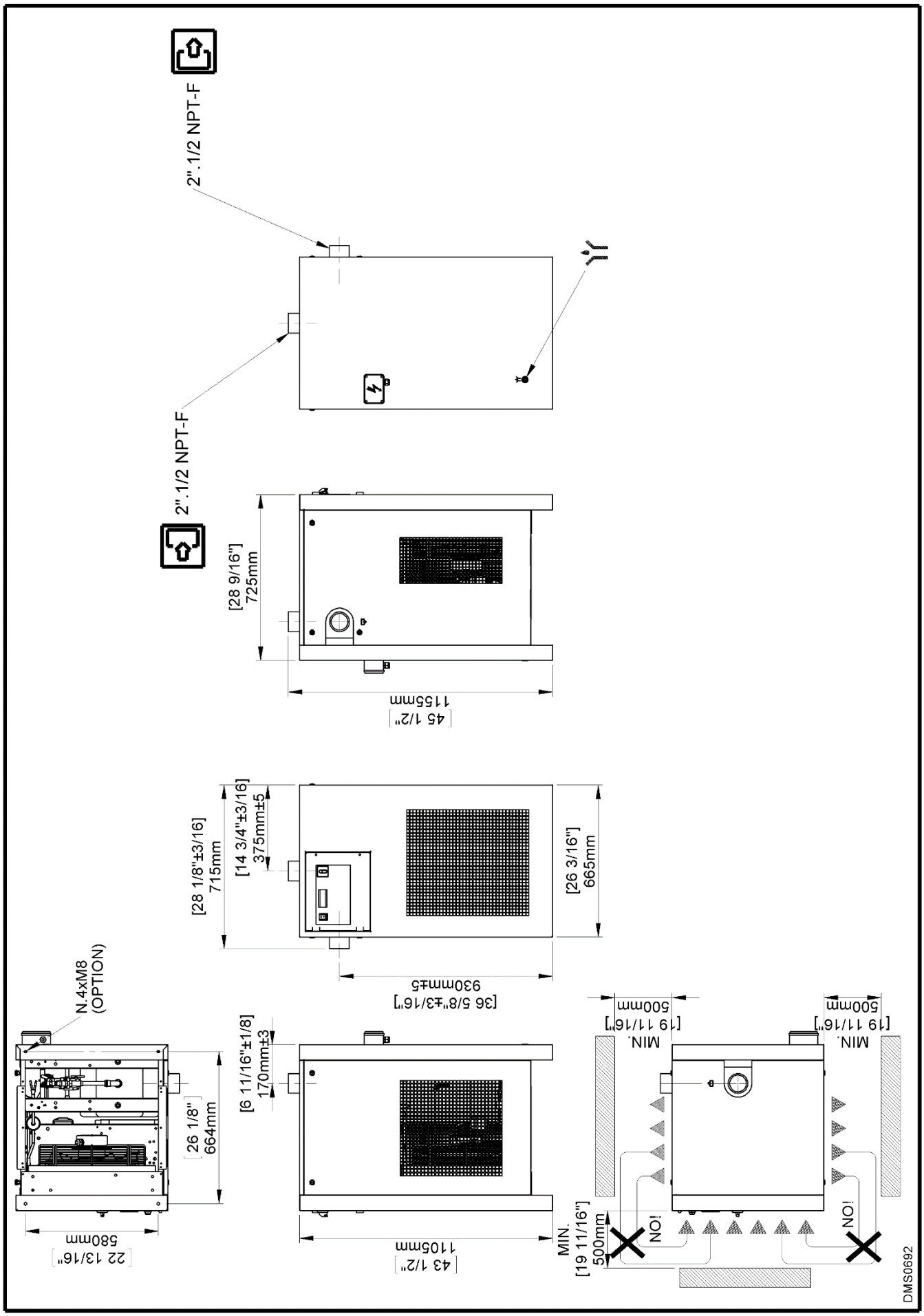
9.1.7 ACT ES 200 – 250 3phase



9.1.8 ACT ES 300 – 350 3phase

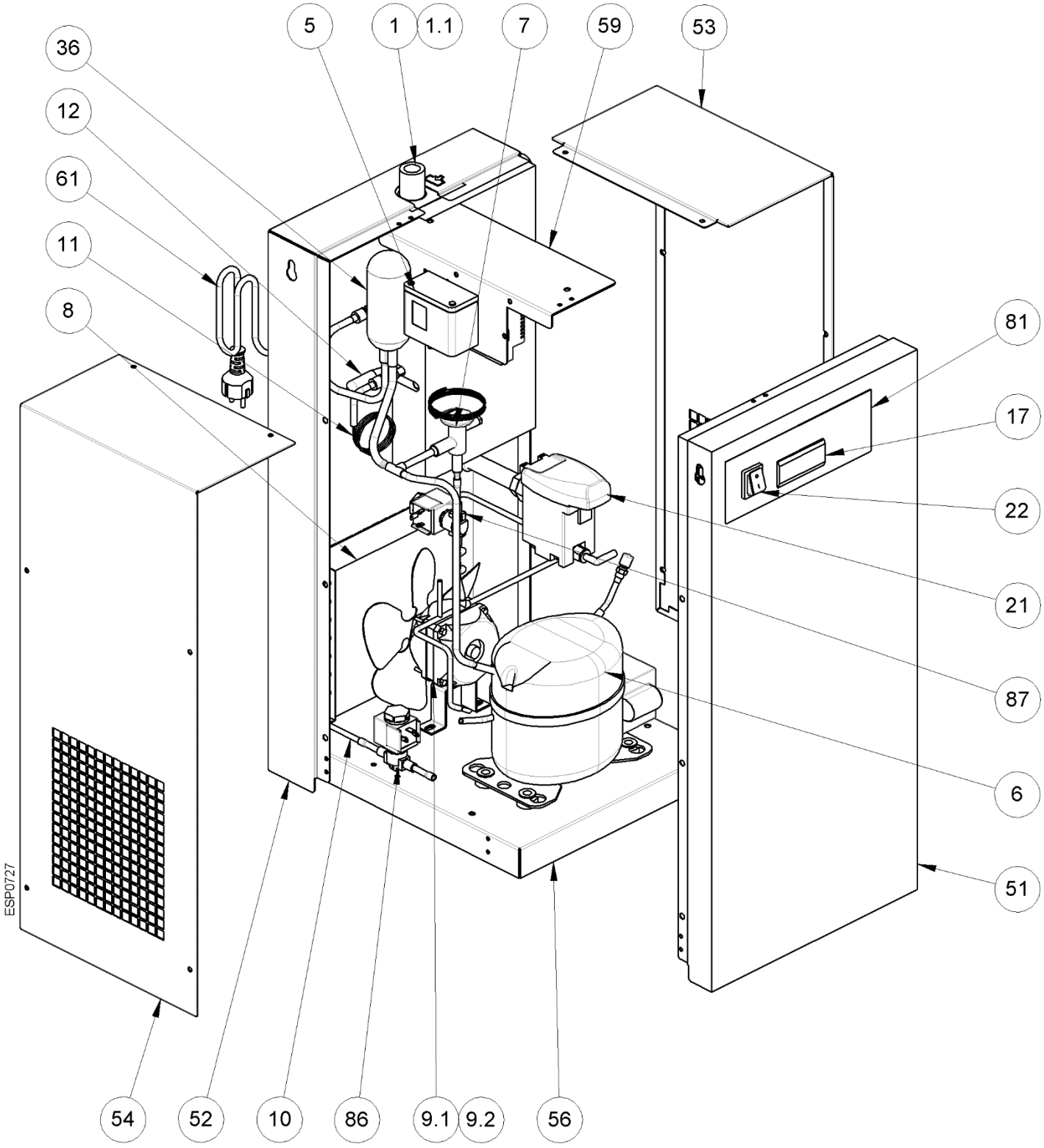


9.1.9 ACT ES 400 – 500 3phase

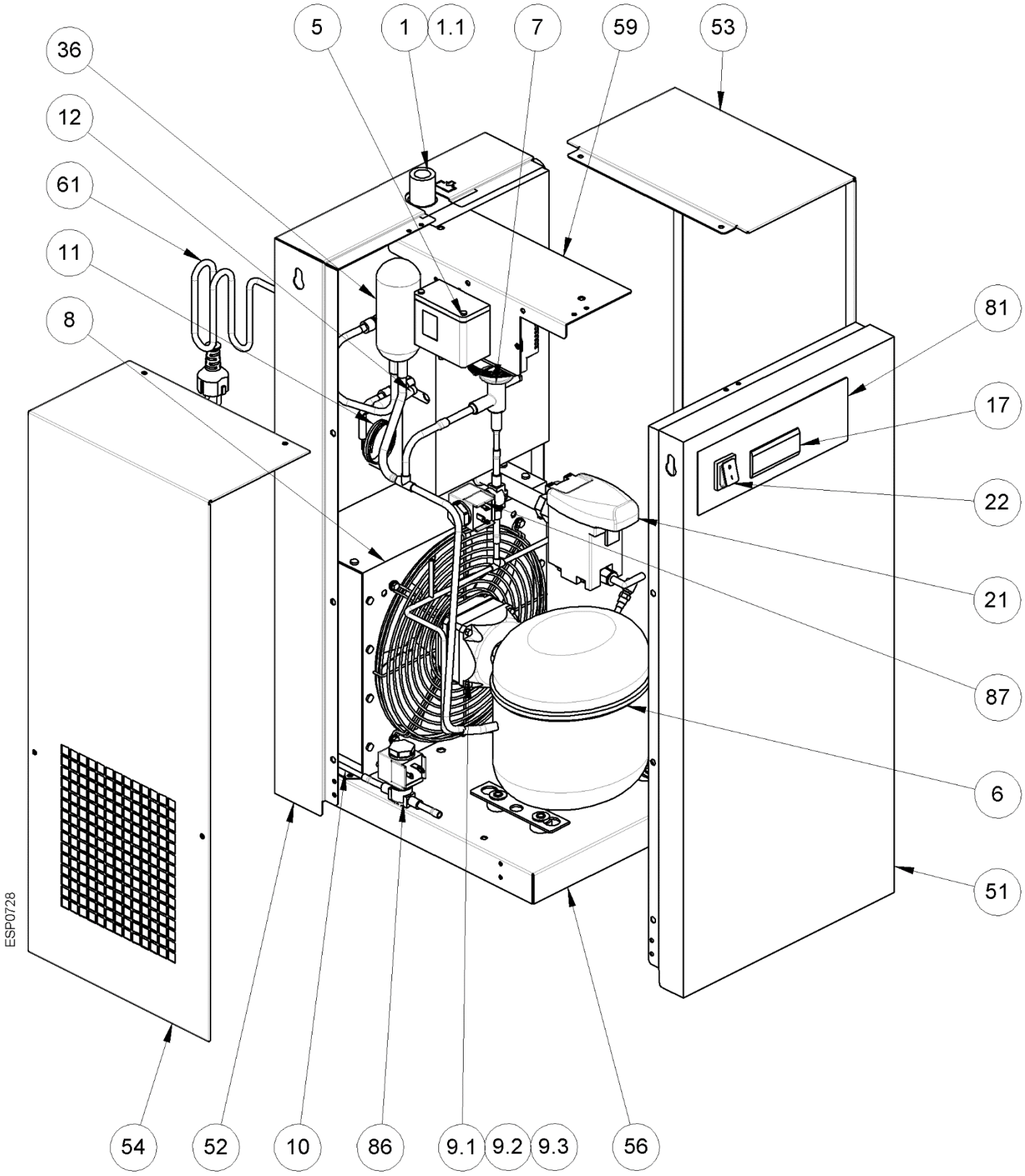


9.2 Exploded views

9.2.1 ACT ES 20 – 30



9.2.2 ACT ES 50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ESP0728
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52
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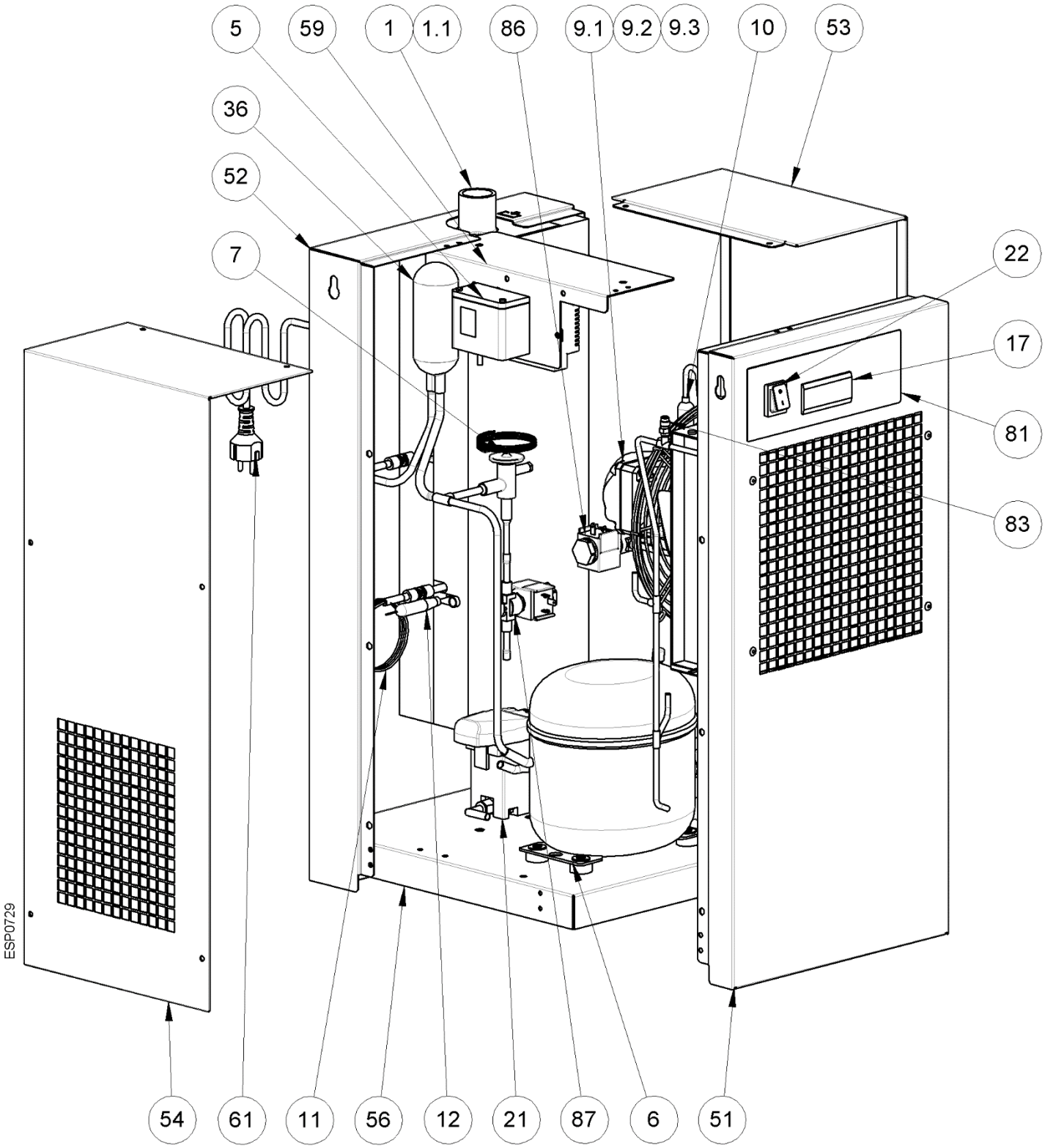
86
9.1
9.2
9.3
56

9.2.3 ACT ES 75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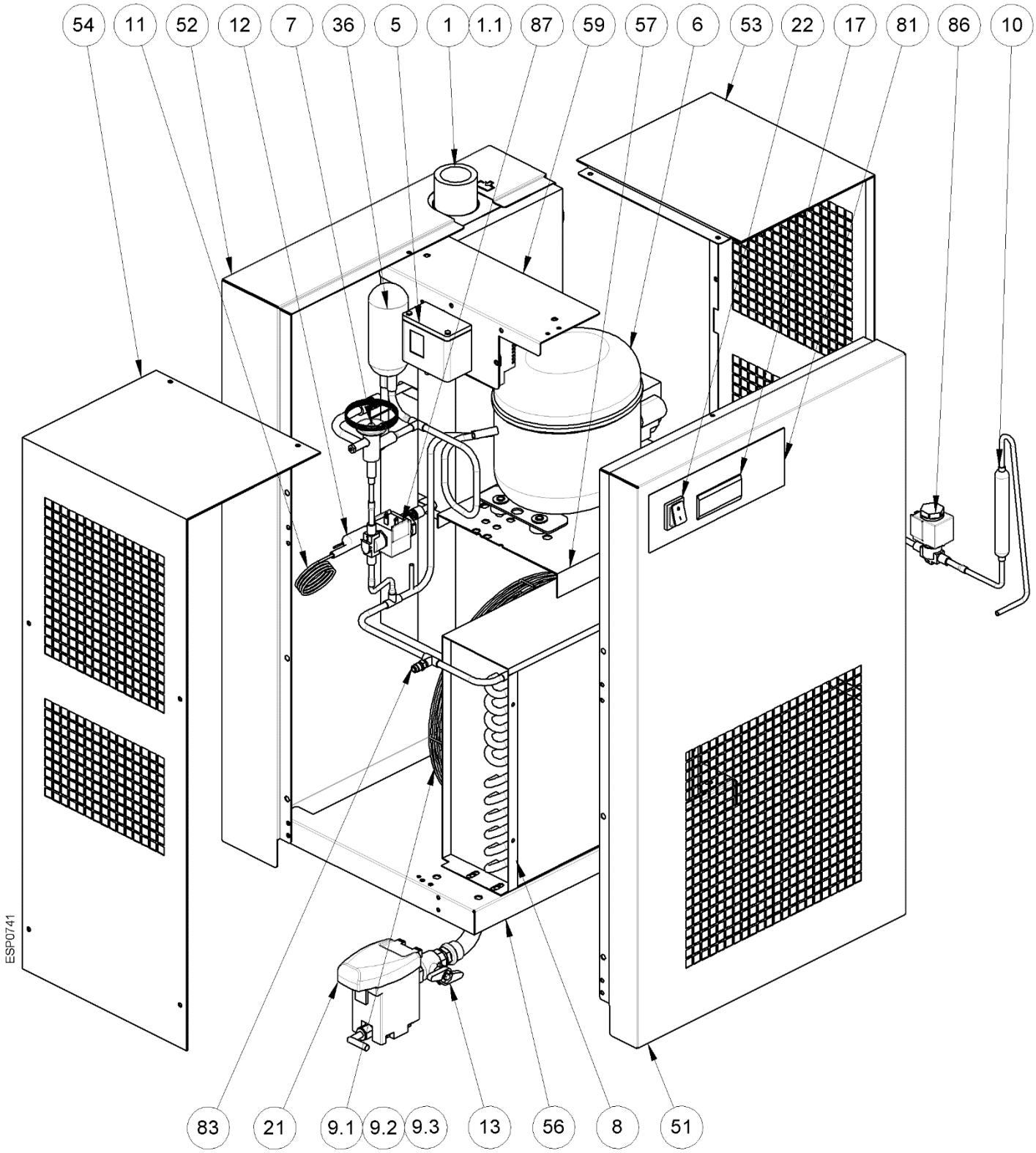
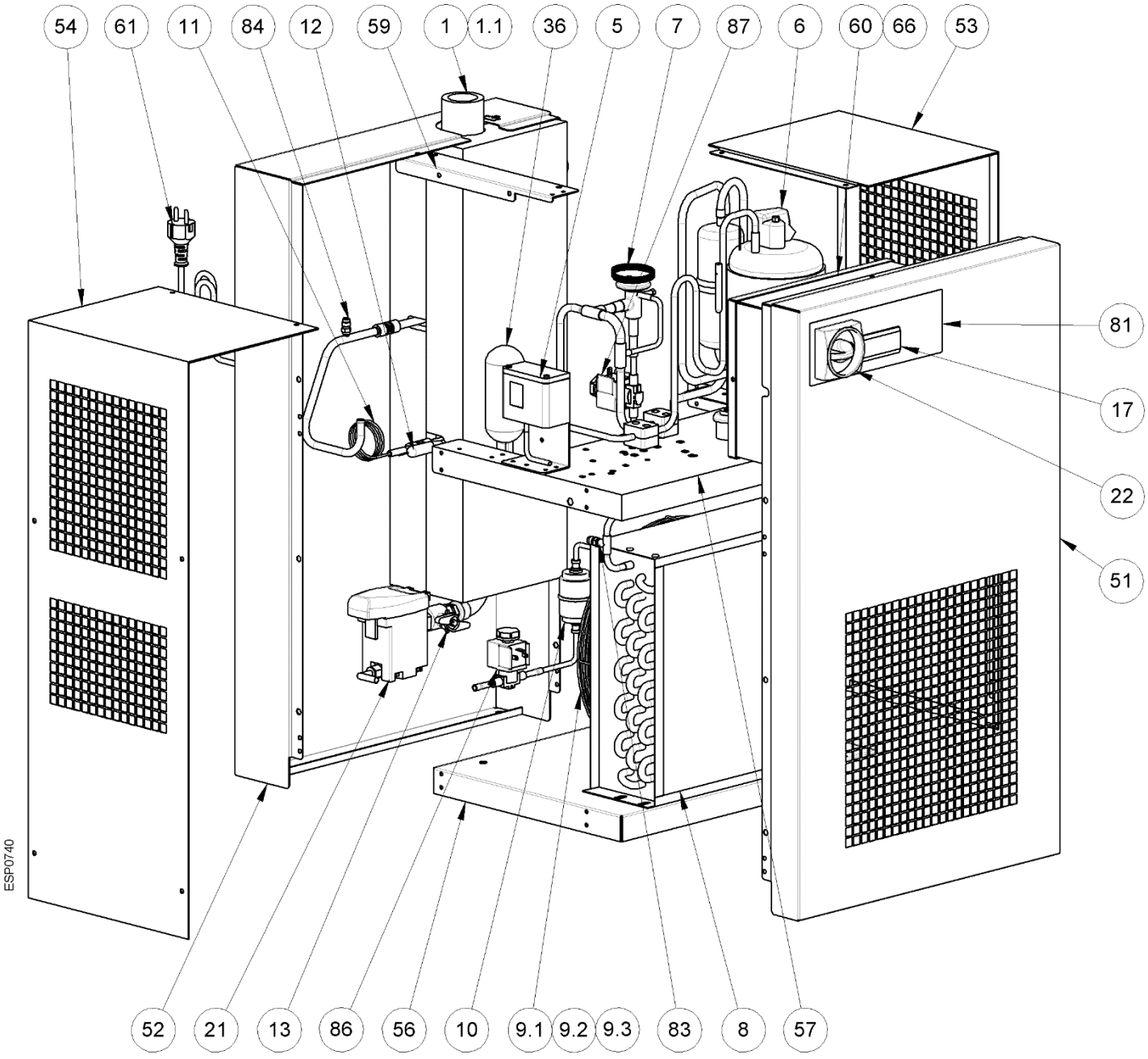
51

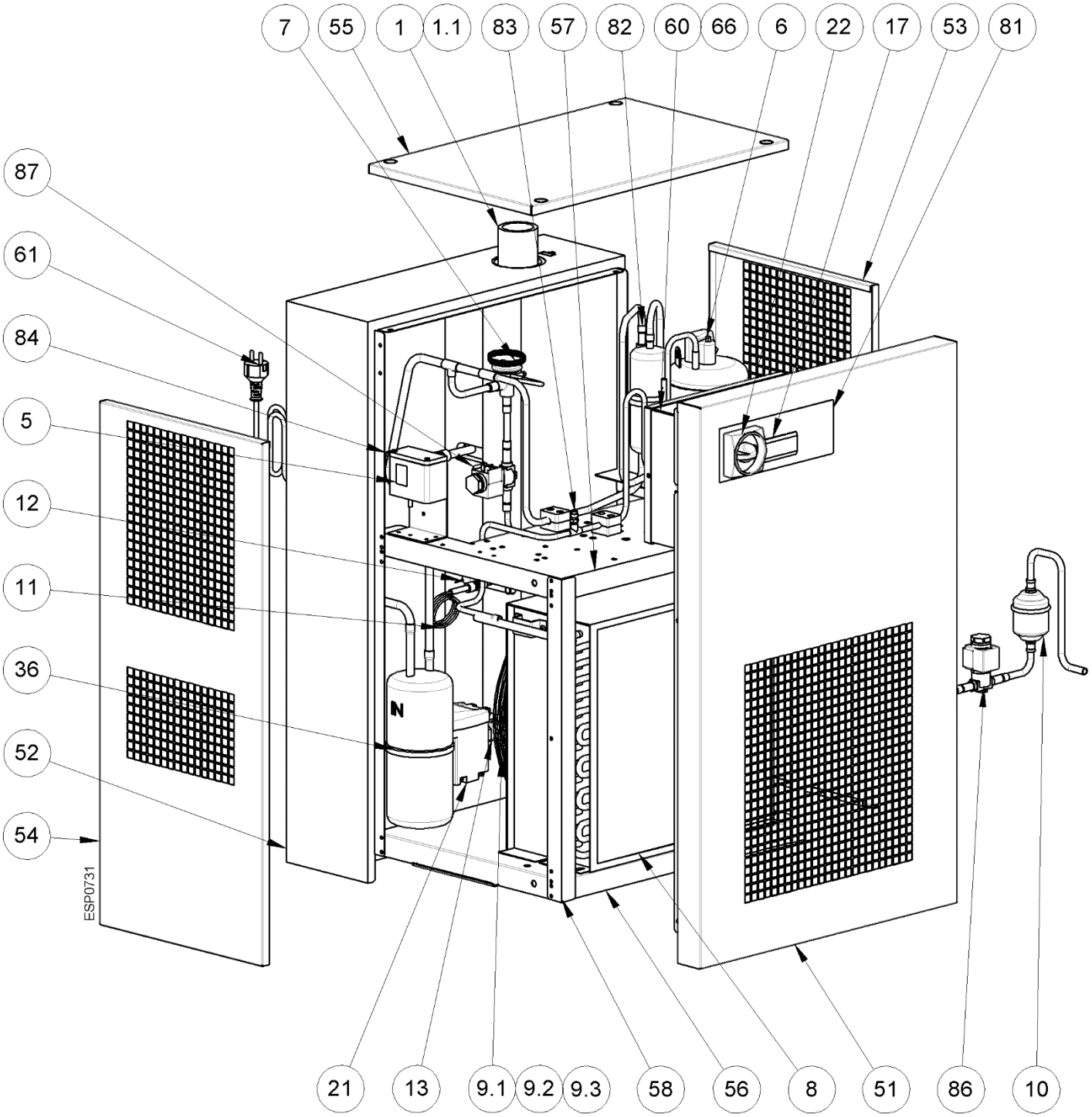
9.2.4 ACT ES 100



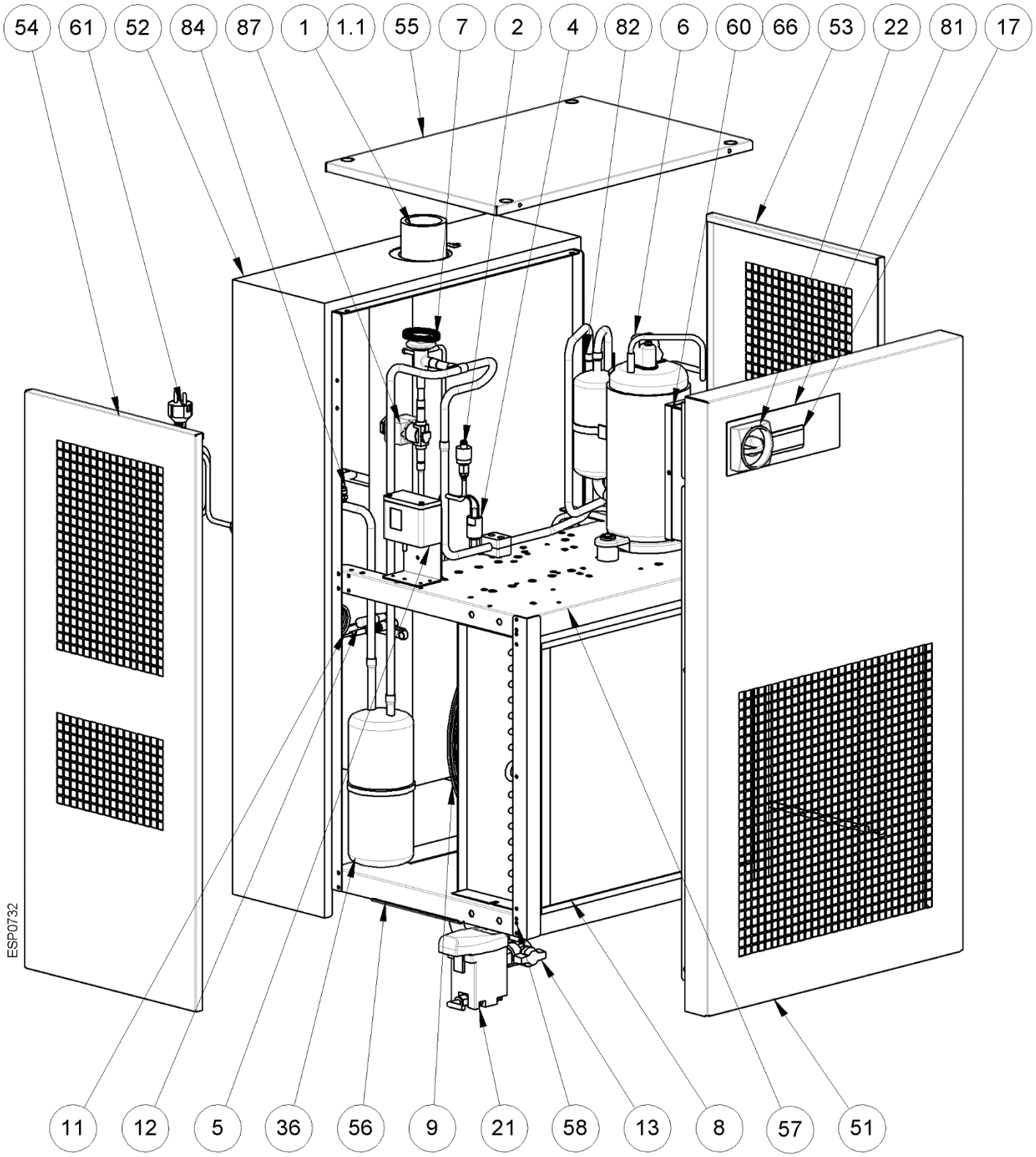
9.2.5 ACT ES 125 – 150



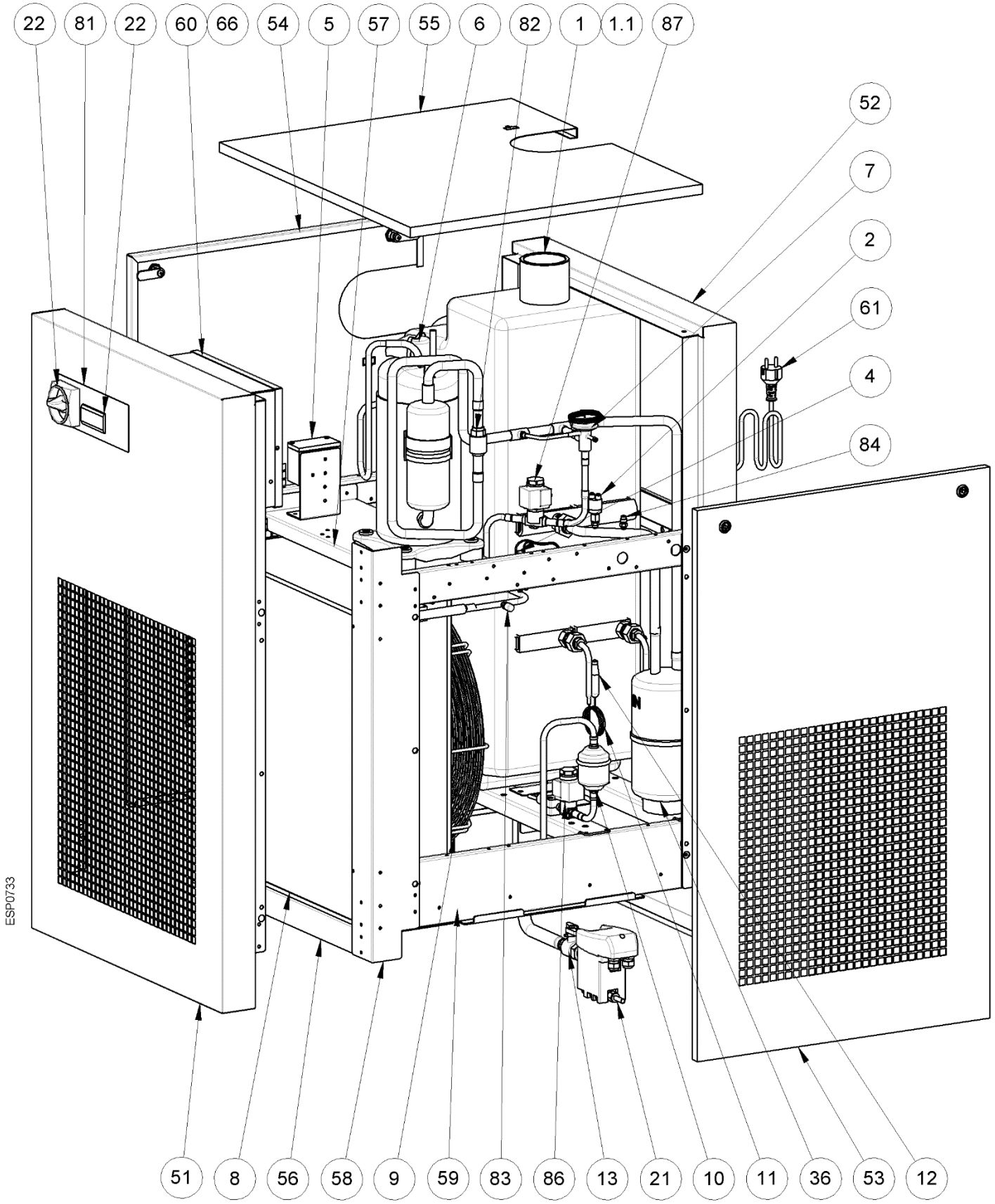
9.2.6 ACT ES 200 – 250



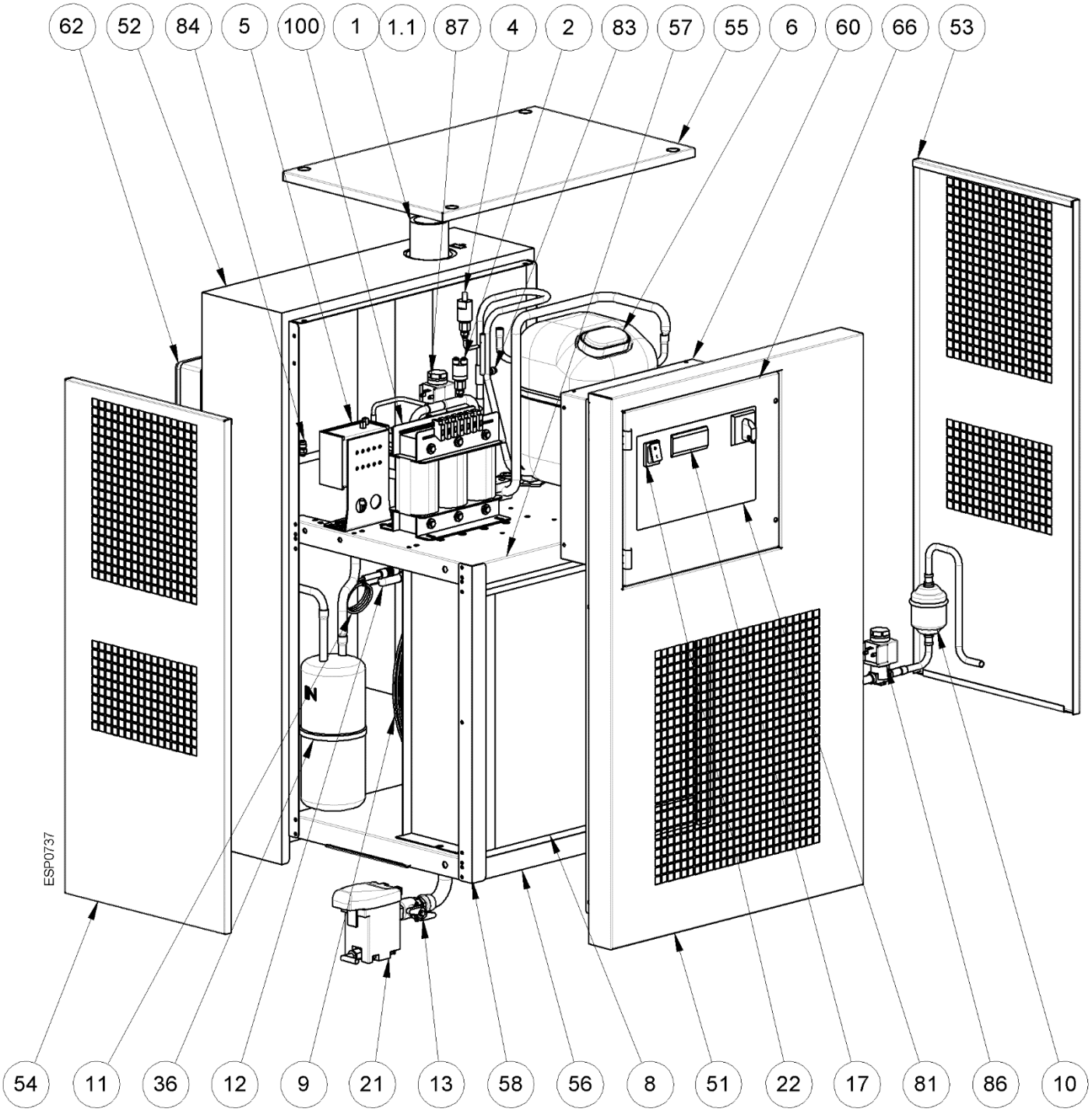
9.2.7 ACT ES 300 – 350



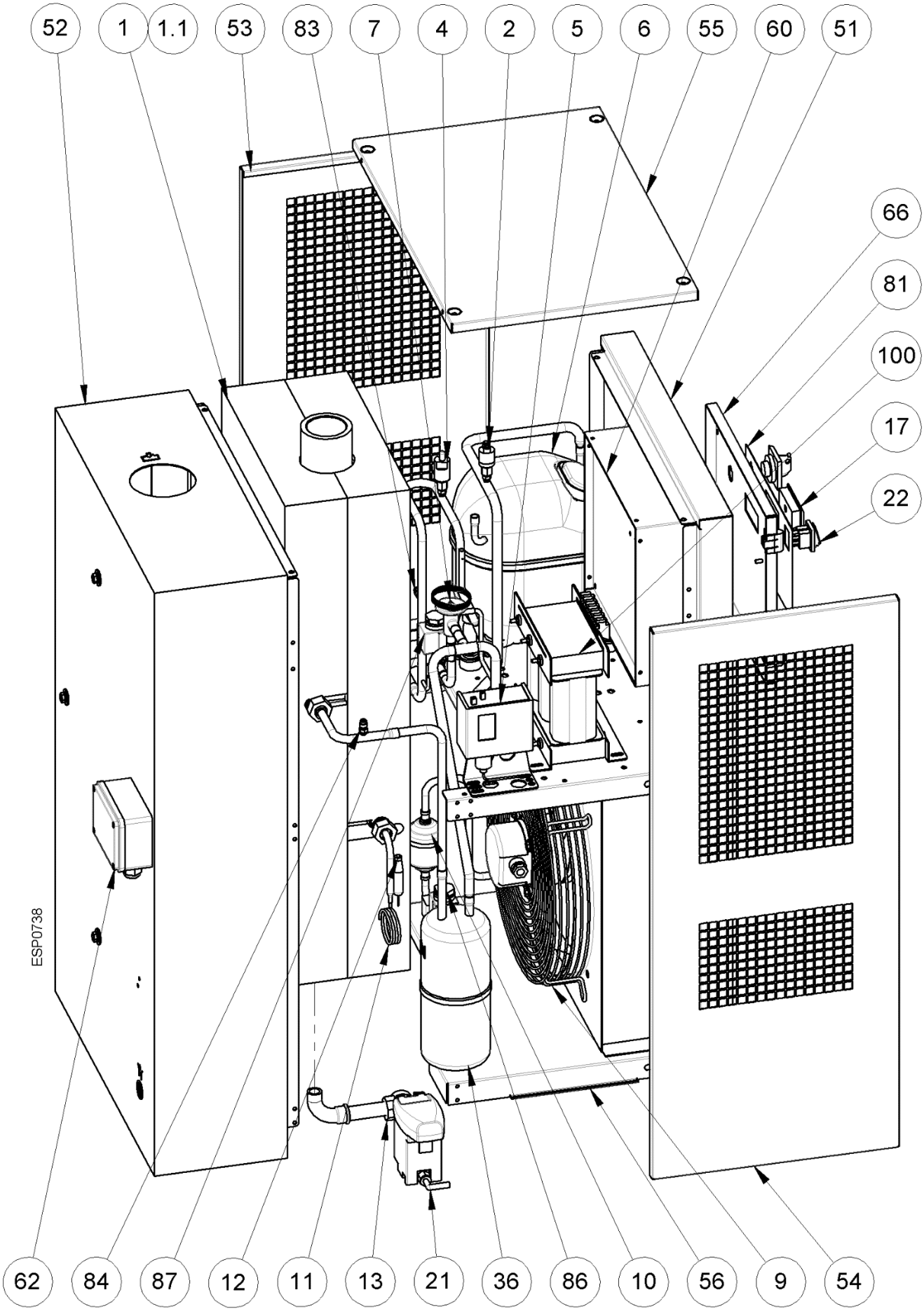
9.2.8 ACT ES 400 – 500



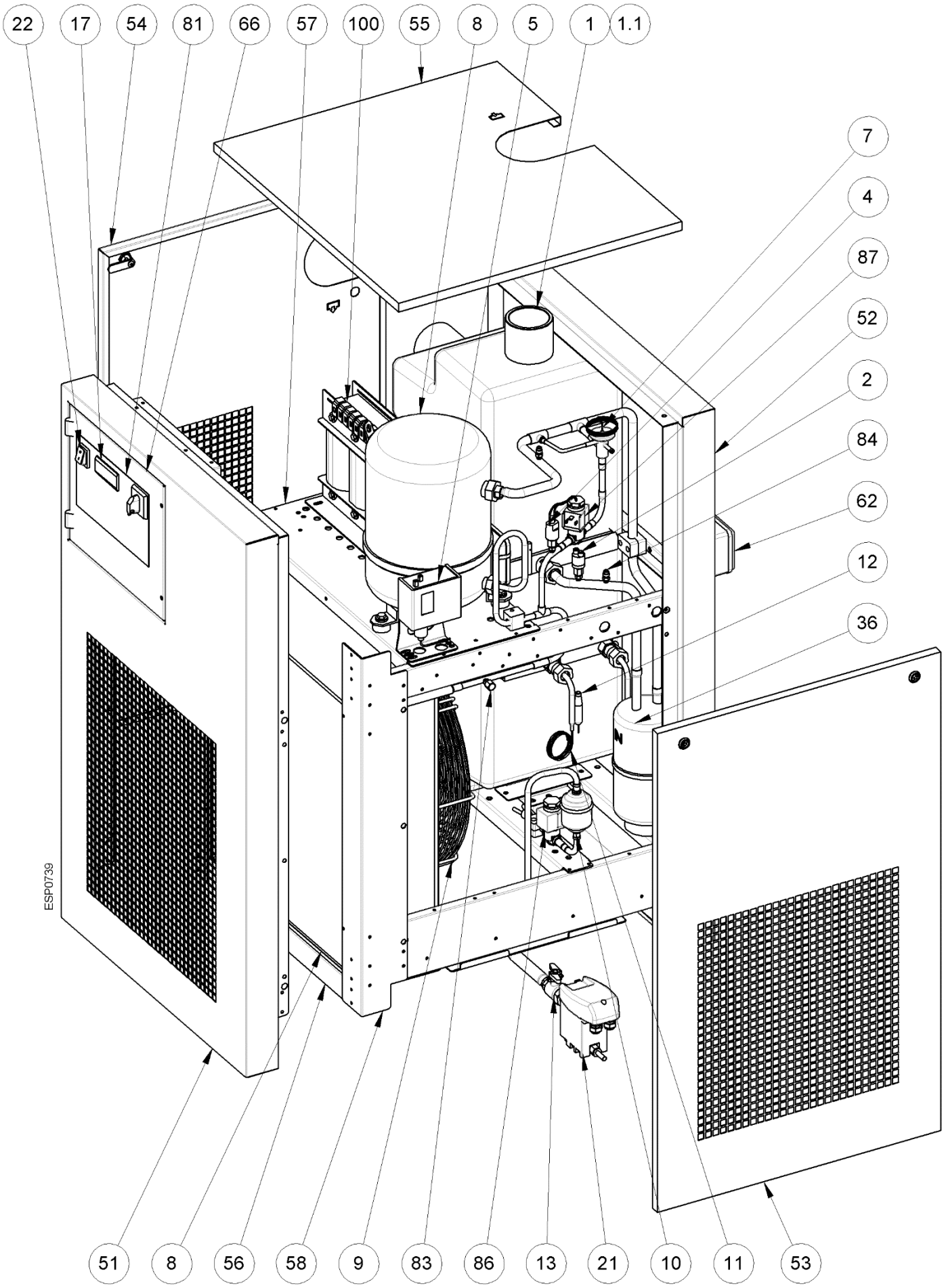
9.2.9 ACT ES 200 – 250 3phase



9.2.10 ACT ES 300 – 350 3phase

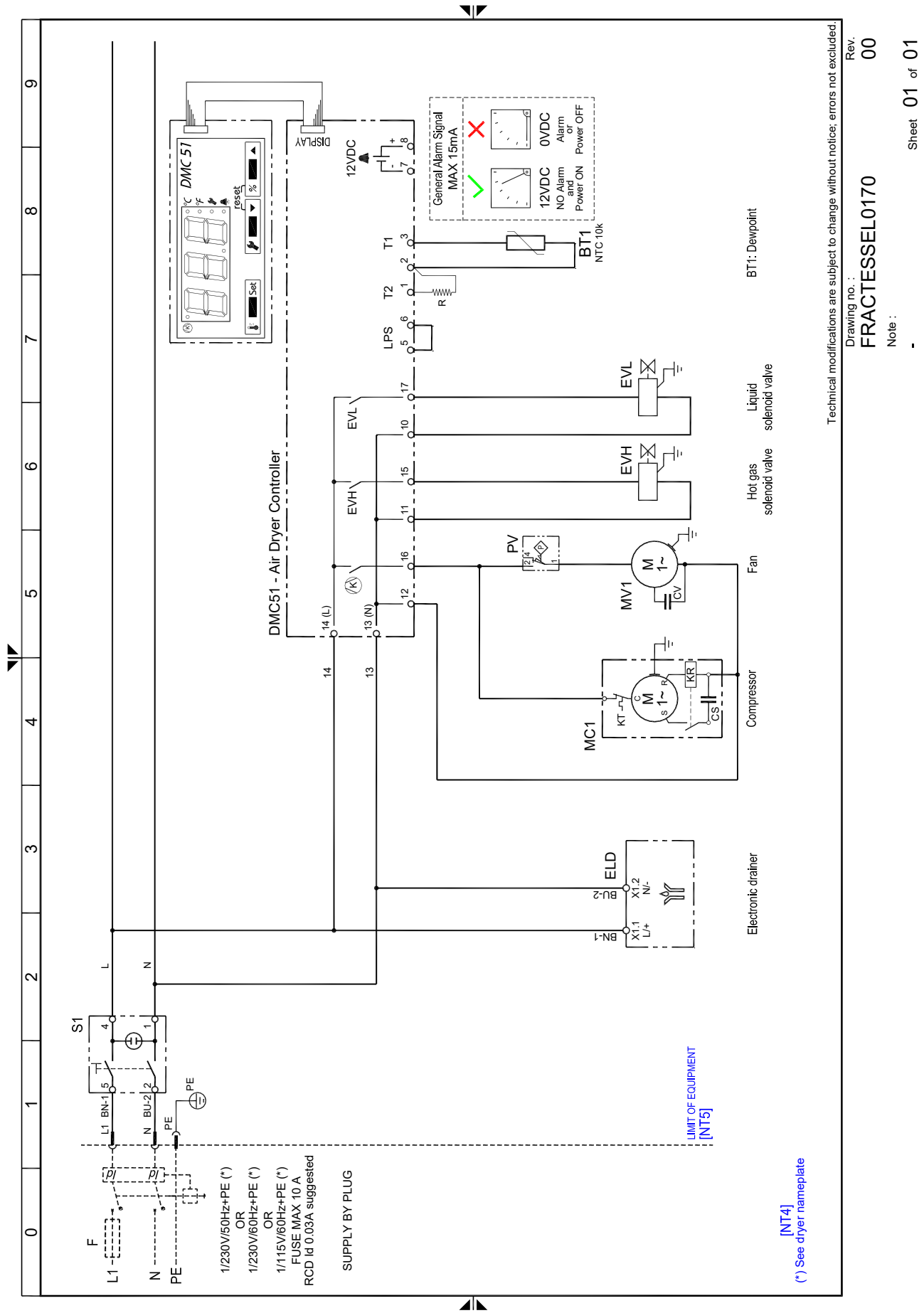


9.2.11 ACT ES 400 – 500 3phase

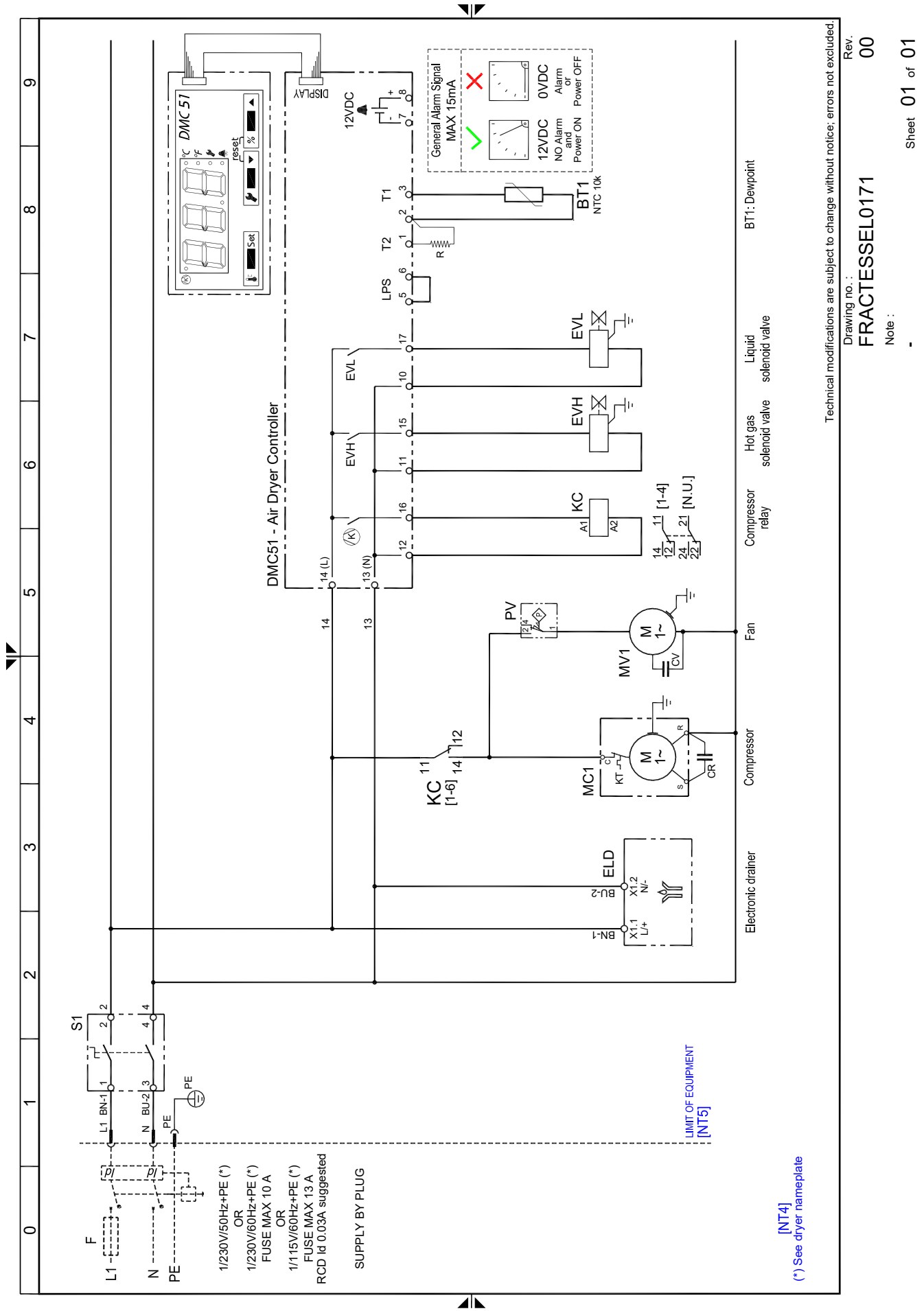


9.3 Electric diagrams

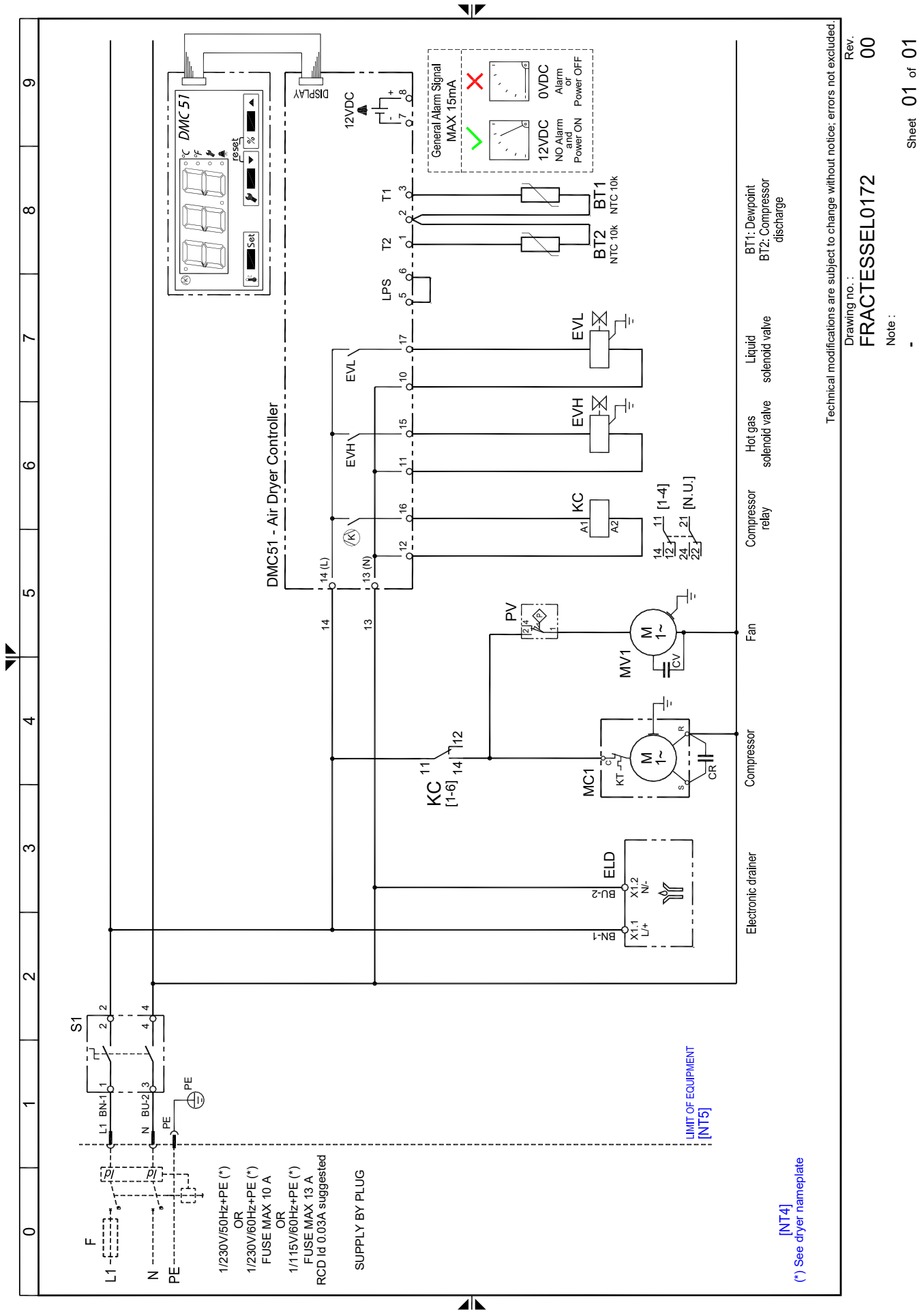
9.3.1 ACT ES 20 – 100



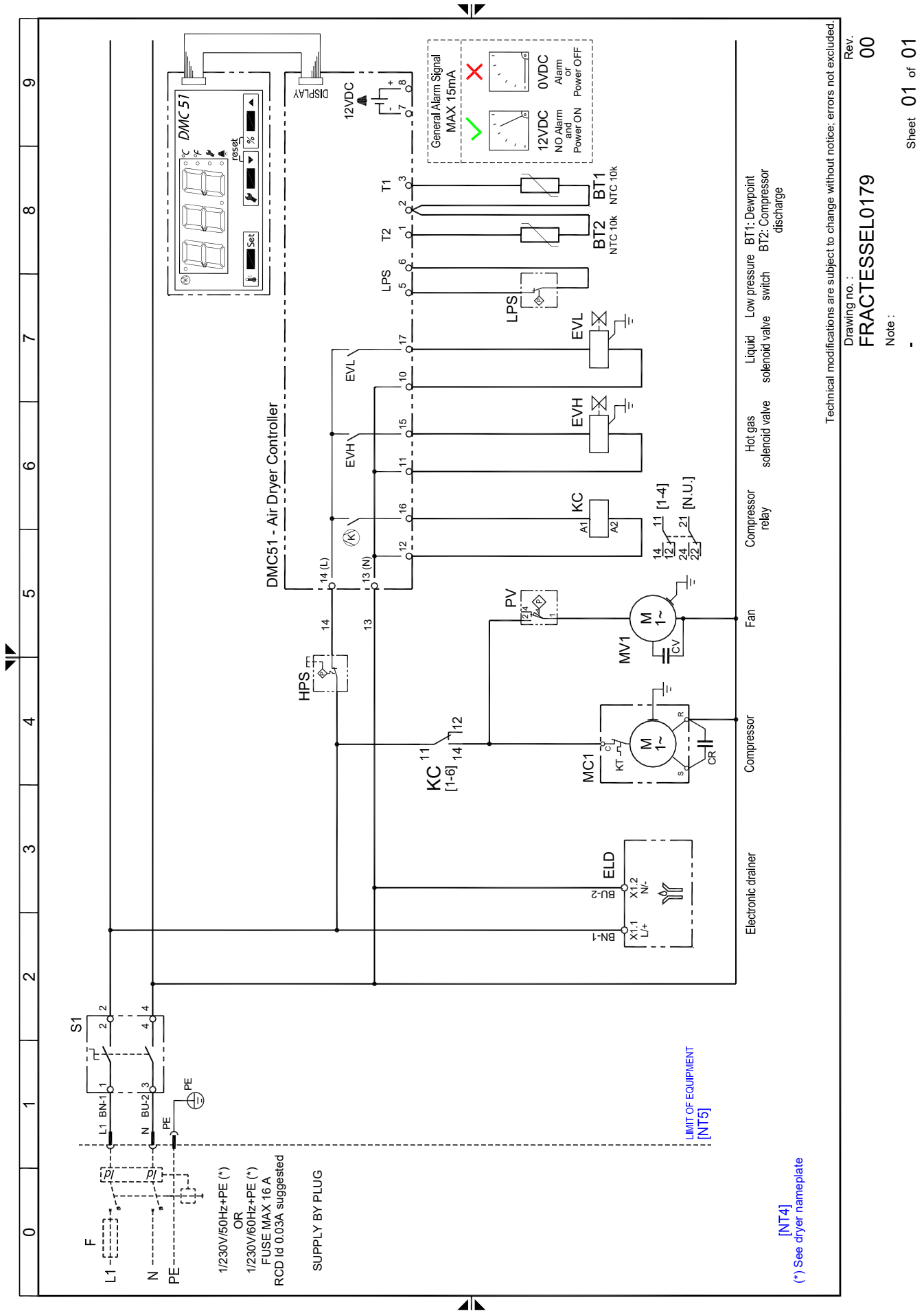
9.3.2 ACT ES 125 – 150



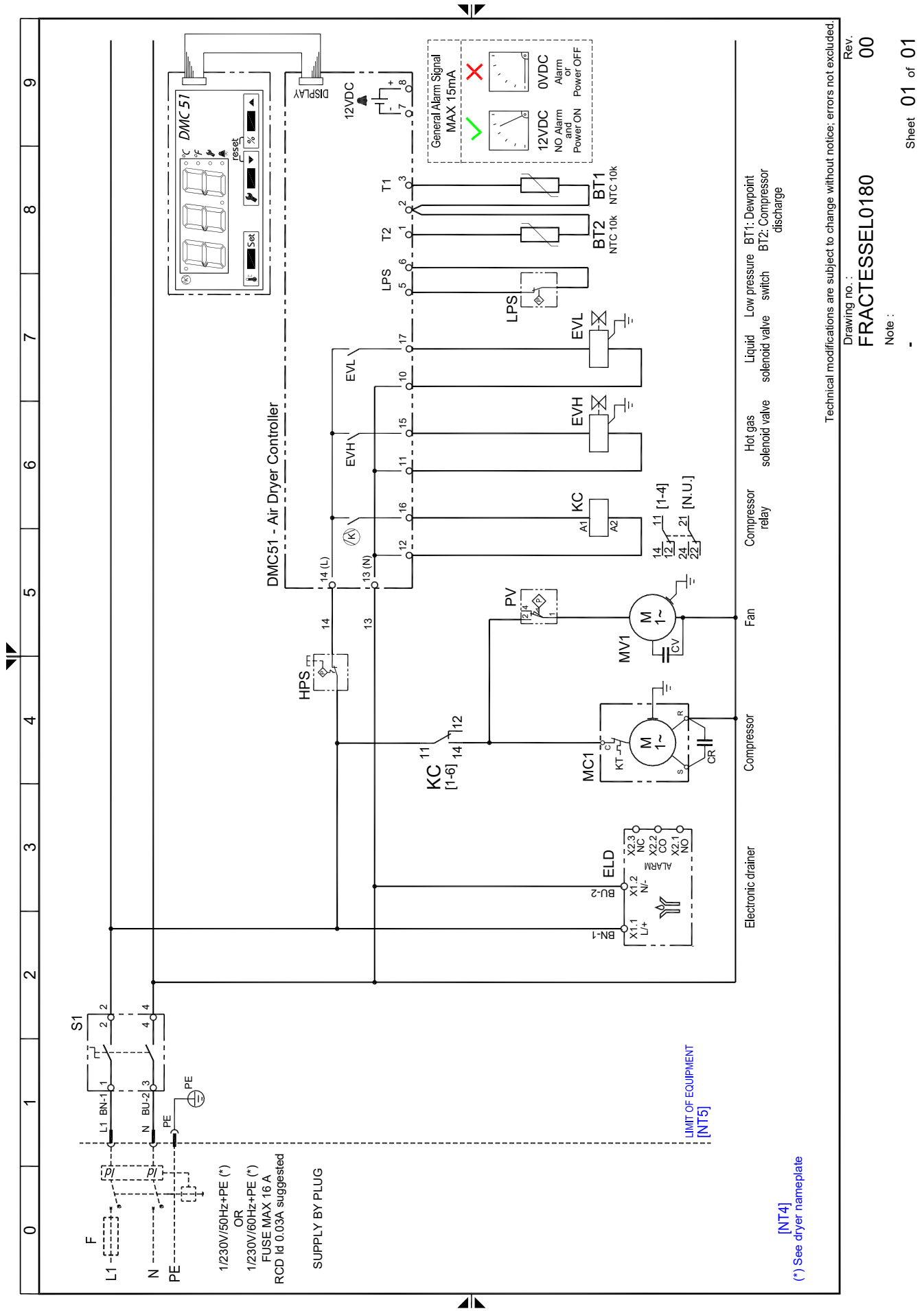
9.3.3 ACT ES 200 – 250



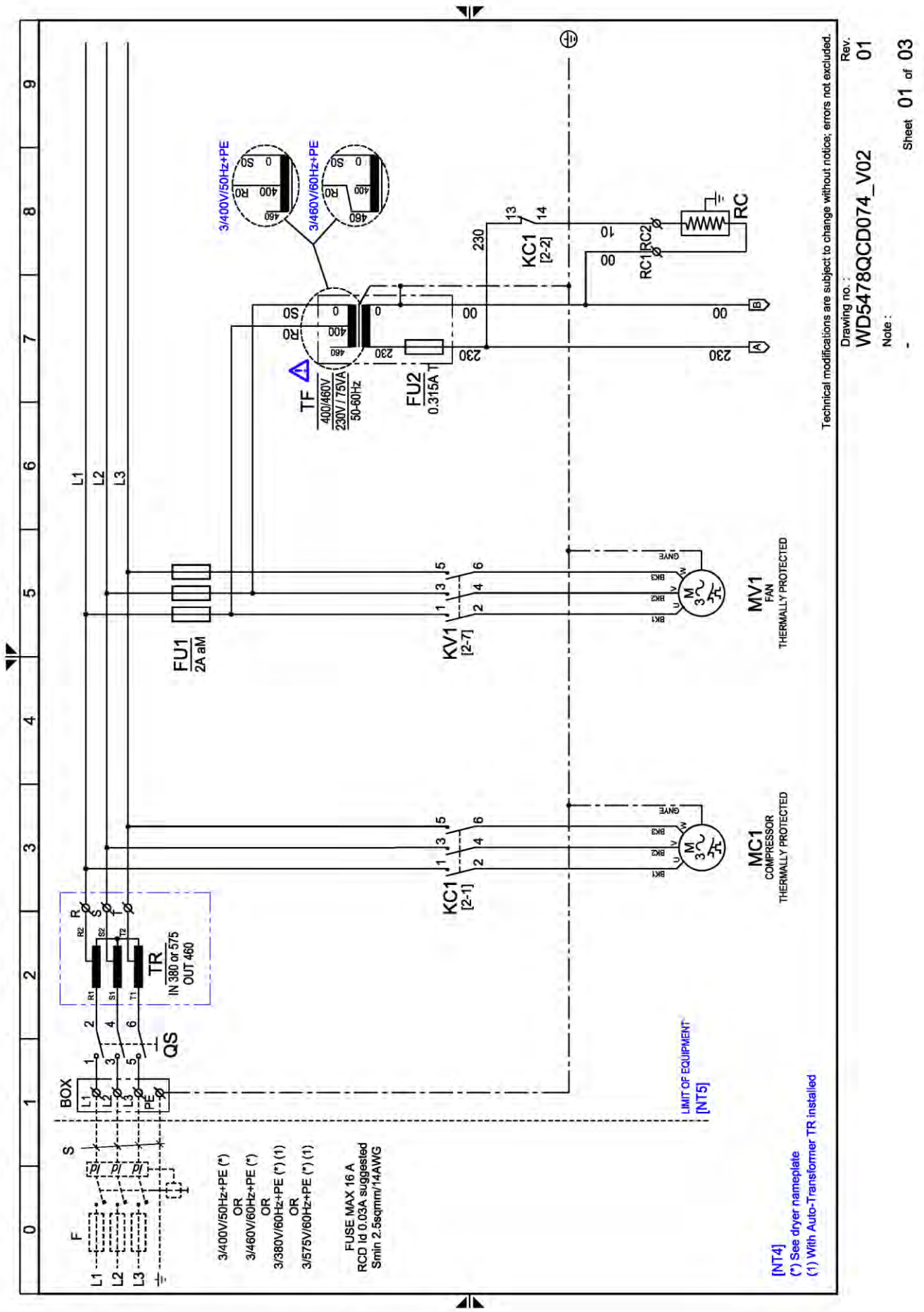
9.3.4 ACT ES 300 – 350



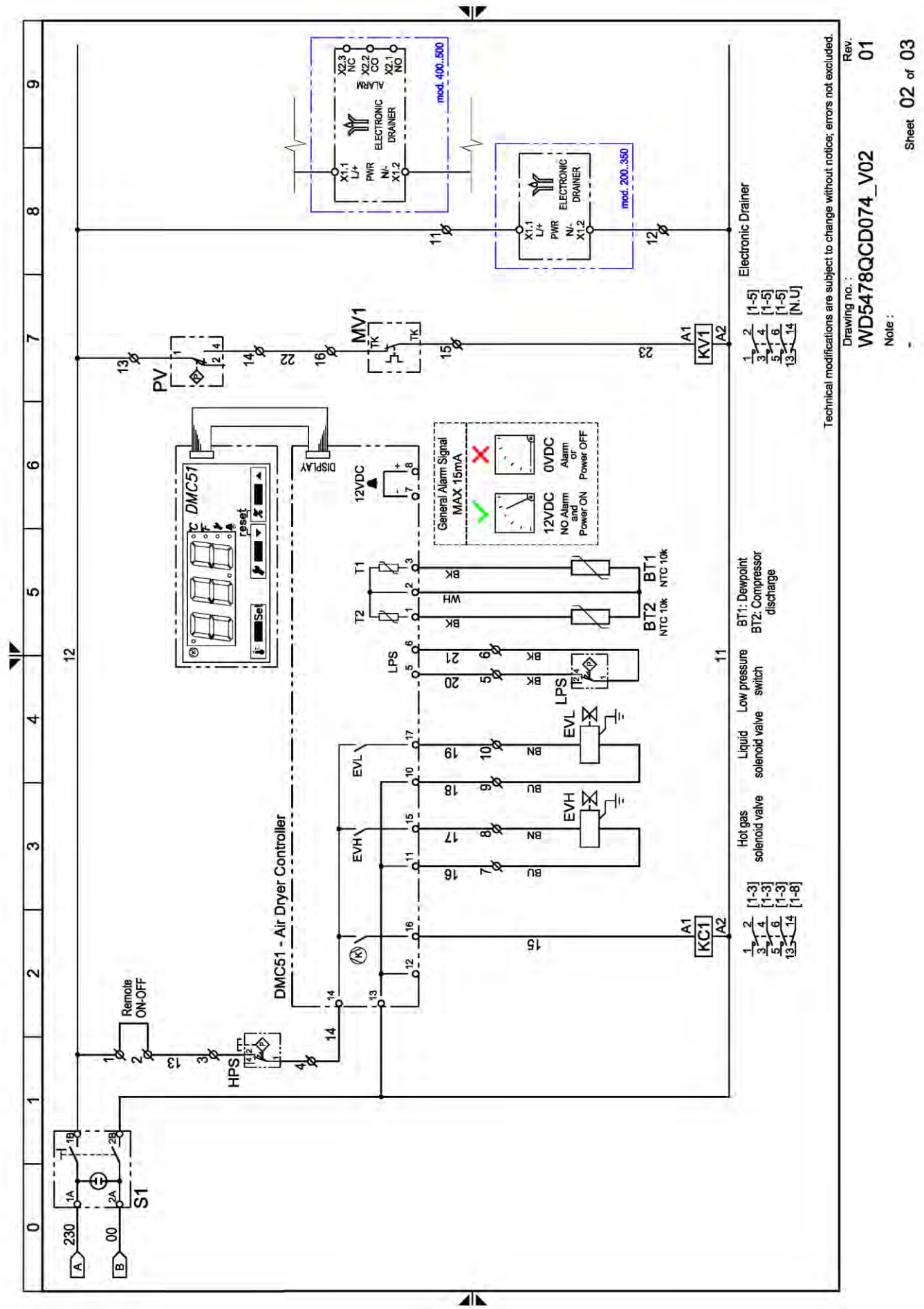
9.3.5 ACT ES 400 – 500



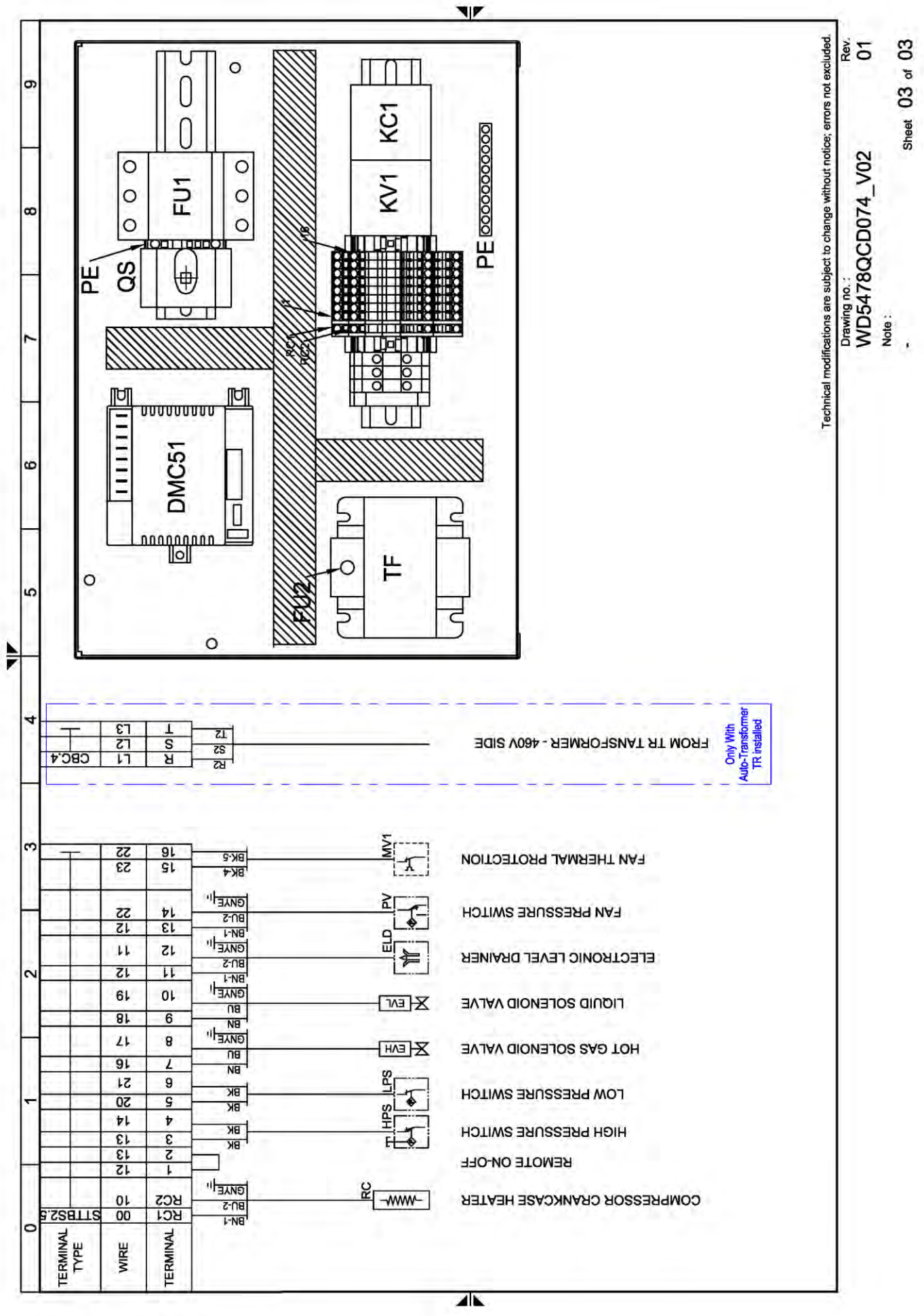
9.3.6 ACT ES 200 – 500 3phase Sheet 1 of 3



9.3.7 ACT ES 200 – 500 3phase Sheet 2 of 3



9.3.8 ACT ES 200 – 500 3phase Sheet 3 of 3



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