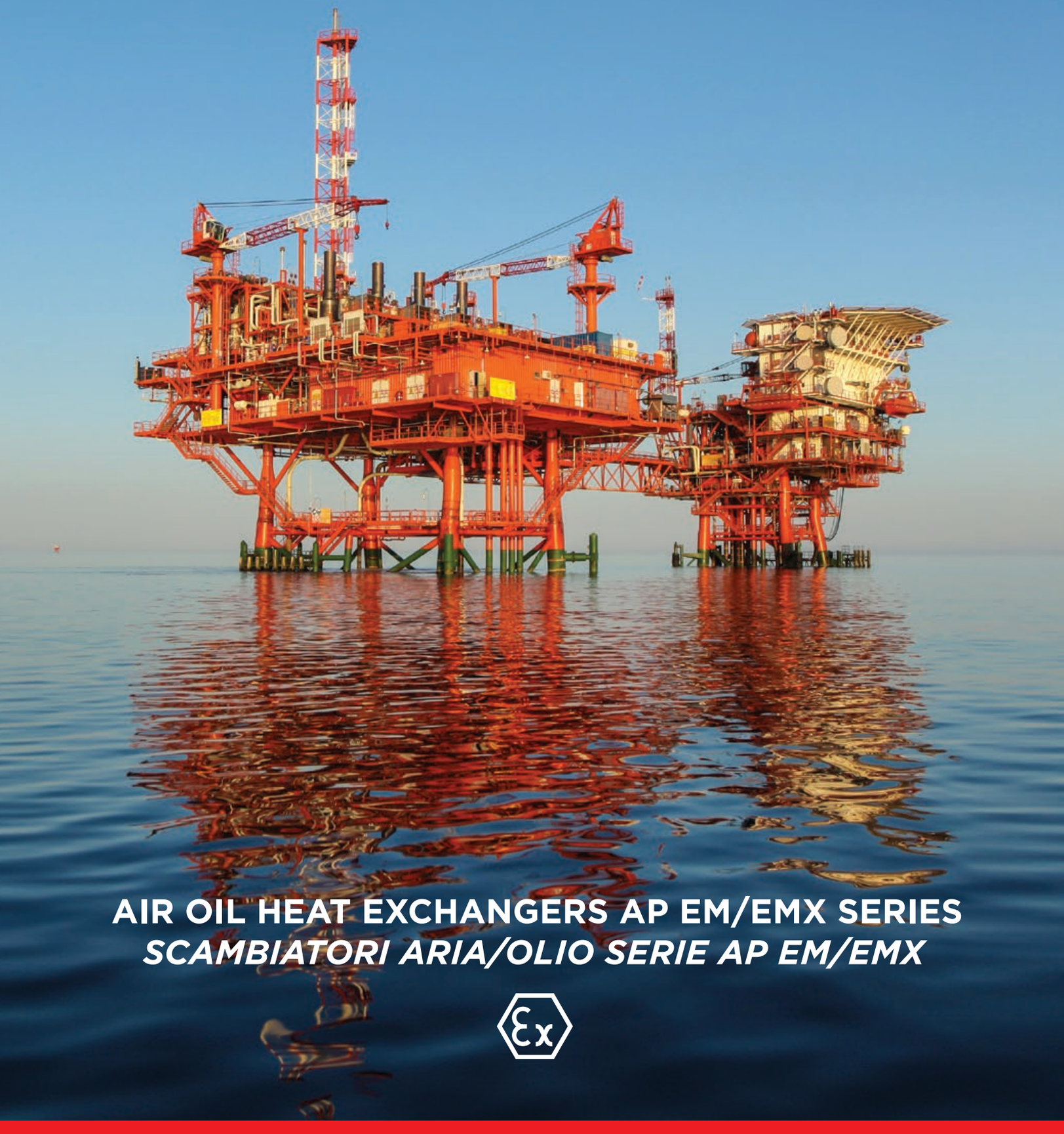
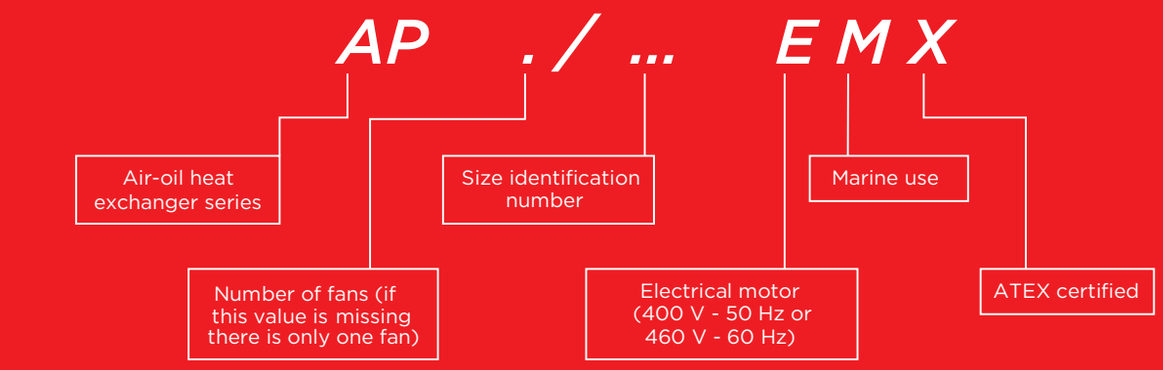
sesino

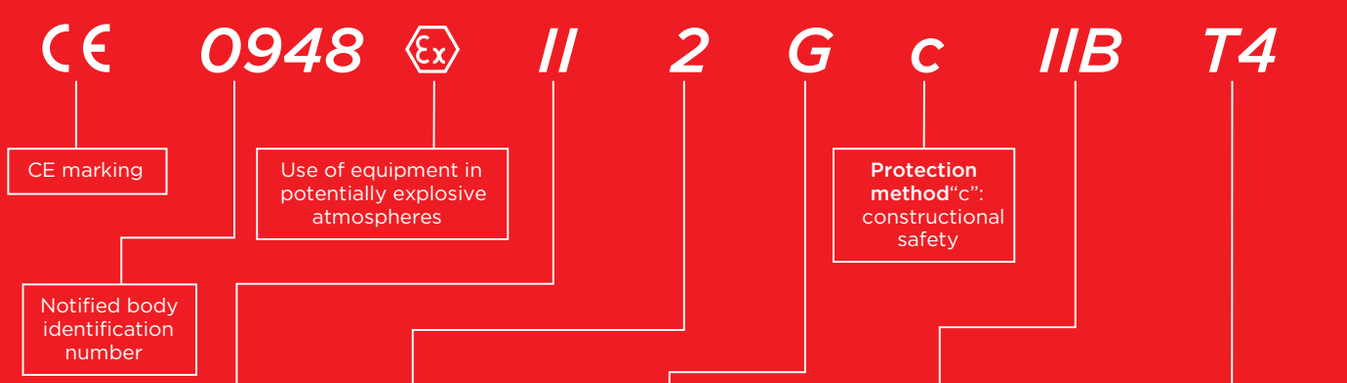
HEAT EXCHANGING EXCELLENCE SINCE 1919



AIR OIL HEAT EXCHANGERS AP EM/EMX SERIES

SCAMBIATORI ARIA/OLIO SERIE AP EM/EMX





Equipment group:	Equipment category	Type of explosive atmospheres	
		G (gas vapours)	D (dust)
I (Mines)	M1 (Very high level)		
	M2 (High level)		
II (Surface)	1 (Very high level)	0	20
	2 (High level)	1	21
	3 (Normal)	2	22

Group of gas
I – Mines (methane)
II – Surface industries
IIA – Propane
IIB – Ethylene
IIC – Hydrogen, Acetylene
(representative ignition gas)

Temperature class (group II)	
Reference ambient T: -20°C ÷ +40°C	
Class	***Maximum surface T***
T1	450°C
T2	300°C
T3	200°C
T4	135°C
T5	100°C
T6	85°C

Edition: September 2015
Art direction, photography & graphic design: Flywheel s.r.l. www.flywheel.it

OUR PHILOSOPHY
FILOSOFIA AZIENDALE

SESINO philosophy has its grounding on the following principles.

1. **Full quality**, meant to be product's quality, assistance and organization quality, quality of our raw materials and our measuring and checking instruments, everything according to ISO 9001:2008 Regulation.

2. **Occupational safety**, a commitment to our staff, in order to grant them no risks while working. A policy for which we obtained BS OHSAS 18001:2007 Certification.

3. **Proactive Skills**, Sesino aptitude to support and cooperate with customers in order to optimize the development of their projects. SESINO can offer custom-made products, produced according to our client's needs, using our experience, knowledge, human resources and technology.

4. **Competitiveness**, which means to be able to face our competitors and believe that we can succeed. This feature is the result of corporate growth, increase in the sales volume, expense reduction and the possibility to invest in technology and marketing research.

La filosofia aziendale della SESINO pone le sue basi sui seguenti fondamenti.

1. ***Qualità totale**, intesa come qualità del prodotto, qualità del servizio, qualità dell'organizzazione, qualità degli strumenti di controllo, qualità delle materie prime, ma non solo a parole, bensì certificata secondo le norme ISO 9001:2008.*

2. ***Sicurezza sul lavoro**, un impegno che ci siamo assunti nei confronti di tutti i nostri collaboratori perché possano lavorare senza rischi di incidenti, anche qui, non solo a parole, bensì certificata secondo la Norma BS OHSAS 18001:2007*

3. ***Capacità propositiva**, intesa come un preciso impegno della SESINO a essere vicina in modo particolare ai costruttori allo scopo di collaborare con gli stessi per l'ottimizzazione e lo sviluppo dei loro progetti. È inoltre una caratteristica produttiva della SESINO quella di poter offrire prodotti fuori standard, costruiti in funzione delle specifiche esigenze della clientela; questo naturalmente presuppone conoscenza, esperienza, risorse umane e tecnologiche per affrontare e risolvere i problemi.*

4. ***Competitività**, che significa doversi e potersi misurare con tutti gli antagonisti, con la consapevolezza di poter anche essere vincenti. La competitività è senza dubbio il risultato di diversi componenti quali la crescita aziendale, l'incremento del fatturato, il contenimento delle spese, la possibilità di finanziare investimenti tecnologici per la ricerca, per il marketing e così via.*

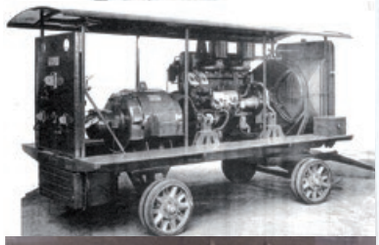
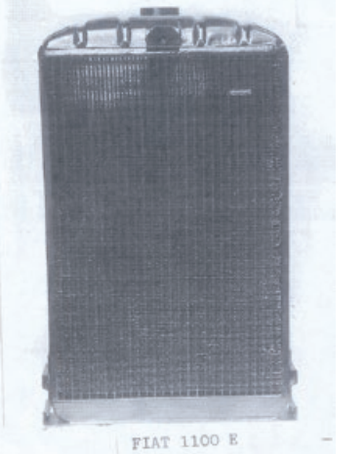
Quality Management System

Occupational Health and Safety Assessment Series

HISTORY
STORIA





SCAMBIATORI DI CALORE ACQUA/OLIO PER OLEODINAMICA
FIAT 1100 E




1919

The Sesino brothers founded the company F.lli Sesino & C., having as its main activity the production and maintenance of grills and radiators for vehicles. *I fratelli Sesino costituiscono la F.lli Sesino & C., avente come attività la costruzione e riparazione di mascherine e radiatori per automobili.*

1920

F.lli Sesino & C. took part into the first Exhibition in Milan and got several statements and rewards for its activity.
La F.lli Sesino & C. partecipa alla prima FIERA DI MILANO e ottiene attestazioni e riconoscimenti per l'attività svolta.

1922

F.lli Sesino & C., after having received a big order for the production of car radiators from company Edoardo Bianchi, moved from the old workshop to the new place in Via Noè, Milan. Until the II World War, the company got several orders for grills and radiators from Bianchi and FIAT. Then, in the new site began the production of gas and electric unit heaters, condensers and evaporators for the first refrigerating systems. *La F.lli Sesino & C., acquisita una fornitura di radiatori per la casa automobilistica EDOARDO BIANCHI, si trasferisce dalla bottega artigiana degli esordi in una nuova sede in Via Noe a Milano. Fino allo scoppio della seconda guerra mondiale, vengono acquisiti ordini per forniture di mascherine e radiatori, oltre che dalla EDOARDO BIANCHI, dalla FIAT. In questa nuova sede inizia la produzione di aerotermi a gas ed elettrici, condensatori ed evaporatori per i primi impianti frigoriferi.*

1934

With the resignation of brother Alfredo the company became Costante Sesino & C. *Con le dimissioni del fratello Alfredo, la Società si trasforma in Costante Sesino & C.*

1945

Finished the II World War, among the several difficulties, Costante Sesino & C. restarted the production of radiators, evaporators and condensers. *Terminata la seconda guerra mondiale, tra le mille difficoltà dei tempi, la Costante Sesino & C. ricomincia a produrre radiatori, evaporatori e condensatori.*

1948

Began the production of radiators for cars, trucks and tractors for the spare parts market. This activity absorbed entirely Costante Sesino production for more than a decade. *Inizia la produzione di radiatori per auto, autocarri e trattori destinata al mercato del ricambio, che occupa la Costante Sesino & C. in maniera esclusiva per oltre un decennio.*

1954

Construction of the new company headquarter in Via Doberdò, Milan, which after further enlargements reached a covered area of 2500 m^2. *Costruzione della nuova sede di Via Doberdò, sempre a Milano che, con vari successivi ampliamenti, raggiunge una superficie coperta di oltre 2500 m^2.*

1955

Against request of a producer of injection presses for plastic material, who was forced to supply in the USA, Costante Sesino & C. started the production of tube-bundle heat exchangers for oil cooling in oleo hydraulic systems. *Su sollecitazione di un costruttore di presse a iniezione per materie plastiche, costretto ad approvvigionarsi degli scambiatori di calore a fascio tubiero negli Stati Uniti, la Costante Sesino & C. inizia la produzione di scambiatori di calore a fascio tubiero per il raffreddamento dell'olio di impianti oleoidraulici.*

1960

Using the experience in the construction of radiators, Costante Sesino & C. began producing air-oil heat exchangers intended to cool mobile and industrial machine's systems, combined radiators for the cooling of water and oil, exchangers for compressors and radiators for power units. *Sfruttando l'esperienza precedente nella costruzione di radiatori, la Costante Sesino & C. inizia la produzione di scambiatori di calore aria-olio destinati al raffreddamento di macchine mobili e industriali, alla costruzione di radiatori combinati per raffreddamento acqua e olio, al raffreddamento di compressori, alla costruzione di radiatori per gruppi elettrogeni.*

1970

The production of radiators for the spare parts market was definitely abandoned in order to concentrate exclusively on the oleo hydraulic market. *Viene deciso di abbandonare la produzione di radiatori per il mercato del ricambio per dedicarsi esclusivamente al mercato oleoidraulico.*

1988

Began the production of aluminium air-oil heat exchangers, which will onwards substitute the brass/copper production. *Inizia la produzione di scambiatori aria-olio in alluminio che andrà progressivamente a sostituire negli anni successivi quella in ottone/rame.*

1999

The Company changed its name in Costante Sesino S.p.A., becoming part of Tognella Group. This event gave the company a fresh new start, granting the possibility to count on cooperation and financial support. This union brought to new investments aimed at improving the company efficiency. *La Società cambia la ragione sociale nell'attuale Costante Sesino S.p.A. ed entra a far parte del Gruppo Tognella . Avrà quindi la possibilità di attingere a nuova linfa vitale, di poter usufruire di tutti quei benefici che derivano dalle sinergie, dalle collaborazioni e dal reciproco sostentamento economico/finanziario. Negli anni successivi vengono effettuati molti investimenti per migliorare l'efficienza produttiva.*

2003

Costante Sesino S.p.A. moved to the current seat in Gessate (Milan): a modern place with a 4000 m^2 producing area and 400 m^2 offices. *Trasferimento della Costante Sesino S.p.A. nell'attuale sede di Gessate in provincia di Milano: si tratta di una moderna sede industriale di oltre 4000 m^2 di superficie produttiva, oltre a 400 m^2 di uffici.*

2009

Introduction of custom-made heat exchangers with different materials and size, addressed mainly to the energy market. *Introduzione di una produzione di scambiatori speciali, destinati al mercato energetico, costruiti con materiali diversi dallo standard, e fornibili con specifiche certificazioni richieste dai clienti.*

2011

Costante Sesino obtained the Centification EN ISO 9001/2008. *Raggiungimento della certificazione di qualità ISO 9001/2008.*

2012

Costante Sesino obtained the OHSAS 18001/2007 Certification for occupational health and safety management system. *Raggiungimento della certificazione OHSAS 18001/2007 per la salute e la sicurezza sul lavoro.*

HEAT EXCHANGING: GENERAL INFORMATION
GENERALITÀ SULLA TRASMISSIONE DEL CALORE

How heat is transferred

The term heat transmission means the processes through which heat is transferred from one body to another or from different points of the same body, because of the presence of temperature differences. The transmission way changes according to the nature of the body.
In a solid body, heat is transferred by conduction, in a liquid by convection, while the third method, radiation, depends on the electromagnetic properties of the bodies involved. This last case is not particularly relevant in the heat exchangers field and thus, only the first two phenomena will be briefly described.

Conduction

Let us suppose to have a flat plate and that the two faces of the plate are in some way kept at two different temperatures: T1 and T2.
There will be a flow of heat from the face with an higher temperature T1 to the one with a lower temperature T2, without any movement of matter. We say that heat is transmitted from one point to another by conduction.

Convection

Now let us consider the case of a body immersed in a fluid. If the temperature of the body is higher than that of the fluid, heat will flow from the former to the latter. Since the temperature of the fluid in contact with the wall is higher than the one of the fluid distant from the wall, a movement is established because of the different densities at the two points. The phenomenon of heat transmission related to this state of motion is called convection.
While conductivity depends exclusively on the material, heat exchange by convection depends on the type of fluid, its condition of motion and the shape of the surface.

General information on heat exchangers and their sizing

Heat exchangers are devices, which allow the exchange of heat between two moving fluids at different temperatures. The two fluids are generally separated by a solid surface, which is usually metal. Heat exchangers can be divided into three groups according to the motion of the two fluids inside.

a) parallel current heat exchanger, when the two fluids move in parallel and in the same direction at all points of the exchanger;
b) counter current heat exchangers, where the two fluids move in parallel but in opposite directions;
c) crosscurrent heat exchangers, where the two fluids move at right-angles to each other.

Sizing a heat exchanger means to calculate the needed exchange surface which is a function of the quantity of heat to dissipate, of the temperatures and the oil flow rates of the two fluids.

Problems regarding oil cooling

The viscosity of oil increases as its temperature decreases. When oil encounters a cold surface in a heat exchanger, it forms an isolating stratum. The thickness of this stratum is inversely proportional to the possibility of heat exchange.
To obtain optimal thermal efficiency, the flow rate of the oil over the exchange surface must be such as to ensure that the thickness of this stratum is as low as possible. In practice, this means that it is essential to ensure that the flow rate of the oil inside the heat exchanger is higher than the minimum indicated on the catalogues.

Sizing of air-oil heat exchangers to be installed on hydraulic system

The technical data required are the same of water-oil heat exchangers, as well as the ambient temperature at which the heat exchanger has to work.
Sizing an air-oil heat exchanger consists, practically, in calculating the needed specific performance, called Kr, and choosing the heat exchanger having the higher specific performance.
$Kr = Q/\Delta T$ where ΔT is the difference between oil inlet temperature and maximum summer ambient temperature, while Q is the quantity of heat to be dissipated which can be easily calculated considering 20-30% of installed power.
To choose the right cooler you must check the diagrams into the technical catalogue.

Example

N = 20 kW
q = 80 lpm
To = 50°C
Tamb = 30°C

Q = 30% 20 = 6 kW = 5.160 kcal/h
ΔT = 50 - 30 = 20°C
Kr = 5.160/20 = 258 kcal/h°C

Drawing a vertical line on the diagram in correspondence with the flow rate 80 l/min, the intersection of this line with the curves gives on ordinates the Kr that each heat exchanger is able to grant in that condition

.

Le vie del calore

Tutti sanno che per "trasmissione del calore" si intendono i processi attraverso cui, a causa di differenze termiche esistenti, il calore si trasferisce da un corpo ad un altro o a punti diversi dello stesso corpo.
Queste modalità, ovviamente, cambiano a seconda che si verifichino in un solido(conduzione), in un liquido (convezione) o per le proprietà elettromagnetiche dei corpi (irraggiamento).
Quest'ultimo caso non riveste particolare rilevanza nel campo degli scambiatori di calore e perciò riteniamo utile accennare solo ai primi due fenomeni.

La conduzione

Supponiamo di avere una lastra piana e di mantenere con qualsiasi artificio le due facce a due temperature diverse: T1>T2. Vi sarà un flusso di calore dalla faccia a temperatura superiore a quella a temperatura inferiore senza movimento di materia; diremo che il calore si trasmette da un punto ad un altro per conduzione.

La convezione

Consideriamo di avere un corpo immerso in un fluido; se la temperatura del corpo è superiore a quella del fluido, vi sarà un flusso di calore dal primo al secondo.
Poiché la temperatura del fluido a contatto con la parete è più alta di quella di un punto lontano dalla parete, si stabilisce un movimento causato dalle diverse densità nei due punti: il fenomeno di trasmissione del calore che è legato a questo stato di moto si chiama convezione.
A differenza della conducibilità che dipende esclusivamente dal materiale, il calore scambiato per convezione trova le sue ragioni, oltre che nel tipo di fluido, nelle condizioni di moto di questo e nella forma della superficie.

Generalità sugli scambiatori di calore e loro dimensionamento

Gli scambiatori di calore sono apparecchi che consentono lo scambio del calore tra due fluidi in movimento a diverse temperature. I due fluidi sono generalmente separati tra loro da una superficie solida, quasi sempre metallica.
Gli scambiatori di calore, in relazione al moto dei due fluidi all'interno dell'apparecchio, si possono dividere in tre gruppi:

a) scambiatori in equicorrente, se i due fluidi si muovono in ogni punto dell'apparecchio parallelamente e nella stessa direzione;
b) scambiatori in controcorrente, se i due fluidi si muovono parallelamente, ma in direzioni opposte;
c) scambiatori a correnti incrociate, se il flusso dei fluidi è ortogonale.

Dimensionare uno scambiatore significa calcolare la superficie di scambio necessaria, che è funzione della quantità di calore da disperdere, delle temperature e delle portate dei due fluidi.

Problemi inerenti al raffreddamento dell'olio

L'olio è un fluido che, con il diminuire della temperatura, aumenta la sua viscosità. Quando in uno scambiatore di calore esso viene a contatto con una superficie fredda, esso forma uno strato isolante il cui spessore è inversamente proporzionale alla possibilità di scambiare calore.
Per ottenere una resa termica ottimale bisogna fare in modo che la velocità di scorrimento dell'olio sulla superficie di scambio sia tale da rendere il più basso possibile lo spessore di tale strato; ciò in pratica si traduce nella assoluta esigenza che negli scambiatori circoli una portata d'olio superiore alla minima indicata sui cataloghi.

Dimensionamento degli scambiatori di calore aria-olio da installare su impianti oleoidraulici

I dati da richiedere sono gli stessi dello scambiatore acqua-olio, oltre, naturalmente, alla temperatura dell'aria ambiente a cui deve funzionare lo scambiatore.
Il dimensionamento dello scambiatore consiste essenzialmente nel calcolo della potenzialità specifica necessaria, chiamata Kr, e scegliere lo scambiatore avente potenzialità specifica immediatamente superiore.

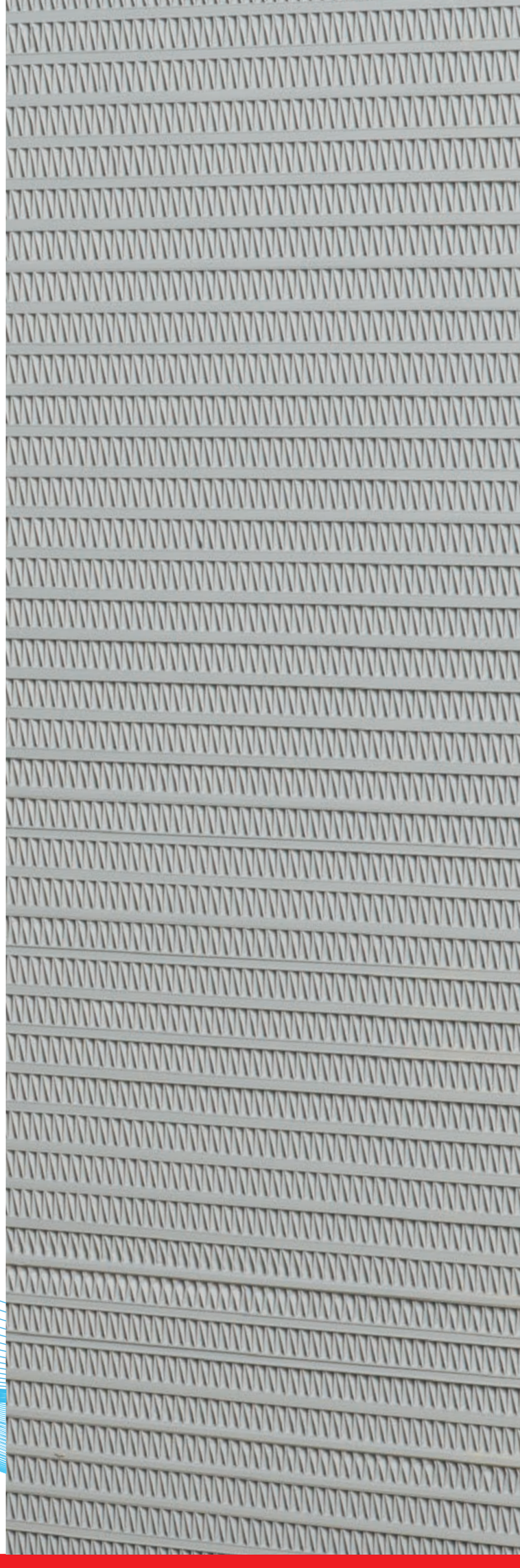
$Kr = Q/\Delta T$, dove ΔT è la differenza tra la temperatura entrata olio e la temperatura ambiente massima estiva e Q è la quantità di calore da disperdere che si calcola considerando il 20-30% della potenza installata.

Per scegliere lo scambiatore idoneo bisogna consultare i diagrammi del catalogo tecnico. Tracciando sui diagrammi una retta verticale in corrispondenza della portata 80 l/min, l'intersezione di tale retta con le curve fornisce in ordinate il Kr che ogni scambiatore è in grado di garantire in quella condizione.

Esempio: N = 20 kW; q = 80 lpm; To = 50°C; Tamb = 30°C

Q = 30% 20 = 6 kW = 5.160 kcal/h
ΔT = 50 - 30 = 20°C
Kr = 5.160/20 = 258 kcal/h°C

La scelta dello scambiatore si esegue utilizzando le curve presenti sul catalogo tecnico. Tracciando una retta verticale in corrispondenza della portata di 80 lpm, l'intersezione con le varie curve di resa fornisce in ordinate il Kr dei diversi scambiatori.



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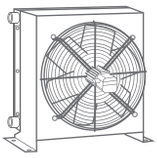
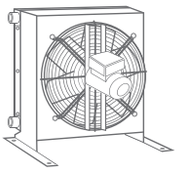


AIR-OIL
HEAT EXCHANGERS
MARINE USE
SCAMBIATORI
ARIA-OLIO
USO MARINO

WITH ALTERNATING CURRENT ELECTRIC FAN
CON VENTILATORI A CORRENTE ALTERNATA



AIR-OIL
HEAT EXCHANGERS
ATEX CERTIFIED
SCAMBIATORI
ARIA-OLIO
CERTIFICATI ATEX

WITH ALTERNATING CURRENT ELECTRIC FAN
CON VENTILATORI A CORRENTE ALTERNATA

AP 300 EMX

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AP 300/2 EMX

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AP 430 EMX

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AP 430/2 EMX

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AP 3/830 EMX

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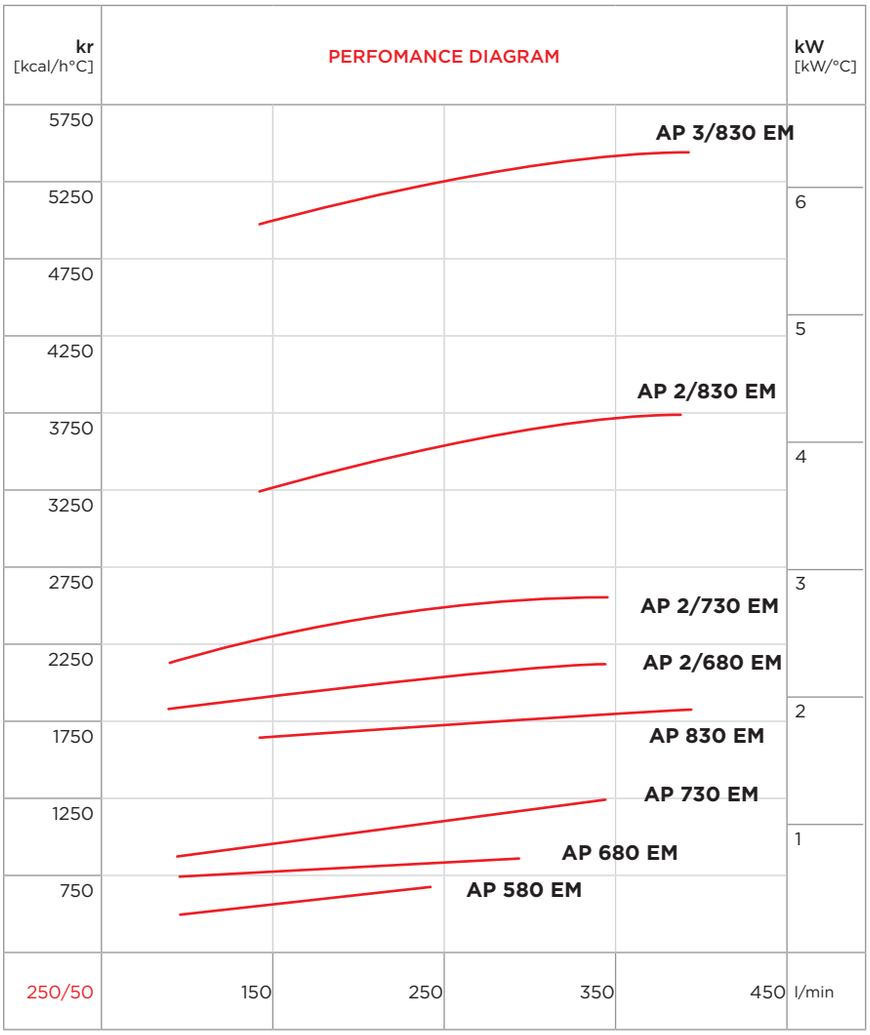
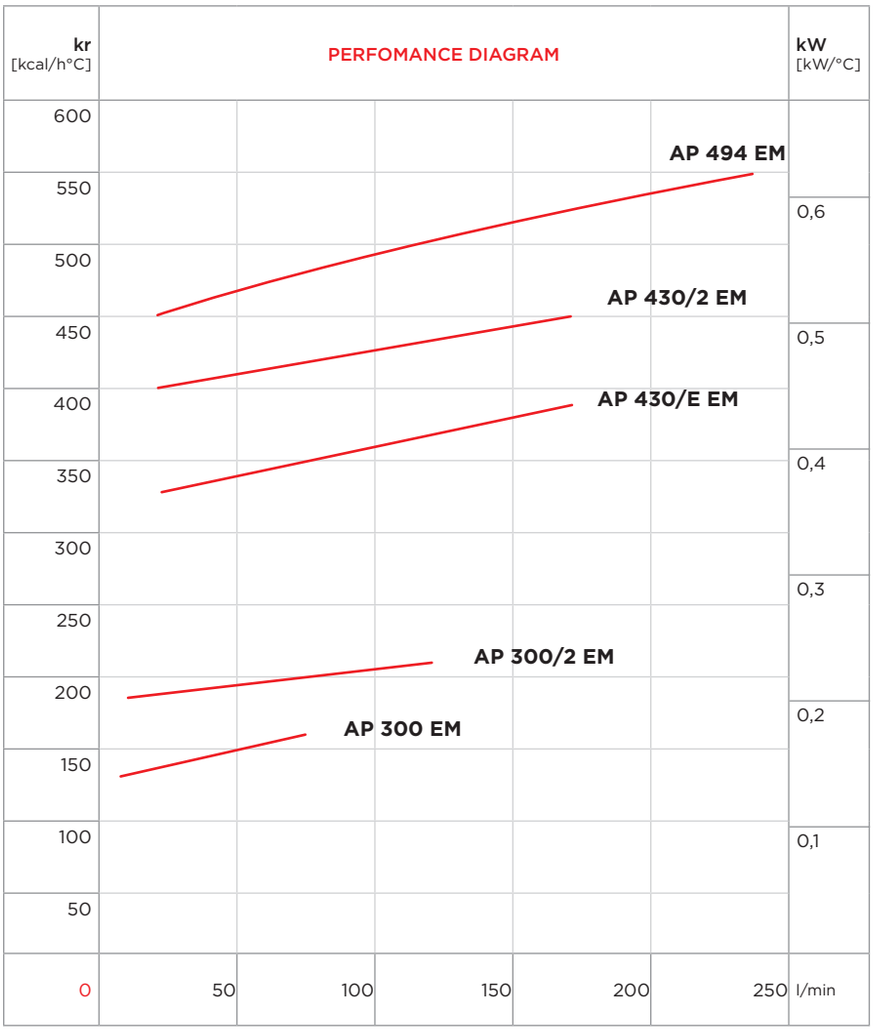
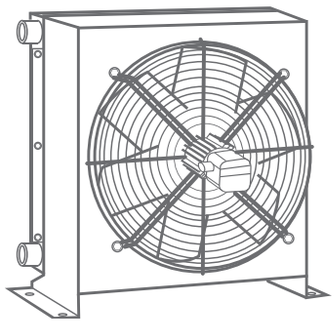

kr
[kcal/h°C]
PERFOMANCE DIAGRAM
kW
[kW/°C]
5750
5250
4750
4250
3750
3250
2750
2250
1750
1250
750
AP 3/830 EM
AP 2/830 EM
AP 2/730 EM
AP 2/680 EM
AP 830 EM
AP 730 EM
AP 680 EM
AP 580 EM
6
5
4
3
2
1
250/50
150
250
350
450
l/min


kr
[kcal/h°C]
PERFOMANCE DIAGRAM
kW
[kW/°C]
600
550
500
450
400
350
300
250
200
150
100
50
AP 494 EM
AP 430/2 EM
AP 430/E EM
AP 300/2 EM
AP 300 EM
0,6
0,5
0,4
0,3
0,2
0,1
0
50
100
150
200
250
l/min

AC MOTOR AIR-OIL HEAT EXCHANGERS - MARINE USE EM TYPE

SCAMBIATORI DI CALORE ARIA OLIO CON VENTILATORE A CORRENTE ALTERNATA - USO MARINO SERIE EM



The advantage of using air into the cooling of oleo hydraulic systems has its bases on the following facts:

- There is no need of water
- The system is independent of the connection to the water main
- Lower working costs in comparison with the water-oil exchangers, even if the starting investment is higher
- Possibility to use warm air to heat the room in winter.
- The particular structure of the cooling element allows great thermic performances and pressure resistance.

Maximum working static pressure: 20 bar; test pressure: 35 bar.

It is always recommended to assemble in parallel with the exchanger a by-pass valve to avoid extreme counter-pressures, particularly when the machine is started with cold oil. On the contrary, it is not useful to use a check valve as by-pass to protect the exchanger from pressure's peaks, since the inertia of the valve itself is too high in comparison with the speed of the pressure waves that occur into the oleo hydraulic systems.
The flow rates shown in the tables are the ones recommended for the exchanger proper working.
The efficiency curves show the specific exchange capacity in kcal/h°C or in kW/°C according to the different oil rates. To calculate the heat quantity the different exchangers are able to dissipate it is enough to multiply such capacity by the difference between the requested oil temperature and the summer room temperature.

The heat exchangers type EM have been designed to be used outdoors, in areas where the level of salinity in the air is high (off-shore application).
The components are the following:

- **Aluminum cooling element with anodizing and corrosion proofing treatment (SWAAT test according to ASTM G 85-94 ANNEX A3)**
- **Coated AISI 304 stainless steel frame**
- **Three-phase electric fan, 400V 50Hz or 480V 60Hz, with IP 56 protection degree and stainless steel protection grill for off-shore application**
- **Fixed thermo-switch (47-36°C or 60-49°C) IP 65 protection degree**

For the right calculation of air-oil heat exchangers, we supply our customers with a calculation software.
The air-oil heat exchangers can be used to cool other kind of fluids, which must be compatible with aluminum and its alloys.
However, for each use, with the exception of oil cooling, we recommend to consult our Technical Department.

Il vantaggio dell'utilizzo dell'aria nel raffreddamento di impianti oleoidraulici trova le sue ragioni nei seguenti fattori:

- *Non necessità l'utilizzo di acqua*
- *Indipendenza della macchina dalle tubazioni di allacciamento alla rete idrica*
- *Inferiore costo di esercizio rispetto agli scambiatori acqua-olio, anche se maggiore è l'investimento iniziale*
- *Possibilità di utilizzare l'aria calda in uscita per riscaldare l'ambiente nella stagione invernale*
- *La particolare costruzione del radiatore consente di ottenere notevoli rese termiche e forte resistenza alla pressione.*

Pressione massima statica di funzionamento: 20 bar; pressione di collaudo: 35 bar.

È sempre consigliabile montare in parallelo allo scambiatore una valvola di by-pass per evitare eccessive contropressioni soprattutto al momento dell'avviamento della macchina con olio freddo. Non è invece conveniente utilizzare una valvola di ritegno come by-pass per proteggere lo scambiatore dai picchi di pressione in quanto l'inerzia della valvola stessa è troppo alta rispetto alla velocità delle onde di pressione che si sviluppano all'interno dell'olio degli impianti oleoidraulici.
Le portate olio indicate nelle tabelle sono quelle consigliate per il buon funzionamento dello scambiatore.
Le curve di rendimento forniscono la potenzialità di scambio specifica in kcal/h°C o in kW/h°C in funzione della portata olio; per calcolare la quantità di calore che i vari scambiatori sono in grado di disperdere, è sufficiente moltiplicare tale potenzialità per la differenza tra le temperature dell'olio desiderata e dell'aria ambiente massima estiva.

Gli scambiatori della serie EM sono stati concepiti per essere installati all'aperto in zone dove la concetrazione di salinità dell'aria è elevata (applicazioni off-shore).
I componenti sono i seguenti:

- ***Radiatore in alluminio con trattamento di anodizzazione anticorrosione (SWAAT test secondo norme ASTM G 85-94 ANNEX A3)***
- ***Telaio in acciaio inossidabile AISI 304 verniciato***
- ***Elettroventola trifase 400V 50Hz o 480V 60Hz con protezione IP 56 e rete in acciaio inossidabile adatta ad applicazioni off-shore***
- ***Termostato taratura fissa (47-36°C o 60-49°C) protezione IP 65***

Per il calcolo degli scambiatore aria-olio è disponibile un software.
Gli scambiatori aria-olio possono essere utilizzati per raffreddare altri tipi di fluidi, a condizione che essi siano compatibili con l'alluminio e le sue leghe.
Consigliamo comunque, per qualsiasi impiego che non sia il raffreddamento dell'olio, di contattare il nostro Ufficio Tecnico.

AP 300 EM

PURCHASE CODES

AP 300 EM three-phase 400V 50HZ with thermo-switch	3RAP300EM50T247 3RAP300EM50T260
AP 300 EM three-phase 480V 60HZ with thermo-switch	3RAP300EM60T247 3RAP300EM60T260
AP 300 EM three-phase 400V 50HZ without thermo-switch	3RAP300EM50ST
AP 300 EM three-phase 480V 60HZ without thermo-switch	3RAP300EM60ST

SPARE PARTS

Cooling element	3RNL300A
Frame	3CNAP300EM.1
Electric fan 400V 50Hz	1VNAP300EM50
Electric fan 480V 60Hz	1VNAP300EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
180	
170	0,20
160	0,19
150	0,18
140	0,17
130	0,16
120	0,15
110/0	0,14

10 20 30 40 50 60 70 80 90 l/min

PRESSURE DROP DIAGRAM

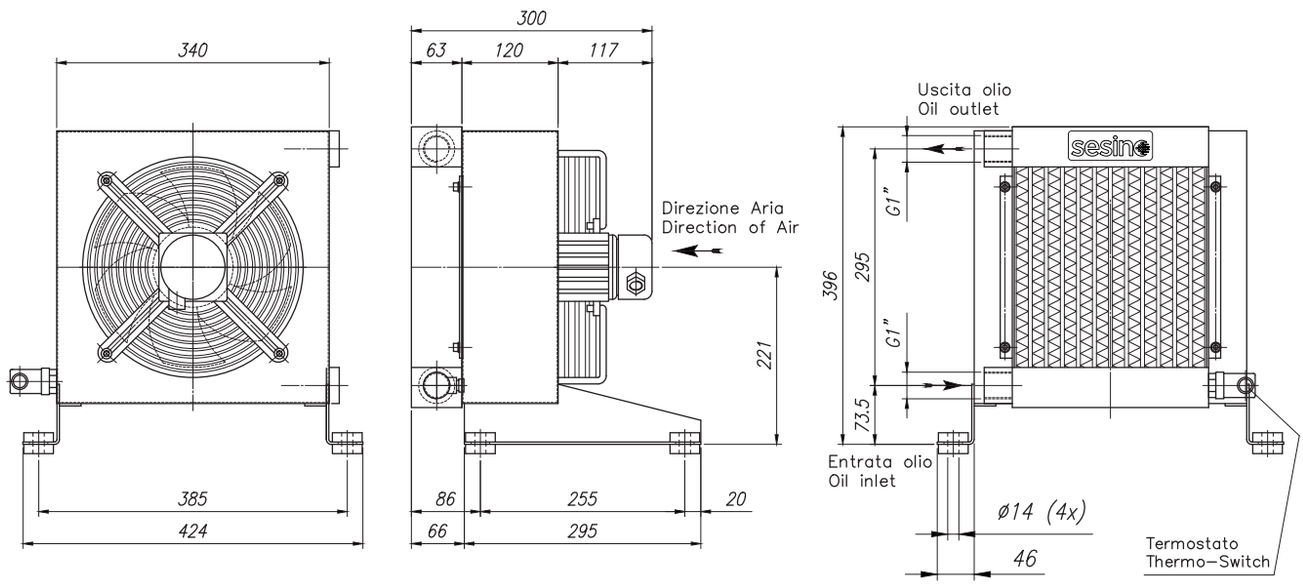
Bar
1,2
1
0,8
0,6
0,4
0,2
0

10 20 30 40 50 60 70 80 90 l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP300EM50ST	10-80	2	400	50	200	0,4	1500	56	73	12	250	-20/+40
3RAP300EM60ST	10-80	2	480	60	152	0,34	1580	56	73	12	250	-20/+40

AP 300 2/EM

PURCHASE CODES

AP 300/2 EM three-phase 400V 50HZ with thermo-switch	3RAP302EM50T247 3RAP302EM50T260
AP 300/2 EM three-phase 480V 60HZ with thermo-switch	3RAP302EM60T247 3RAP302EM60T260
AP 300/2 EM three-phase 400V 50HZ without thermo-switch	3RAP302EM50ST
AP 300/2 EM three-phase 480V 60HZ without thermo-switch	3RAP302EM60ST

SPARE PARTS

Cooling element	3RNL302A
Frame	3CNAP302EM.1
Electric fan 400V 50Hz	1VNAP300EM50
Electric fan 480V 60Hz	1VNAP300EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
230	0,26
220	0,25
210	0,24
200	0,23
190	0,22
180	0,21
170	0,2
160/0	l/min

20 40 60 80 100 120 140 160 180

PRESSURE DROP DIAGRAM

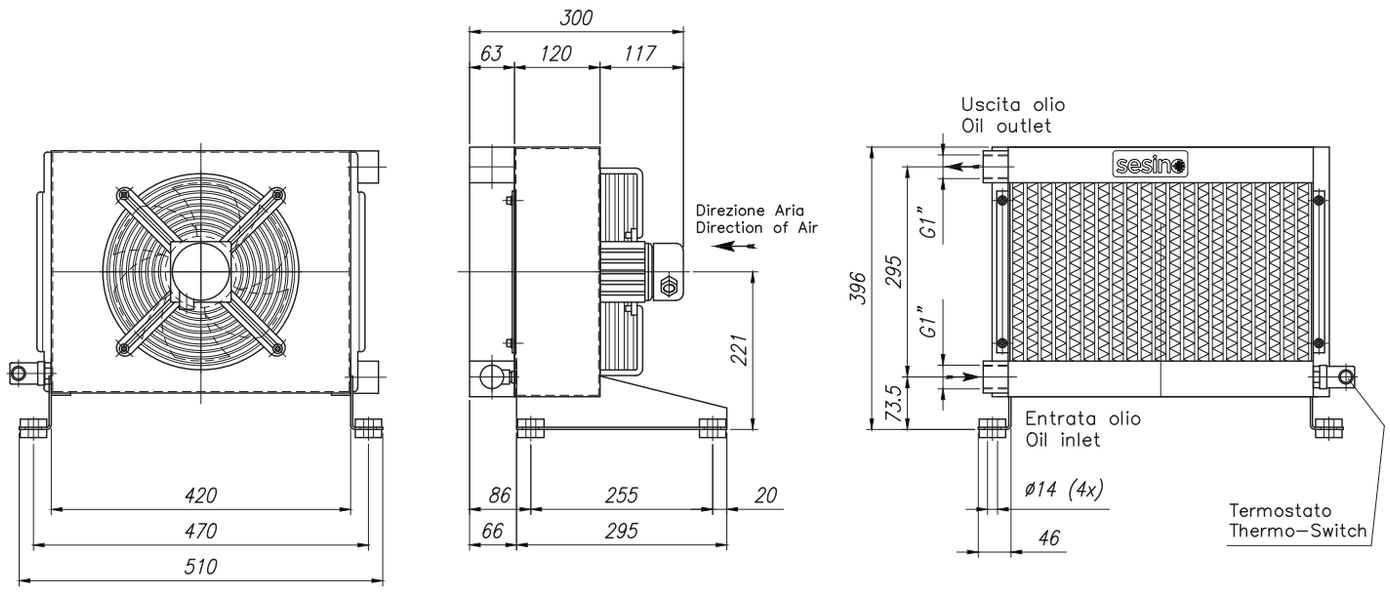
Bar	
0,9	
0,75	
0,6	
0,45	
0,3	
0,15	
0	l/min

20 40 60 80 100 120 140 160 180

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP302EM50ST	20-160	3,6	400	50	200	0,4	1700	56	73	17	250	-20/+40
3RAP302EM60ST	20-160	3,6	480	60	152	0,34	1800	56	73	17	250	-20/+40

AP 430 EM

PURCHASE CODES

AP 430 EM three-phase 400V 50HZ with thermo-switch	3RAP430EM50T247 3RAP430EM50T260
AP 430 EM three-phase 480V 60HZ with thermo-switch	3RAP430EM60T247 3RAP430EM60T260
AP 430 EM three-phase 400V 50HZ without thermo-switch	3RAP430EM50ST
AP 430 EM three-phase 480V 60HZ without thermo-switch	3RAP430EM60ST

SPARE PARTS

Cooling element	3RNL430A
Frame	3CNAP430EM.1
Electric fan 400V 50Hz	1VNAP430EM50
Electric fan 480V 60Hz	1VNAP430EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
420	
400	0,475
380	0,45
360	0,425
340	0,4
320	0,375
300	0,35
280/0 30 60 90 120 150 180 210	l/min

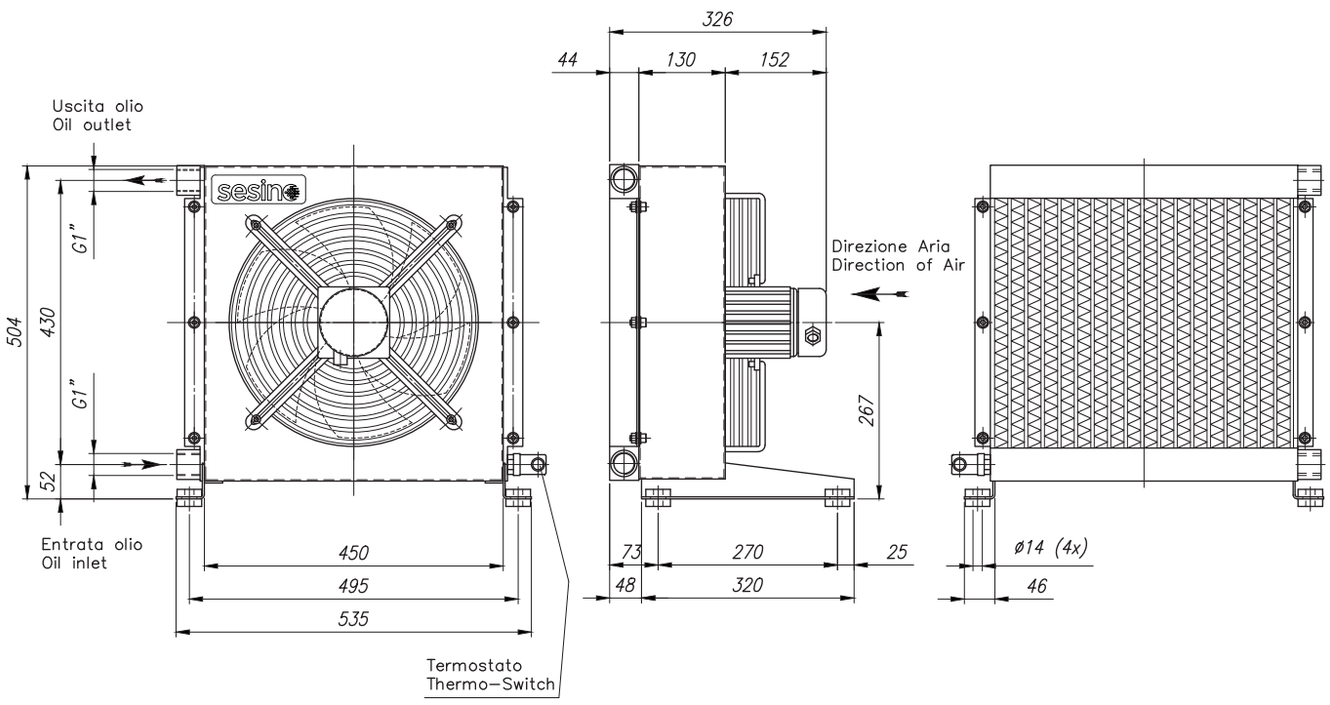
PRESSURE DROP DIAGRAM

Bar	
3	
2,5	
2	
1,5	
1	
0,5	
0 30 60 92 120 150 180 210	l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP430EM50ST	30-180	3,6	400	50	162	0,64	2600	56	73	20	350	-20/+40
3RAP430EM60ST	30-180	3,6	480	60	241	0,62	2800	56	73	20	350	-20/+40

AP 430 2/EM

PURCHASE CODES

AP 430/2 EM three-phase 400V 50HZ with thermo-switch	3RAP432EM50T247 3RAP432EM50T260
AP 430/2 EM three-phase 480V 60HZ with thermo-switch	3RAP432EM60T247 3RAP432EM60T260
AP 430/2 EM three-phase 400V 50HZ without thermo-switch	3RAP432EM50ST
AP 430/2 EM three-phase 480V 60HZ without thermo-switch	3RAP432EM60ST

SPARE PARTS

Cooling element	3RNL432A
Frame	3CNAP432EM.1
Electric fan 400V 50Hz	1VNAP432EM50
Electric fan 480V 60Hz	1VNAP432EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
500	
475	0,55
450	
425	0,5
400	
375	0,45
350	0,4
325/0	30 60 90 120 150 180 210 l/min

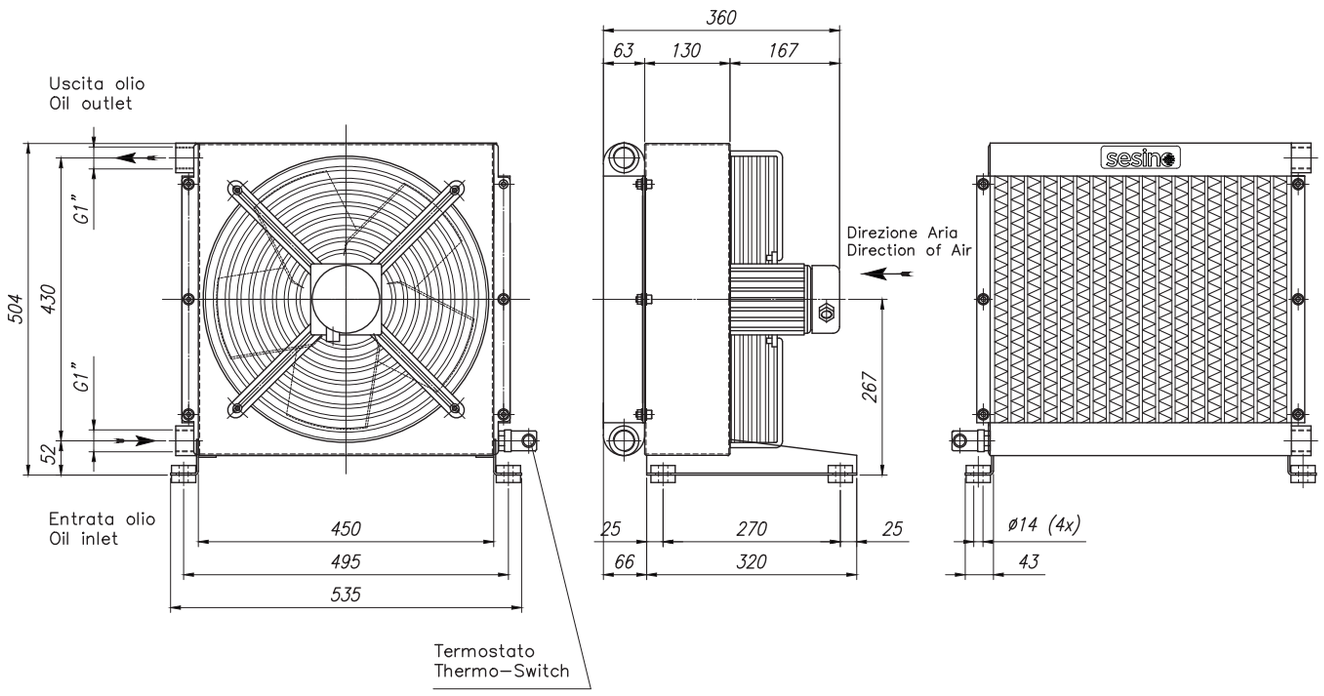
PRESSURE DROP DIAGRAM

Bar	
1,75	
1,5	
1,25	
1	
0,75	
0,5	
0,25	
0	30 60 92 120 150 180 210 l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP432EM50ST	30-180	5,5	400	50	196	0,72	3500	56	72	28	400	-20/+40
3RAP432EM60ST	30-180	5,5	480	60	261	0,72	3700	56	72	28	400	-20/+40

AP 494 EM

PURCHASE CODES

AP 494 EM three-phase 400V 50HZ with thermo-switch	3RAP494EM50T247 3RAP494EM50T260
AP 494 EM three-phase 480V 60HZ with thermo-switch	3RAP494EM60T247 3RAP494EM60T260
AP 494 EM three-phase 400V 50HZ without thermo-switch	3RAP494EM50ST
AP 494 EM three-phase 480V 60HZ without thermo-switch	3RAP494EM60ST

SPARE PARTS

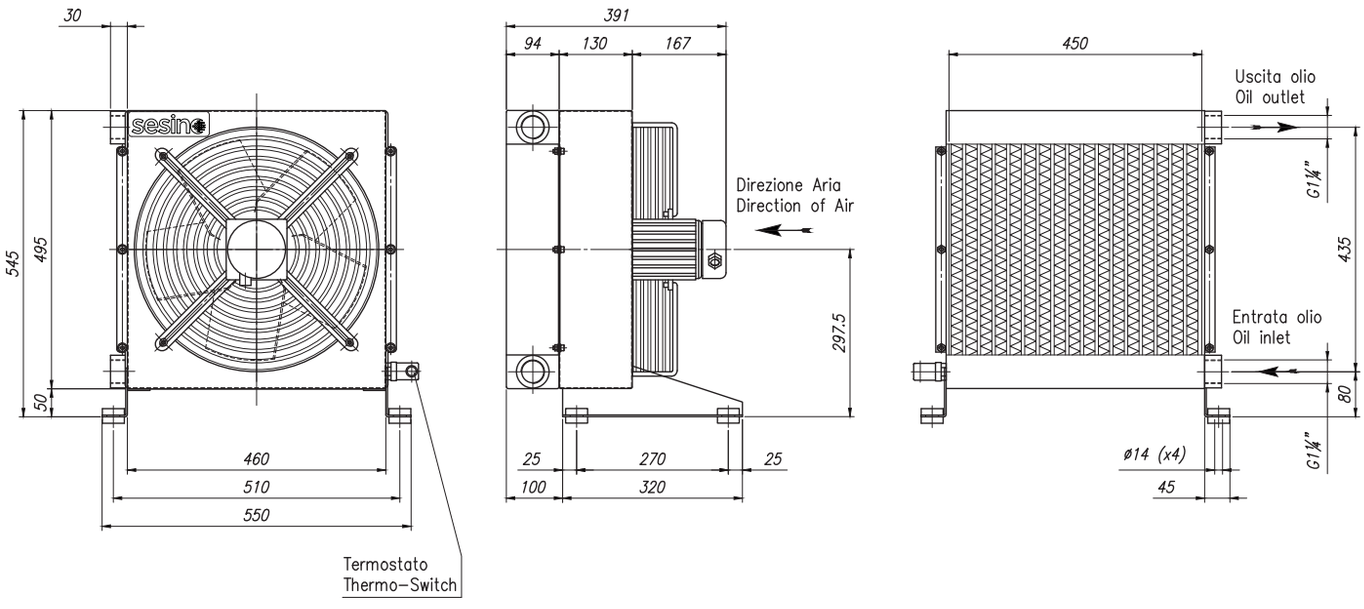
Cooling element	3RNL494A
Frame	3CNAP494EM.1
Electric fan 400V 50Hz	1VNAP432EM50
Electric fan 480V 60Hz	1VNAP432EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

kr [kcal/h°C]	PERFOMANCE DIAGRAM						kW [kW/°C]
625							
575							0,7
525							0,65
475							0,6
425							0,55
375							0,5
							0,45
							0,4
325/0	50	100	150	200	250	300	l/min

Bar	PRESSURE DROP DIAGRAM						
2							
1,75							
1,5							
1,25							
1							
0,75							
0,5							
0,25							
0	50	100	150	200	250	300	l/min

CORRECTION FACTOR							
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP494EM50ST	30-240	8	400	50	196	0,72	3300	56	73	30	400	-20/+40
3RAP494EM60ST	30-240	8	480	60	261	0,72	3500	56	73	30	400	-20/+40

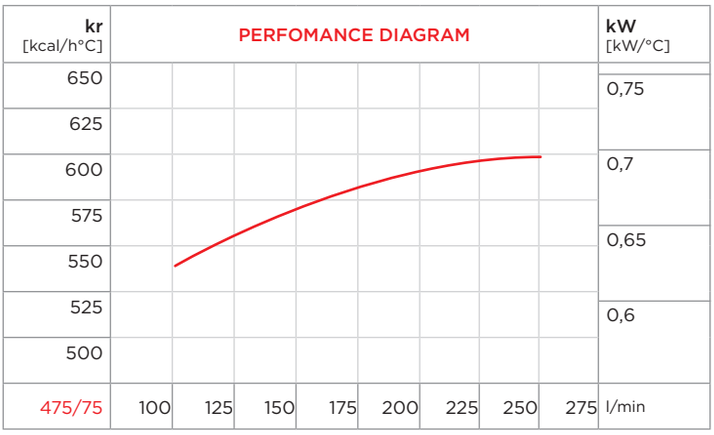
AP 580 EM

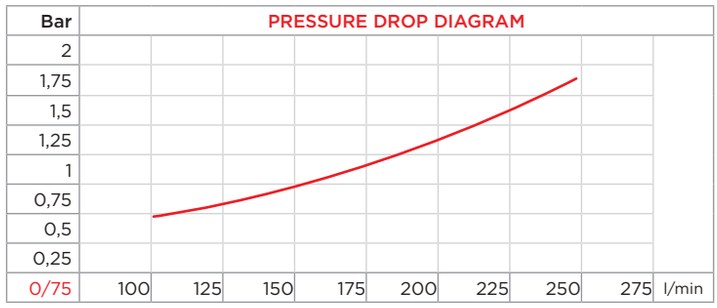
PURCHASE CODES

AP 580 EM three-phase 400V 50HZ with thermo-switch	3RAP580EM50T247 3RAP580EM50T260
AP 580 EM three-phase 480V 60HZ with thermo-switch	3RAP580EM60T247 3RAP580EM60T260
AP 580 EM three-phase 400V 50HZ without thermo-switch	3RAP580EM50ST
AP 580 EM three-phase 480V 60HZ without thermo-switch	3RAP580EM60ST

SPARE PARTS

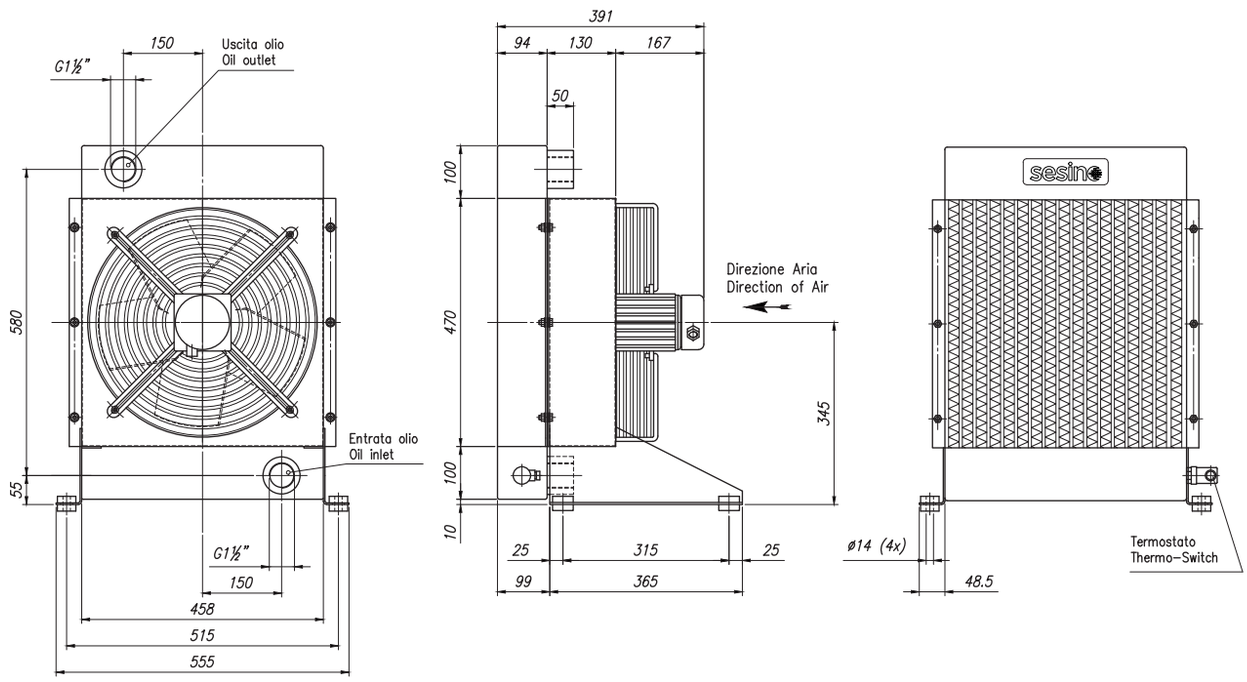
Cooling element	3RNL580A
Frame	3CNAP580EM.1
Electric fan 400V 50Hz	1VNAP432EM50
Electric fan 480V 60Hz	1VNAP432 EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49





CORRECTION FACTOR							
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP580EM50ST	100-250	11,5	400	50	196	0,72	3500	56	72	45	400	-20/+40
3RAP580EM60ST	100-250	11,5	480	60	261	0,72	3700	56	72	45	400	-20/+40

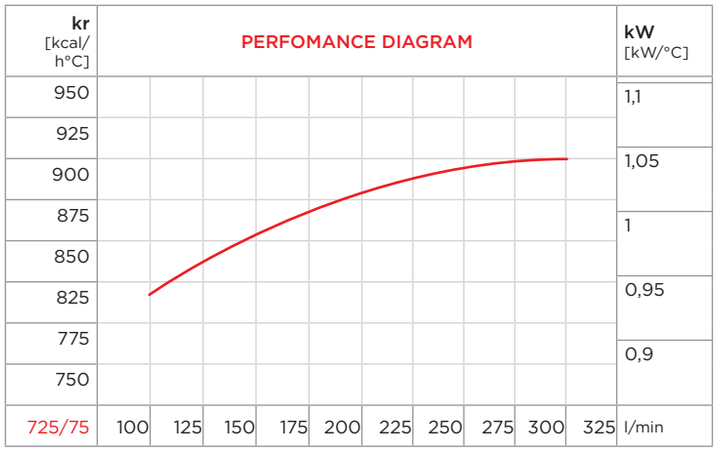
AP 680 EM

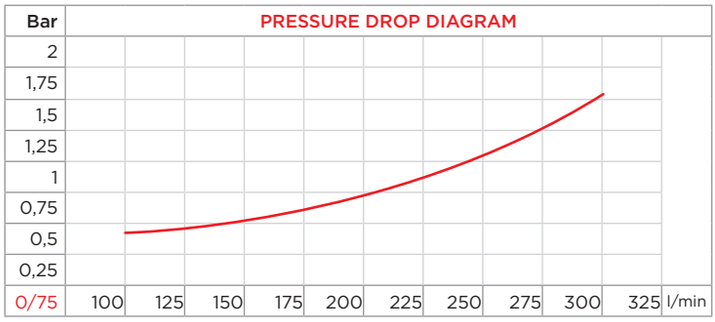
PURCHASE CODES

AP 680 EM three-phase 400V 50HZ with thermo-switch	3RAP680EM50T247 3RAP680EM50T260
AP 680 EM three-phase 480V 60HZ with thermo-switch	3RAP680EM60T247 3RAP680EM60T260
AP 680 EM three-phase 400V 50HZ without thermo-switch	3RAP680EM50ST
AP 680 EM three-phase 480V 60HZ without thermo-switch	3RAP680EM60ST

SPARE PARTS

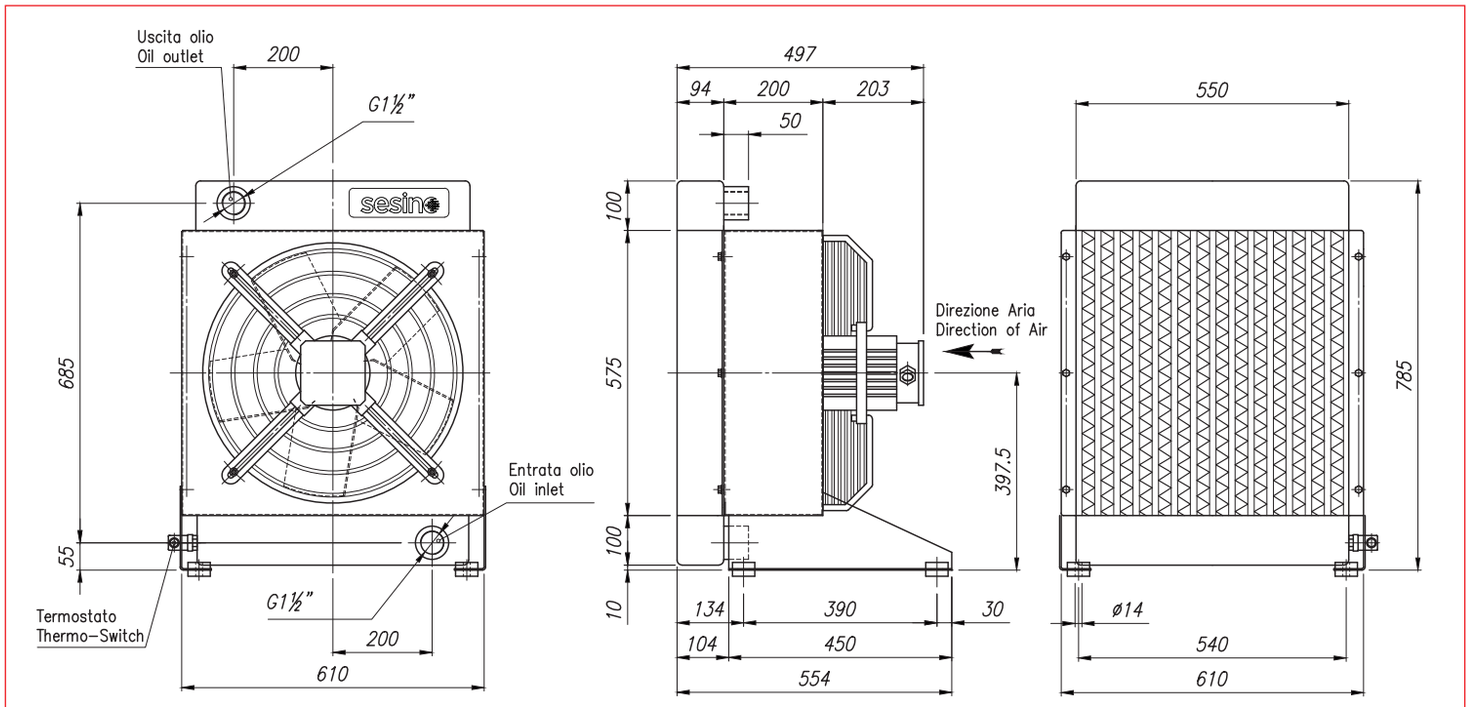
Cooling element	3RNL680A
Frame	3CNAP680EM.1
Electric fan 400V 50Hz	1VNAP680EM50
Electric fan 480V 60Hz	1VNAP680EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49





CORRECTION FACTOR							
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP680EM50ST	100-300	15	400	50	725	1,34	7500	56	75	67	500	-20/+40
3RAP680EM60ST	100-300	15	480	60	816	1,27	7900	56	75	67	500	-20/+40

AP 730 EM

PURCHASE CODES

AP 730 EM three-phase 400V 50HZ with thermo-switch	3RAP730EM50T247 3RAP730EM50T260
AP 730 EM three-phase 480V 60HZ with thermo-switch	3RAP730EM60T247 3RAP730EM60T260
AP 730 EM three-phase 400V 50HZ without thermo-switch	3RAP730EM50ST
AP 730 EM three-phase 480V 60HZ without thermo-switch	3RAP730EM60ST

SPARE PARTS

Cooling element	3RNL730A
Frame	3CNAP730EM.1
Electric fan 400V 50Hz	1VNAP680EM50
Electric fan 480V 60Hz	1VNAP680EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
1300	
1250	
1200	1,4
1150	
1100	1,3
1050	
1000	1,2
950	
900	1,1

850/50	100	150	200	250	300	350	400	l/min

PRESSURE DROP DIAGRAM

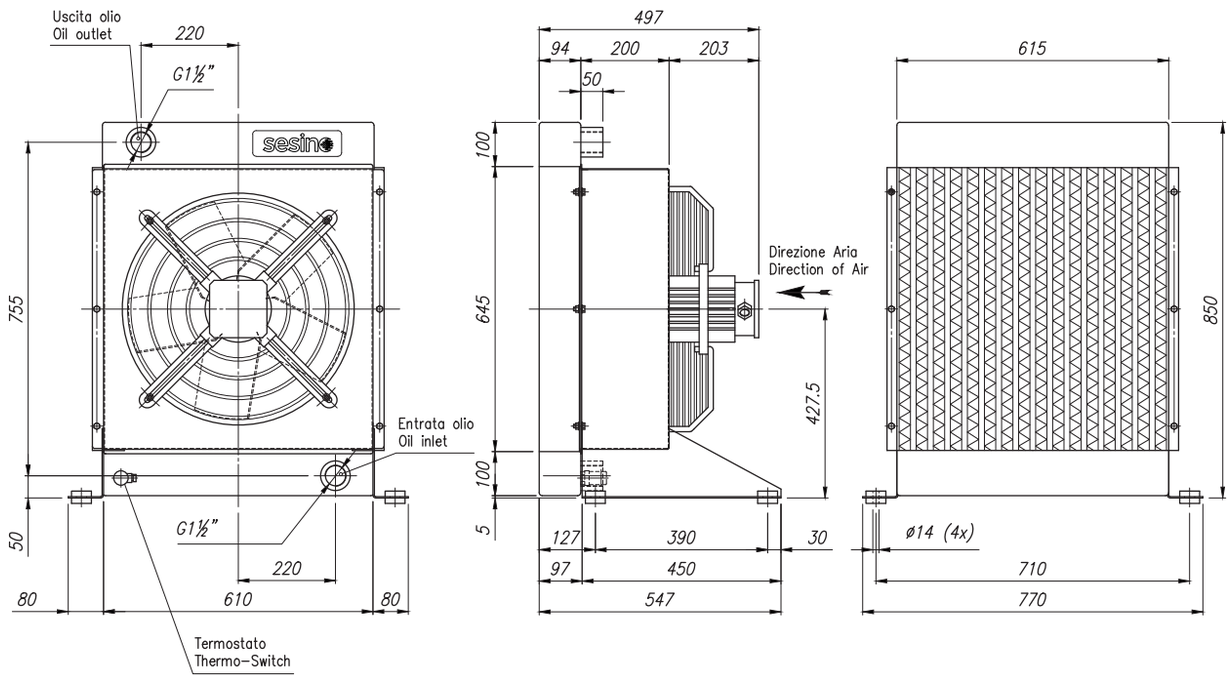
Bar
2,25
2
1,75
1,5
1,25
1
0,75
0,5
0,25

0/75	100	150	200	250	300	350	400	l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP730EM50ST	100-350	16	400	50	725	1,34	7800	56	75	78	500	-20/+40
3RAP730EM60ST	100-350	16	480	60	816	1,27	8200	56	75	78	500	-20/+40

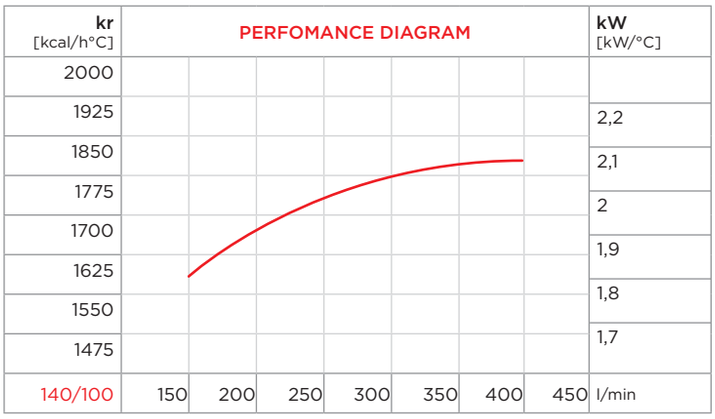
AP 830 EM

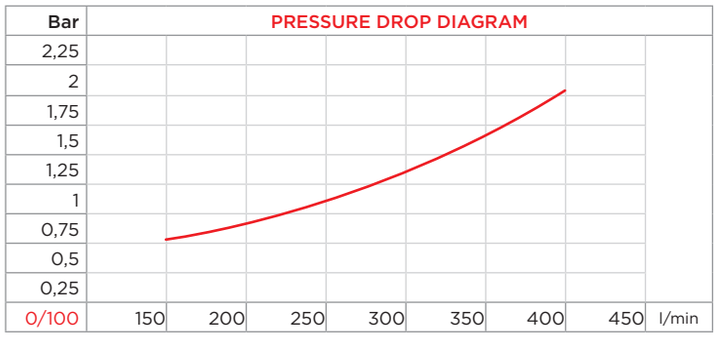
PURCHASE CODES

AP 830 EM three-phase 400V 50HZ with thermo-switch	3RAP830EM50T247 3RAP830EM50T260
AP 830 EM three-phase 480V 60HZ with thermo-switch	3RAP830EM60T247 3RAP830EM60T260
AP 830 EM three-phase 400V 50HZ without thermo-switch	3RAP830EM50ST
AP 830 EM three-phase 480V 60HZ without thermo-switch	3RAP830EM60ST

SPARE PARTS

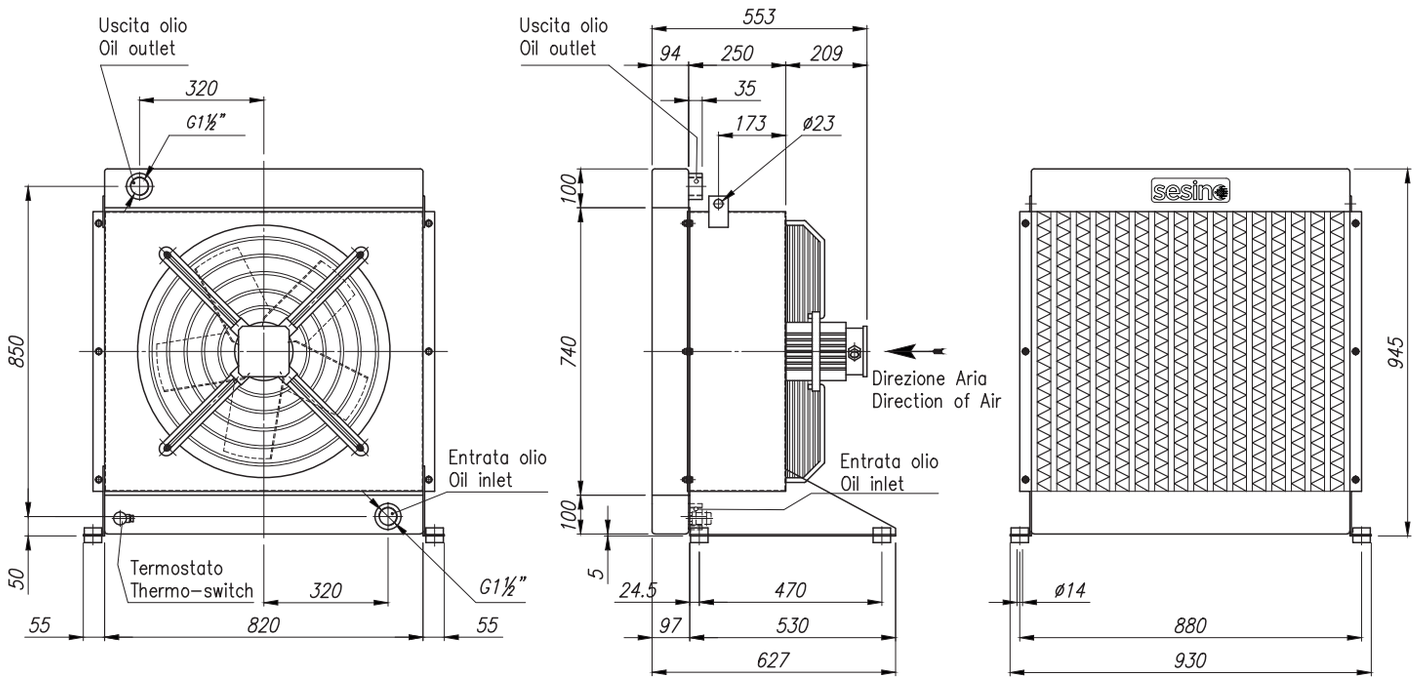
Cooling element	3RNL830A
Frame	3CNAP830EM.1
Electric fan 400V 50Hz	1VNAP830EM50
Electric fan 480V 60Hz	1VNAP830EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49





CORRECTION FACTOR							
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP830EM50ST	150-400	20	400	50	1050	2	10000	56	75	86	500	-20/+40
3RAP830EM60ST	150-400	20	480	60	1417	2,44	10600	56	75	86	500	-20/+40

AP 2/680 EM

PURCHASE CODES

AP 2/680 EM three-phase 400V 50HZ with thermo-switch	3RAP2680EM50T47 3RAP2680EM50T60
AP 2/680 EM three-phase 480V 60HZ with thermo-switch	3RAP2680EM60T47 3RAP2680EM60T60
AP 2/680 EM three-phase 400V 50HZ without thermo-switch	3RAP2/680EM50ST
AP 2/680 EM three-phase 480V 60HZ without thermo-switch	3RAP2/680EM60ST

SPARE PARTS

Cooling element	3RNL2/680A
Frame	3CNAP2/680EM.1
Electric fan 400V 50Hz	1VNAP680EM50
Electric fan 480V 60Hz	1VNAP680EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
2100	
2025	2,37
1950	2,25
1875	
1800	2,12
1725	2
1650	
1575	1,87
1500/0	l/min

50 100 150 200 250 300 350 400

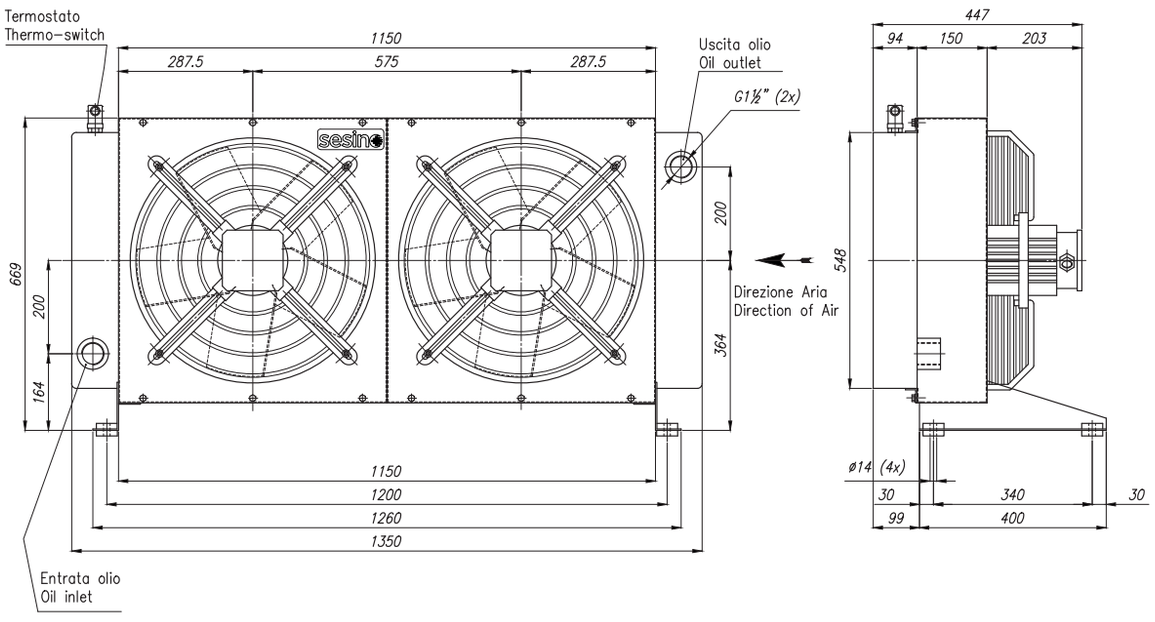
PRESSURE DROP DIAGRAM

Bar	
3	
2,75	
2,5	
2,25	
2	
1,75	
1,5	
1,25	
1	
0,75	
0,50	
0,25	
0	50 100 150 200 250 300 350 400 l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP2/680EM50ST	100-300	28	400	50	2x 725	2x 1,34	2x 7500	56	77	125	500	-20/+40
3RAP2/680EM60ST	100-300	28	480	60	2x 816	2x 1,27	2x 7900	56	77	125	500	-20/+40

AP 2/730 EM

PURCHASE CODES

AP 2/730 EM three-phase 400V 50HZ with thermo-switch	3RAP2730EM50T47 3RAP2730EM50T60
AP 2/730 EM three-phase 480V 60HZ with thermo-switch	3RAP2730EM60T47 3RAP2730EM60T60
AP 2/730 EM three-phase 400V 50HZ without thermo-switch	3RAP2/730EM50ST
AP 2/730 EM three-phase 480V 60HZ without thermo-switch	3RAP2/730EM60ST

SPARE PARTS

Cooling element	3RNL2/730A
Frame	3CNAP2/730EM.1
Electric fan 400V 50Hz	1VNAP680EM50
Electric fan 480V 60Hz	1VNAP680EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
2750	
2650	
2550	3
2450	
2350	2,75
2250	
2150	2,5
2050	
1950	2,25
1850/0	l/min

50 100 150 200 250 300 350 400

PRESSURE DROP DIAGRAM

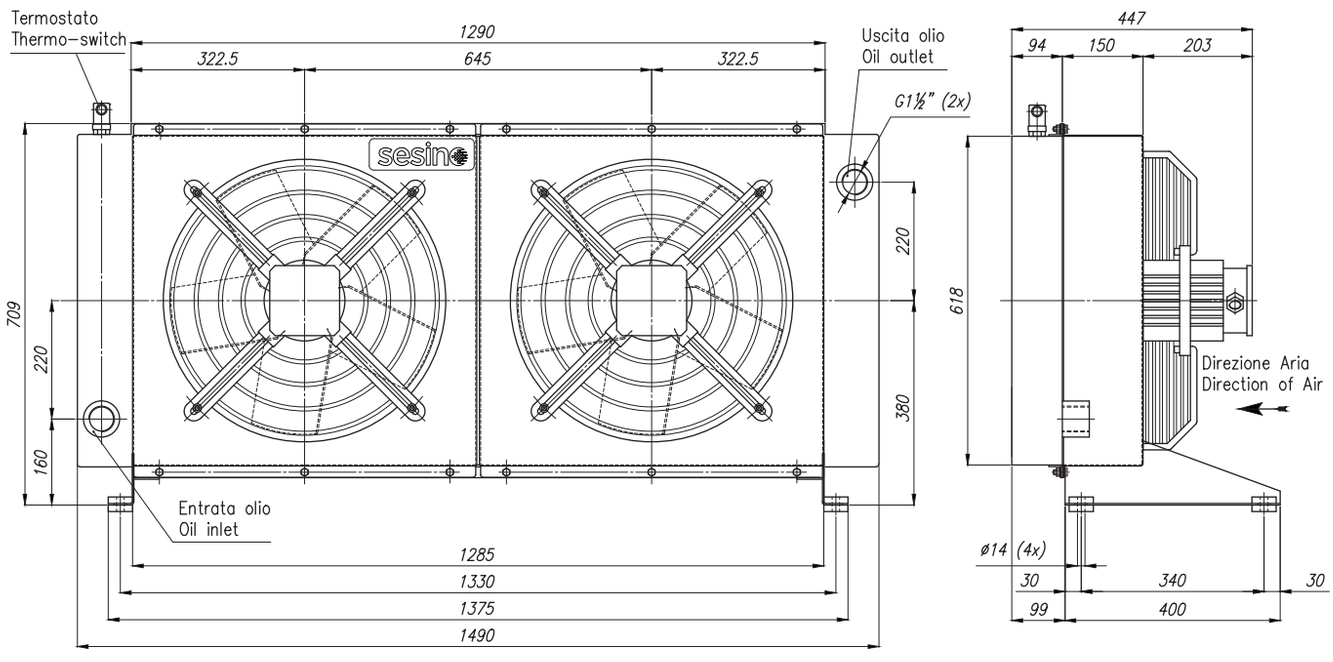
Bar
3,5
3
2,5
2
1,5
1
0,50
0

50 100 150 200 250 300 350 400 l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP2/730EM50ST	100-350	30	400	50	2x 725	2x 1,34	2x 7800	56	77	145	500	-20/+40
3RAP2/730EM60ST	100-350	30	480	60	2x 816	2x 1,27	2x 8200	56	77	145	500	-20/+40

AP 2/830 EM

PURCHASE CODES

AP 2/830 EM three-phase 400V 50HZ with thermo-switch	3RAP2830EM50T47 3RAP2830EM50T60
AP 2/830 EM three-phase 480V 60HZ with thermo-switch	3RAP2830EM60T47 3RAP2830EM60T60
AP 2/830 EM three-phase 400V 50HZ without thermo-switch	3RAP2/830EM50ST
AP 2/830 EM three-phase 480V 60HZ without thermo-switch	3RAP2/830EM60ST

SPARE PARTS

Cooling element	3RNL2/830A
Frame	3CNAP2/830EM.1
Electric fan 400V 50Hz	1VNAP830EM50
Electric fan 480V 60Hz	1VNAP830EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
4000	
3850	4,5
3700	4,25
3550	4
3400	
3250	3,75
3100	3,5
2950	

2800/100	150	200	250	300	350	400	450	l/min

PRESSURE DROP DIAGRAM

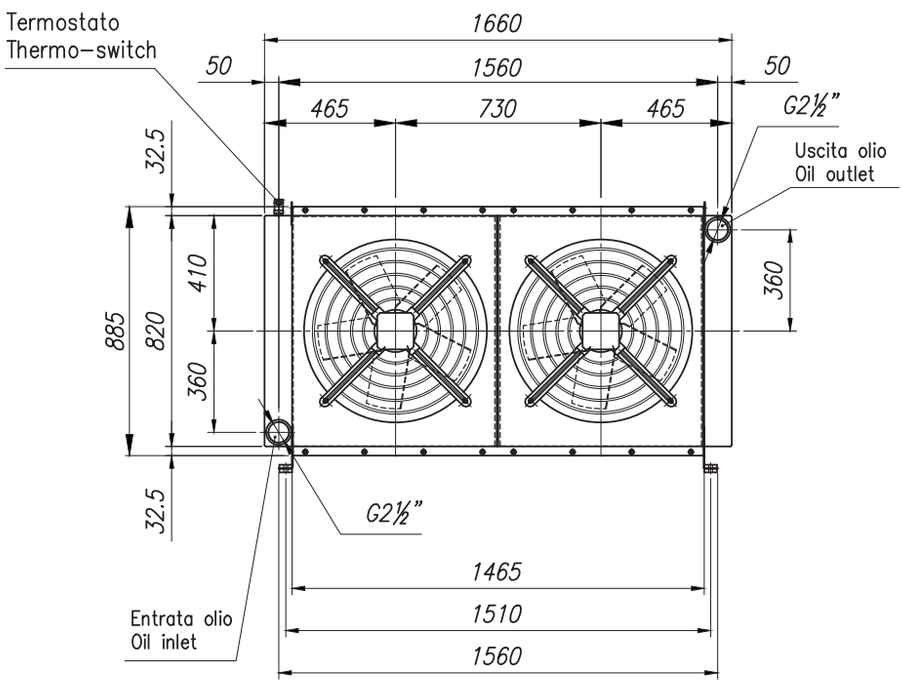
Bar	
5	
4	
3	
2	
1	

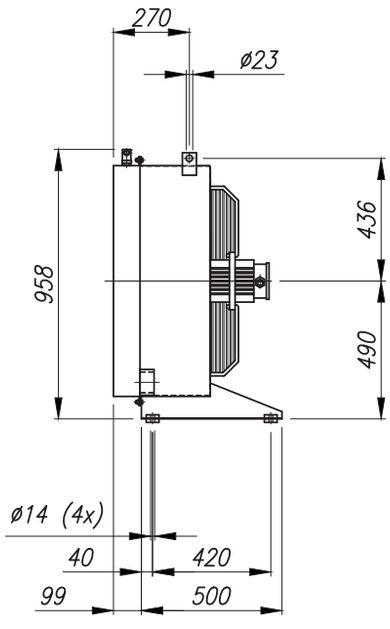
0/50	100	150	200	250	300	350	400	450	500	l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

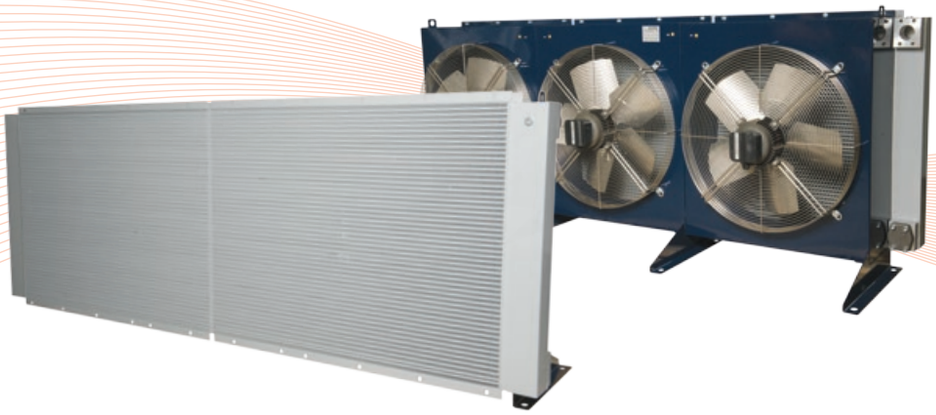
- Dimensions and technical characteristics are not binding





CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP2/830EM50ST	150-400	40	400	50	2x 1050	2x 2	2x 10000	56	75	186	560	-20/+40
3RAP2/830EM60ST	150-400	40	480	60	2x 1417	2x 2,44	2x 10600	56	75	186	560	-20/+40

AP 3/830 EM



PURCHASE CODES

AP 3/830 EM three-phase 400V 50HZ with thermo-switch	3RAP3830EM50T47 3RAP3830EM50T60
AP 3/830 EM three-phase 480V 60HZ with thermo-switch	3RAP3830EM60T47 3RAP3830EM60T60
AP 3/830 EM three-phase 400V 50HZ without thermo-switch	3RAP3/830EM50ST
AP 3/830 EM three-phase 480V 60HZ without thermo-switch	3RAP3/830EM60ST

SPARE PARTS

Cooling element	3RNL3/830A
Frame	3CNAP3 /830EM.1
Electric fan 400V 50Hz	1VNAP830EM50
Electric fan 480V 60Hz	1VNAP830EM60
Thermo-switch 47-36	1TRM 47-36
Thermo-switch 60-49	1TRM 60-49

PERFOMANCE DIAGRAM

kr [kcal/h°C]								kW [kW/°C]
5700								
5550								6,5
5400								6,25
5250								6
5100								
4950								5,75
4800								5,5
4650								
4500/100	150	200	250	300	350	400	450	l/min

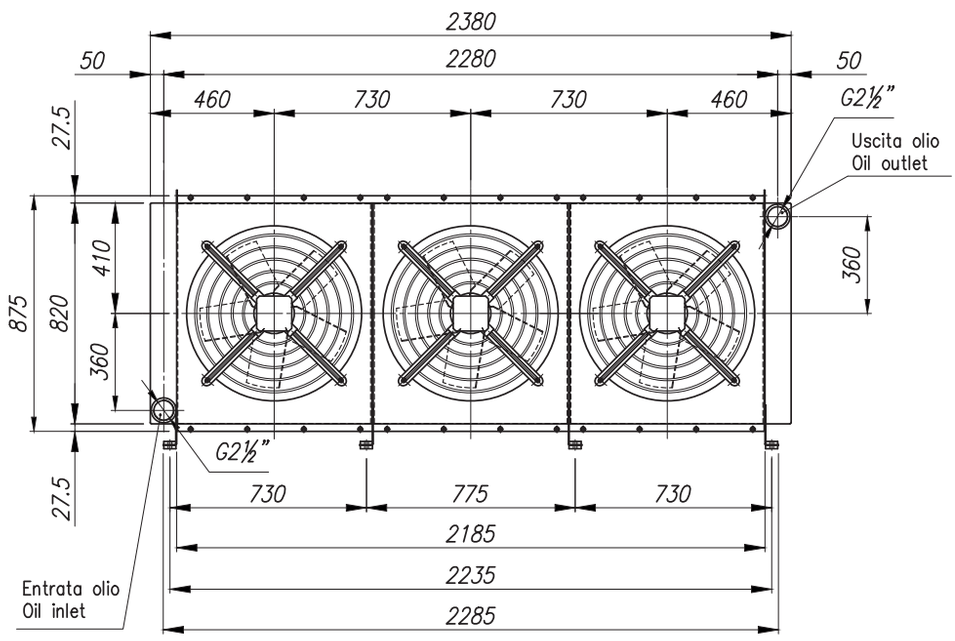
PRESSURE DROP DIAGRAM

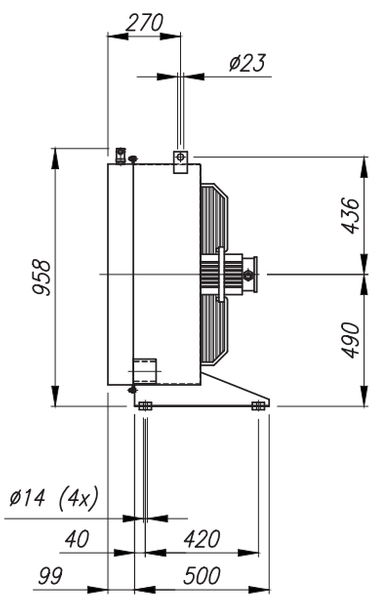
Bar										
7,5										
6										
4,5										
3										
1,5										
0/50	100	150	200	250	300	350	400	450	500	l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding





CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP3/830EM50ST	150-400	60	400	50	3x 1050	3x 2	3x 10000	56	78	268	560	-20/+40
3RAP3/830EM60ST	150-400	60	480	60	3x 1417	3x 2,44	3x 10600	56	78	268	560	-20/+40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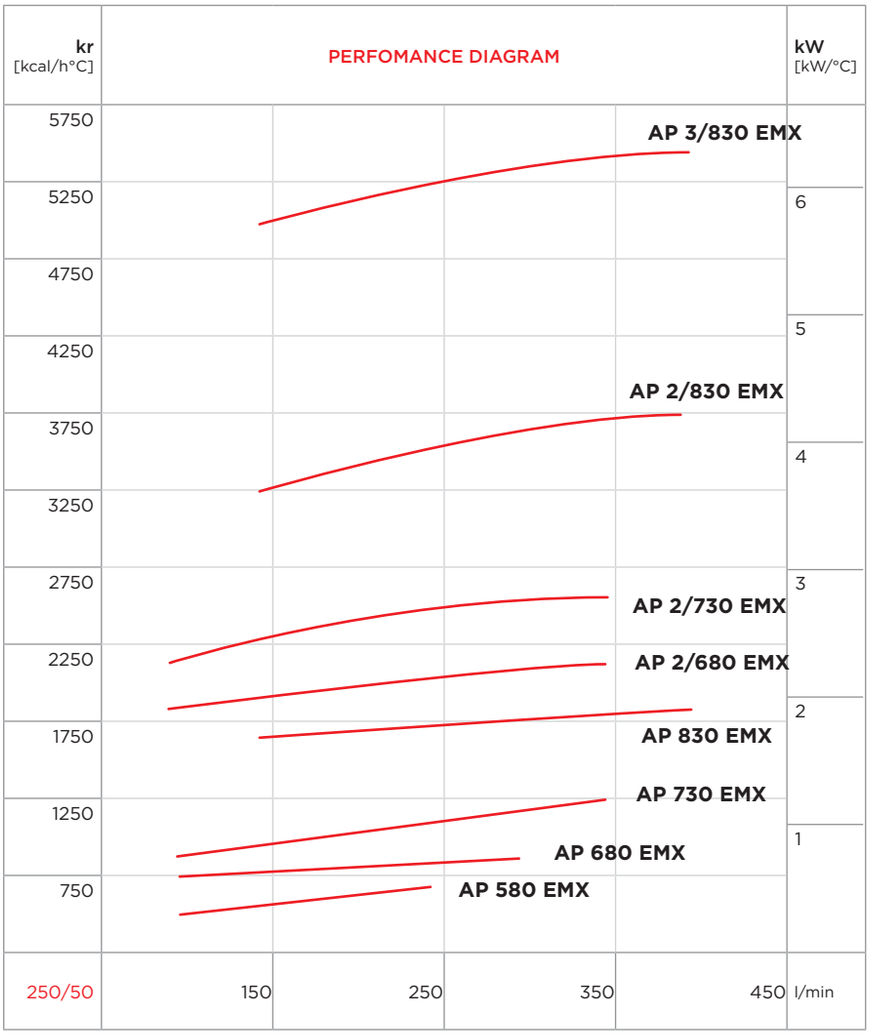
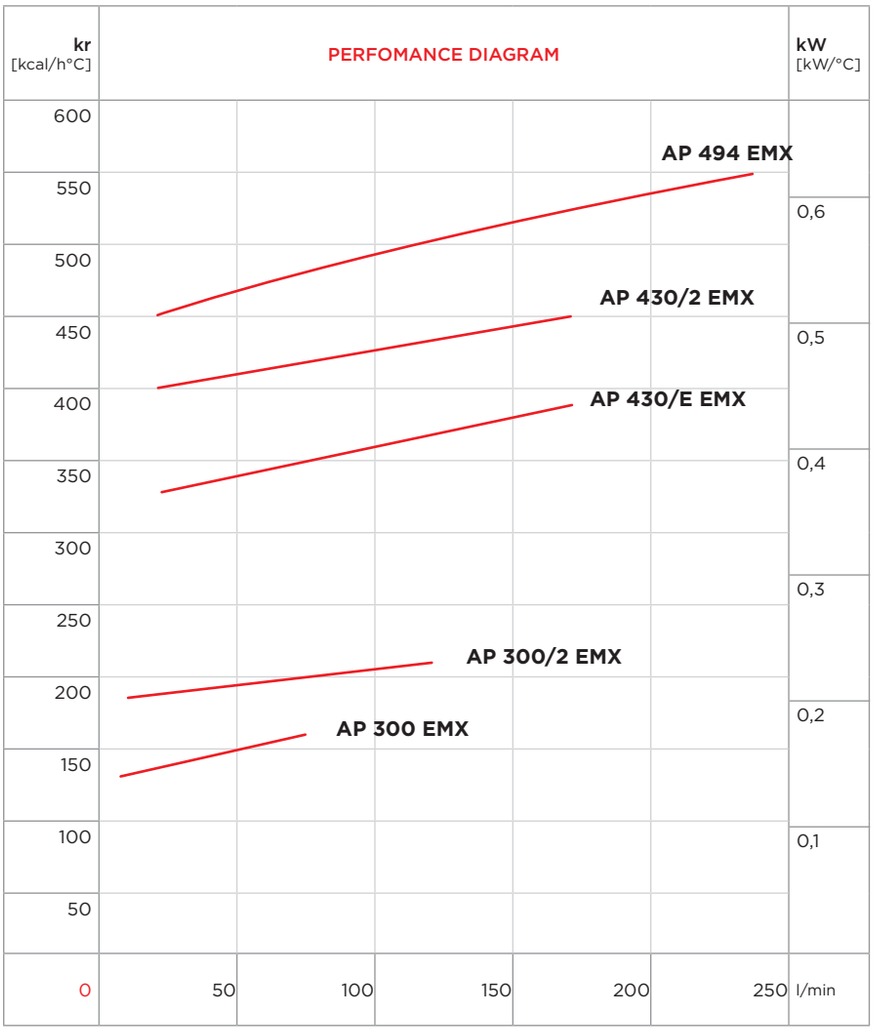
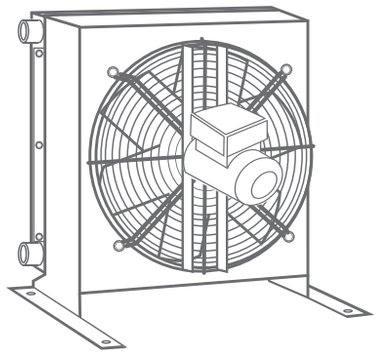

kr
[kcal/h°C]
PERFOMANCE DIAGRAM
kW
[kW/°C]
5750
5250
4750
4250
3750
3250
2750
2250
1750
1250
750
AP 3/830 EMX
AP 2/830 EMX
AP 2/730 EMX
AP 2/680 EMX
AP 830 EMX
AP 730 EMX
AP 680 EMX
AP 580 EMX
6
5
4
3
2
1
250/50
150
250
350
450
l/min


kr
[kcal/h°C]
PERFOMANCE DIAGRAM
kW
[kW/°C]
600
550
500
450
400
350
300
250
200
150
100
50
AP 494 EMX
AP 430/2 EMX
AP 430/E EMX
AP 300/2 EMX
AP 300 EMX
0,6
0,5
0,4
0,3
0,2
0,1
0
50
100
150
200
250
l/min

AC MOTOR AIR-OIL HEAT EXCHANGERS - MARINE USE AND ATEX REGULATION EMX TYPE

SCAMBIATORI DI CALORE ARIA OLIO CON VENTILATORE A CORRENTE ALTERNATA - USO MARINO NORME ATEX SERIE EMX



The advantage of using air into the cooling of oleo hydraulic systems has its bases on the following facts:

- There is no need of water
- The system is independent of the connection to the water main
- Lower working costs in comparison with the water-oil exchangers, even if the starting investment is higher
- Possibility to use warm air to heat the room in winter.
- The particular structure of the cooling element allows great thermic performances and pressure resistance.

Maximum working static pressure: 20 bar; test pressure: 35 bar.

It is always recommended to assemble in parallel with the exchanger a by-pass valve to avoid extreme counter-pressures, particularly when the machine is started with cold oil. On the contrary, it is not useful to use a check valve as by-pass to protect the exchanger from pressure's peaks, since the inertia of the valve itself is too high in comparison with the speed of the pressure waves that occur into the oleo hydraulic systems.
The flow rates shown in the tables are the ones recommended for the exchanger proper working.
The efficiency curves show the specific exchange capacity in kcal/h°C or in kW/°C according to the different oil rates. To calculate the heat quantity the different exchangers are able to dissipate it is enough to multiply such capacity by the difference between the requested oil temperature and the summer room temperature.

The heat exchangers type EMX have been designed to be used outdoors, in areas where the level of salinity in the air and the explosion risks are high.
The components are the following:

- **Aluminum cooling element with anodizing and corrosion proofing treatment (SWAAT test according to ASTM G 85-94 ANNEX A3)**
- **Coated AISI 304 stainless steel frame**
- **Three-phase electric fan, 400V 50Hz or 460V 60Hz according to ATEX IP 56 Category 2G, protection Ex-d class T4 Group IIB and stainless steel protection grill.**

For the right calculation of air-oil heat exchangers, we supply our customers with a calculation software.
The air-oil heat exchangers can be used to cool other kind of fluids, which must be compatible with aluminum and its alloys.
However, for each use, with the exception of oil cooling, we recommend to consult our Technical Department.

Il vantaggio dell'utilizzo dell'aria nel raffreddamento di impianti oleoidraulici trova le sue ragioni nei seguenti fattori:

- *Non necessità l'utilizzo di acqua*
- *Indipendenza della macchina dalle tubazioni di allacciamento alla rete idrica*
- *Inferiore costo di esercizio rispetto agli scambiatori acqua-olio, anche se maggiore è l'investimento iniziale*
- *Possibilità di utilizzare l'aria calda in uscita per riscaldare l'ambiente nella stagione invernale*
- *La particolare costruzione del radiatore consente di ottenere notevoli rese termiche e forte resistenza alla pressione.*

Pressione massima statica di funzionamento: 20 bar; pressione di collaudo: 35 bar.

*È sempre consigliabile montare in parallelo allo scambiatore una valvola di by-pass per evitare eccessive contropressioni soprattutto al momento dell'avviamento della macchina con olio freddo. Non è invece conveniente utilizzare una valvola di ritegno come by-pass per proteggere lo scambiatore dai picchi di pressione in quanto l'inerzia della valvola stessa è troppo alta rispetto alla velocità delle onde di pressione che si sviluppano all'interno dell'olio degli impianti oleoidraulici.
Le portate olio indicate nelle tabelle sono quelle consigliate per il buon funzionamento dello scambiatore.
Le curve di rendimento forniscono la potenzialità di scambio specifica in kcal/h°C o in kW/h°C in funzione della portata olio; per calcolare la quantità di calore che i vari scambiatori sono in grado di disperdere, è sufficiente moltiplicare tale potenzialità per la differenza tra le temperature dell'olio desiderata e dell'aria ambiente massima estiva.*

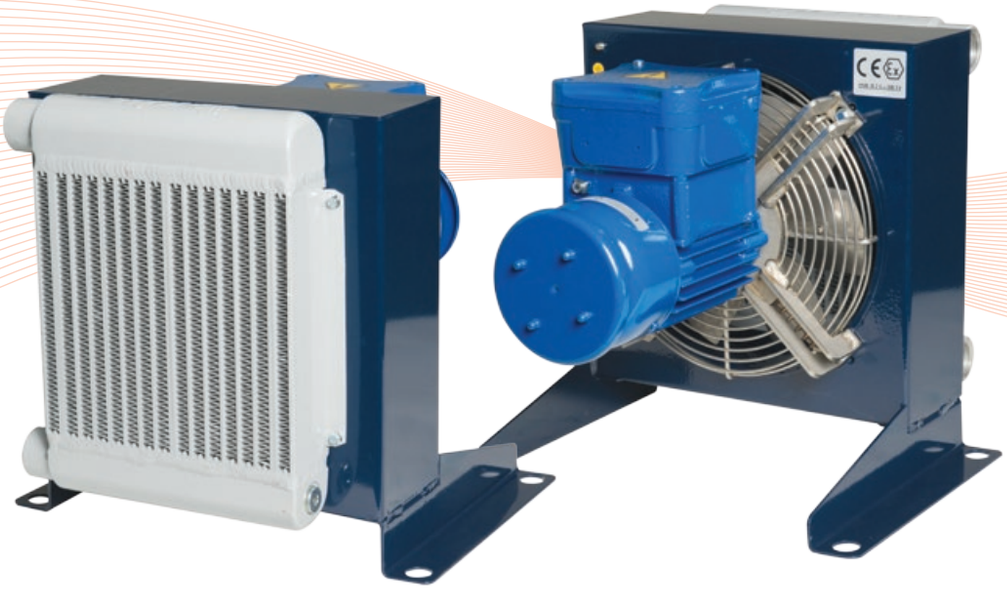
Gli scambiatori della serie EMX sono stati concepiti per essere installati all'aperto in zone dove la concetrazione di salinità dell'aria è elevata ed è alto il rischio di esplosione

I componenti sono i seguenti:

- ***Radiatore in alluminio con trattamento di anodizzazione anticorrosione (SWAAT test secondo norme ASTM G 85-94 ANNEX A3)***
- ***Telaio in acciaio inossidabile AISI 304 verniciato***
- ***Motore elettrico trifase 400V 50Hz o 460V 60Hz norme ATEX IP 56 Categoria 2G protezione Ex-d classe T4 Gruppo IIB e rete di protezione in acciaio inossidabile***

*Per il calcolo degli scambiatore aria-olio è disponibile il nostro software.
Gli scambiatori aria-olio possono essere utilizzati per raffreddare altri tipi di fluidi, a condizione che essi siano compatibili con l'alluminio e le sue leghe.
Consigliamo comunque, per qualsiasi impiego che non sia il raffreddamento dell'olio, di contattare il nostro Ufficio Tecnico.*

AP 300 EMX



PURCHASE CODES

AP 300 EMX three-phase 400V 50HZ	3RAP300EMX50
AP 300 EMX three-phase 460V 60HZ	3RAP300EMX60

SPARE PARTS

Cooling element	3RNL300A
Frame	3CNAP300EMX.1
Electric fan 400V 50Hz	1VNAP300EMX50
Electric fan 460V 60Hz	1VNAP300EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
180	
170	0,20
160	0,19
150	0,18
140	0,17
130	0,16
120	0,15
110/0	0,14

10 20 30 40 50 60 70 80 90 l/min

PRESSURE DROP DIAGRAM

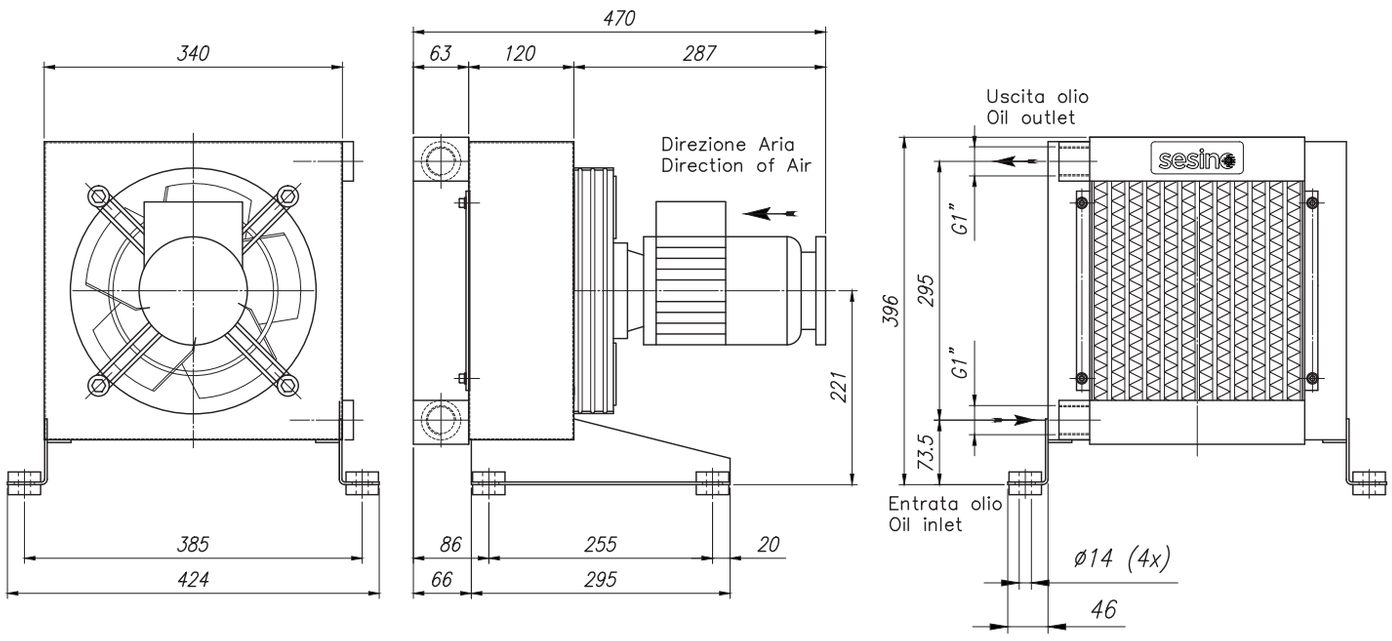
Bar
1,2
1
0,8
0,6
0,4
0,2
0

10 20 30 40 50 60 70 80 90 l/min

CORRECTION FACTOR

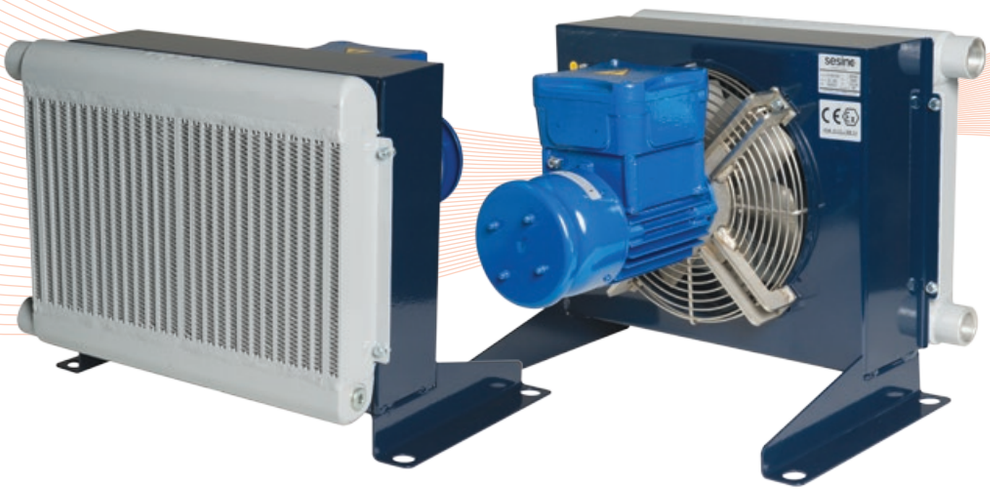
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP300EMX50	10-80	2	400	50	180	0,75	1500	56	81	30	250	-20/+40
3RAP300EMX60	10-80	2	460	60	180	0,65	1580	56	83	30	250	-20/+40

AP 300 2/EMX



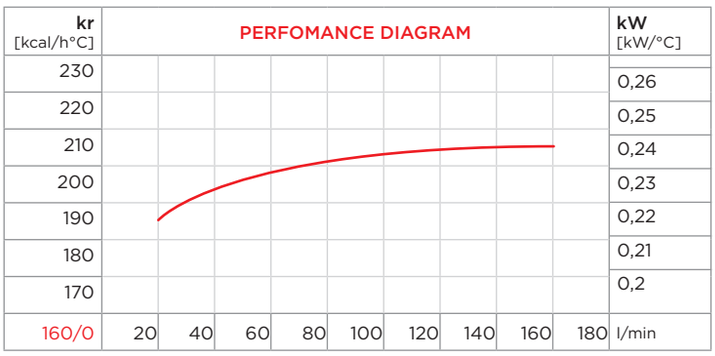
PURCHASE CODES

AP 300/2 EMX three-phase 400V 50HZ	3RAP302EMX50
AP 300/2 EMX three-phase 460V 60HZ	3RAP302EMX60

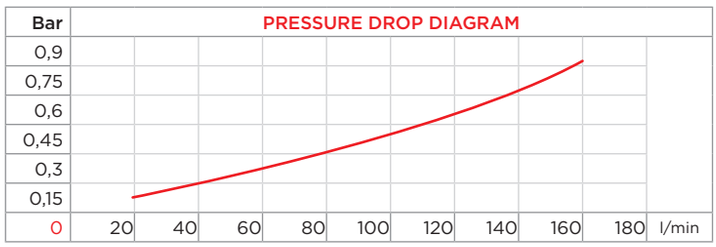
SPARE PARTS

Cooling element	3RNL302A
Frame	3CNAP302EMX.1
Electric fan 400V 50Hz	1VNAP300EMX50
Electric fan 460V 60Hz	1VNAP300EMX60

PERFOMANCE DIAGRAM



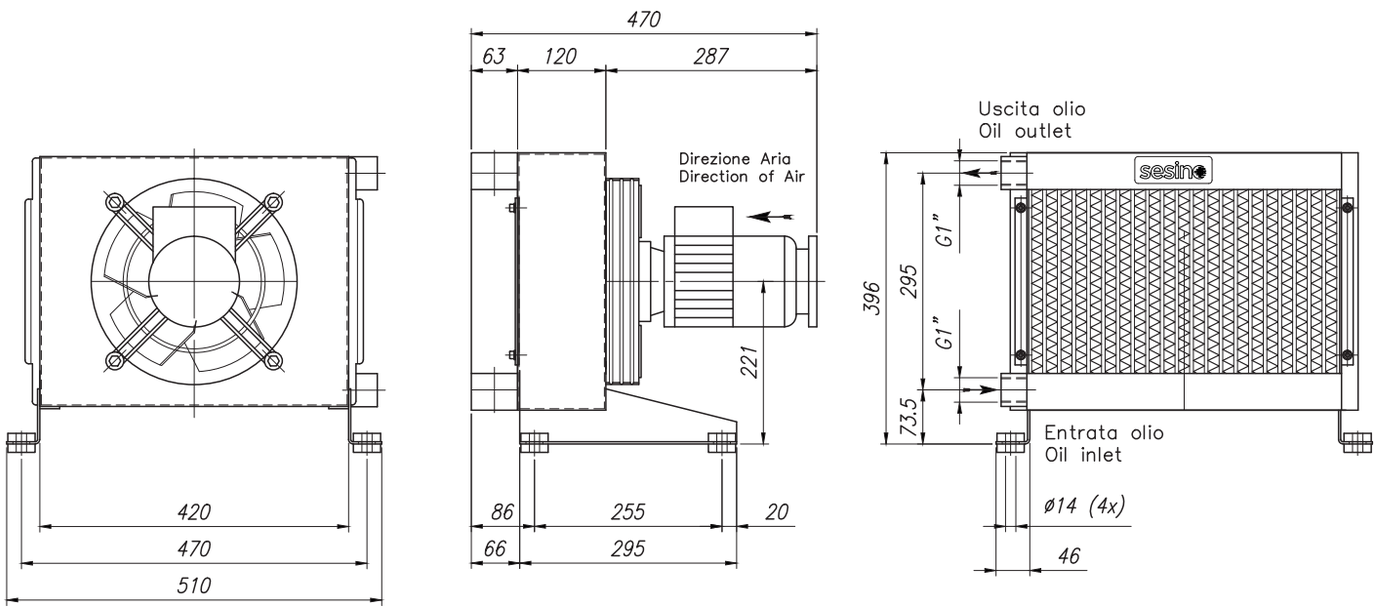
PRESSURE DROP DIAGRAM



CORRECTION FACTOR

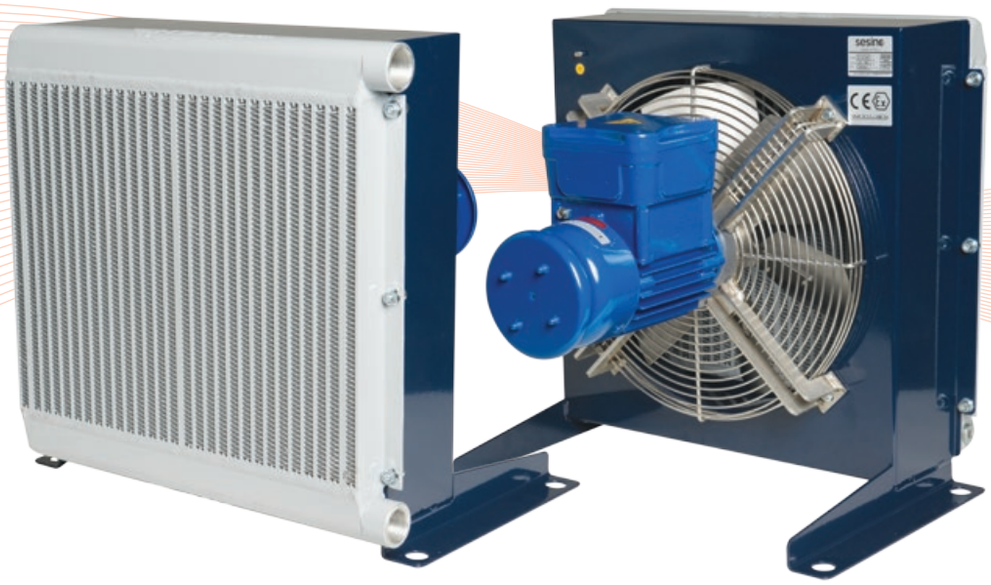
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP302EMX50	20-160	3,6	400	50	180	0,75	1700	56	80	35	250	-20/+40
3RAP302EMX60	20-160	2	460	60	180	0,65	1800	56	82	35	250	-20/+40

AP 430 EMX



PURCHASE CODES

AP 430 EMX three-phase 400V 50HZ	3RAP430EMX50
AP 430 EMX three-phase 460V 60HZ	3RAP430EMX60

SPARE PARTS

Cooling element	3RNL430A
Frame	3CNAP430EMX.1
Electric fan 400V 50Hz	1VNAP430EMX50
Electric fan 460V 60Hz	1VNAP430EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
420	
400	0,475
380	0,45
360	0,425
340	0,4
320	0,375
300	0,35
280/0	l/min

30	60	90	120	150	180	210

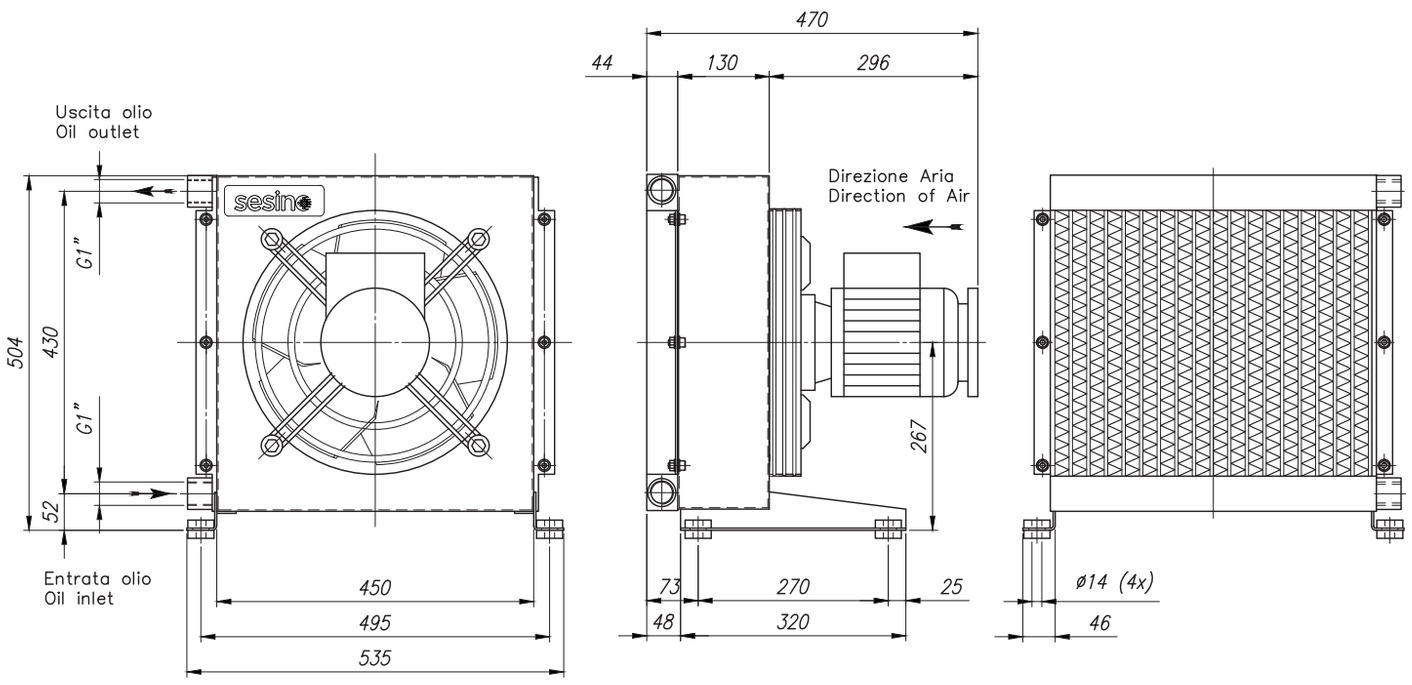
PRESSURE DROP DIAGRAM

Bar	
3	
2,5	
2	
1,5	
1	
0,5	
0	30 60 92 120 150 180 210 l/min

CORRECTION FACTOR

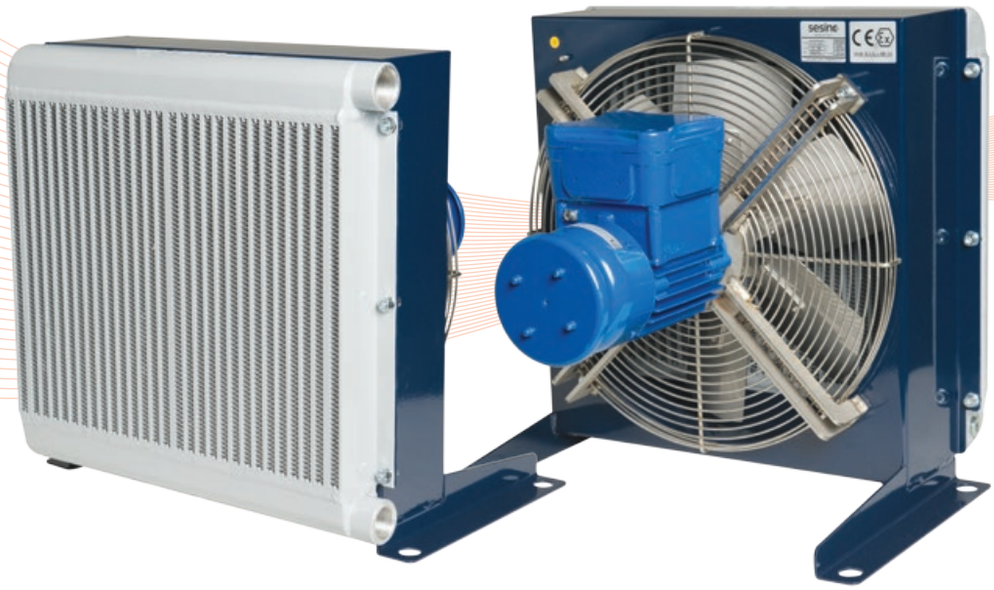
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP430EMX50	30-180	3,6	400	50	120	0,62	2600	56	81	38	350	-20/+40
3RAP430EMX60	30-180	3,6	460	60	170	0,54	2800	56	83	38	350	-20/+40

AP 430 2/EMX



PURCHASE CODES

AP 430/2 EMX three-phase 400V 50HZ	3RAP432EMX50
AP 430/2 EMX three-phase 460V 60HZ	3RAP432EMX60

SPARE PARTS

Cooling element	3RNL432A
Frame	3CNAP432EMX.1
Electric fan 400V 50Hz	1VNAP432EMX50
Electric fan 460V 60Hz	1VNAP432EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]								kW [kW/°C]
500								
475								0,55
450								
425								0,5
400								0,45
375								
350								0,4
325/0	30	60	90	120	150	180	210	l/min

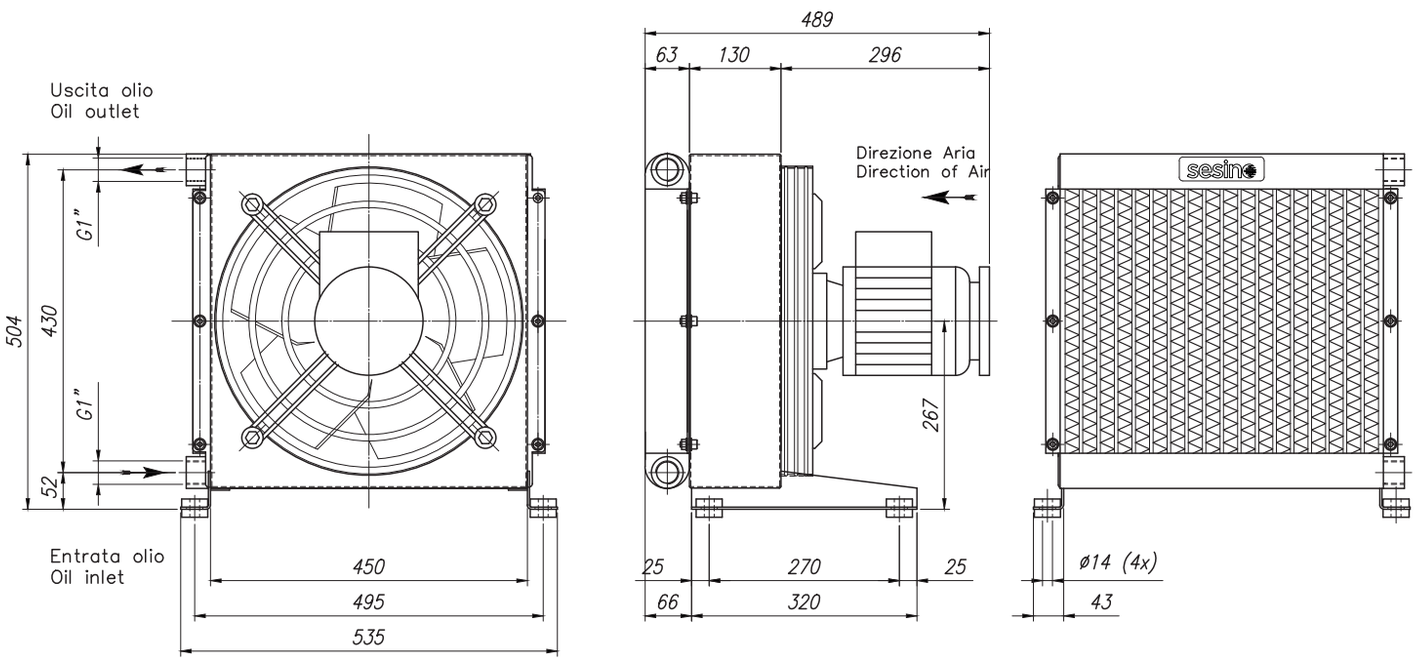
PRESSURE DROP DIAGRAM

Bar								
1,75								
1,5								
1,25								
1								
0,75								
0,5								
0,25								
0	30	60	92	120	150	180	210	l/min

CORRECTION FACTOR

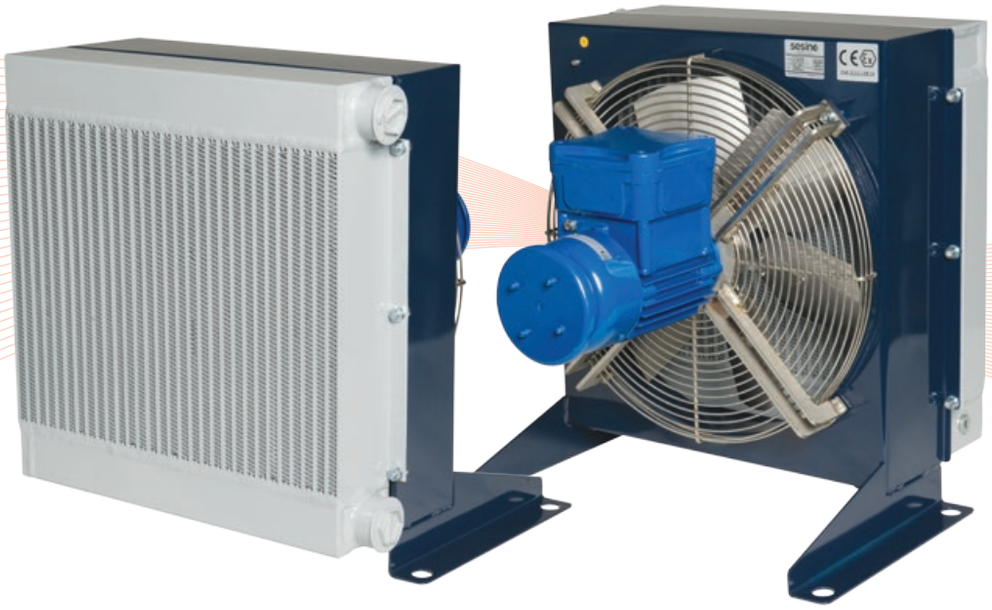
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP432EMX50	30-180	5,5	400	50	180	0,67	3500	56	79	40	400	-20/+40
3RAP432EMX60	30-180	5,5	460	60	180	0,58	3700	56	81	40	400	-20/+40

AP 494 EMX



PURCHASE CODES

AP 494 EMX three-phase 400V 50HZ	3RAP494EMX50
AP 494 EMX three-phase 460V 60HZ	3RAP494EMX60

SPARE PARTS

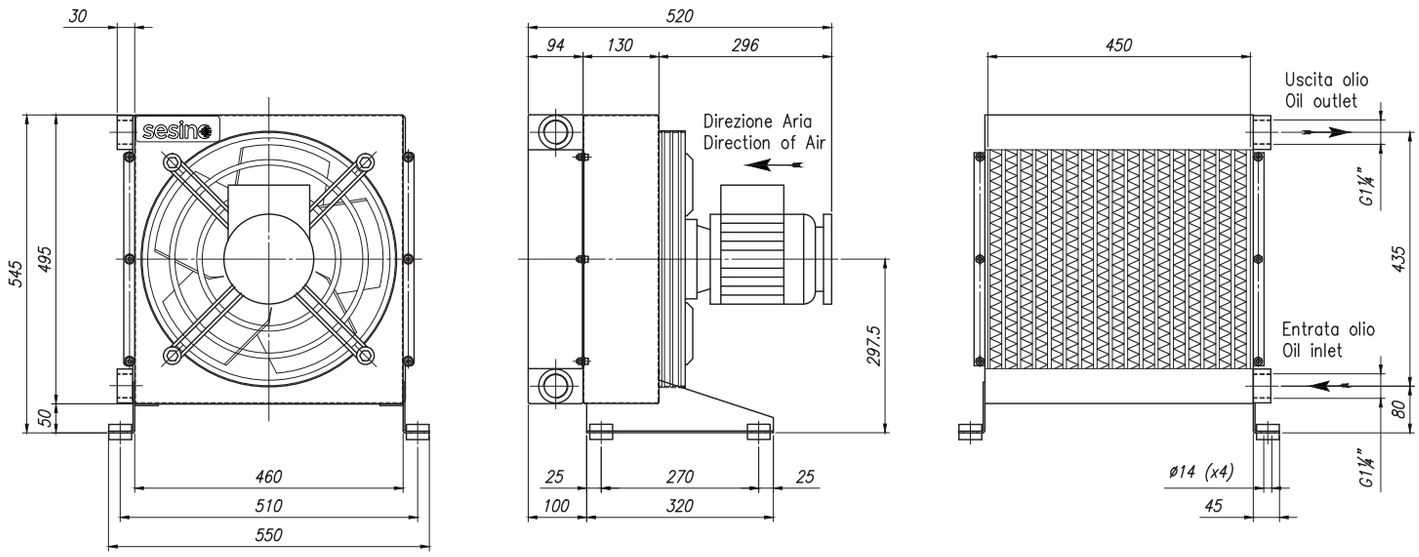
Cooling element	3RNL494A
Frame	3CNAP494EMX.1
Electric fan 400V 50Hz	1VNAP432EMX50
Electric fan 460V 60Hz	1VNAP432EMX60

kr [kcal/h°C]	PERFOMANCE DIAGRAM						kW [kW/°C]
625							
575							0,7
525							0,65
475							0,6
425							0,55
375							0,5
							0,45
							0,4
325/0	50	100	150	200	250	300	l/min

Bar	PRESSURE DROP DIAGRAM						
2							
1,75							
1,5							
1,25							
1							
0,75							
0,5							
0,25							
0	50	100	150	200	250	300	l/min

CORRECTION FACTOR							
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP494EMX50	30-240	8	400	50	180	0,67	3300	56	80	50	400	-20/+40
3RAP494EMX60	30-240	8	460	60	180	0,59	3500	56	82	30	400	-20/+40

AP 580 EMX

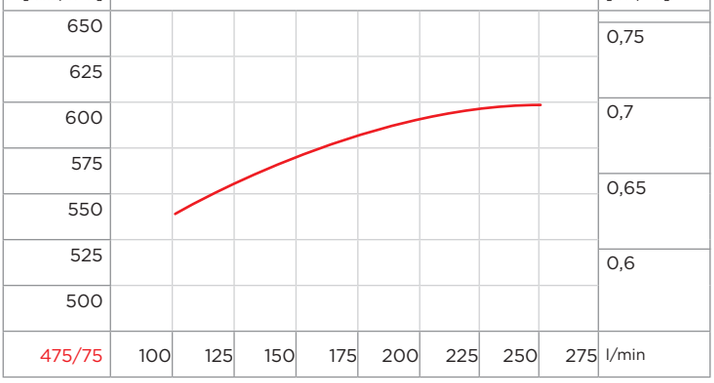
PURCHASE CODES

AP 580 EMX three-phase 400V 50HZ	3RAP580EMX50
AP 580 EMX three-phase 460V 60HZ	3RAP580EMX60

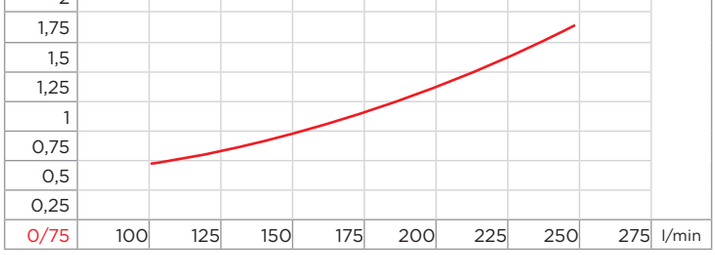
SPARE PARTS

Cooling element	3RNL580A
Frame	3CNAP580EMX.1
Electric fan 400V 50Hz	1VNAP432EMX50
Electric fan 460V 60Hz	1VNAP432EMX60

PERFOMANCE DIAGRAM



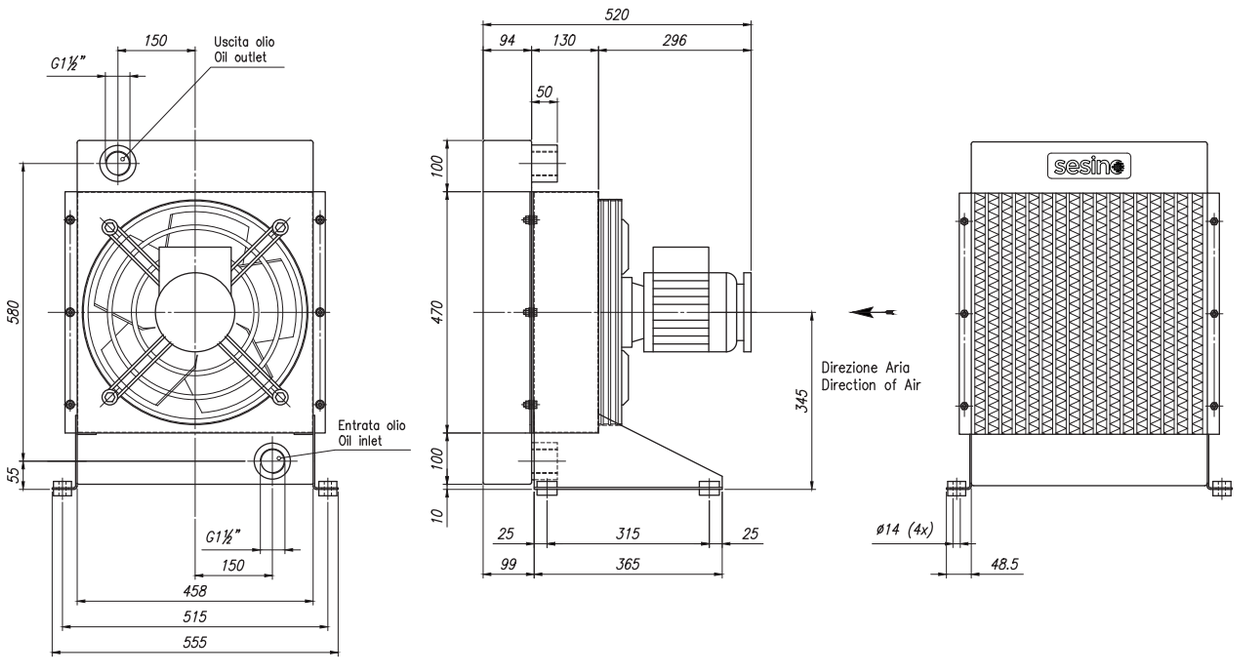
PRESSURE DROP DIAGRAM



CORRECTION FACTOR

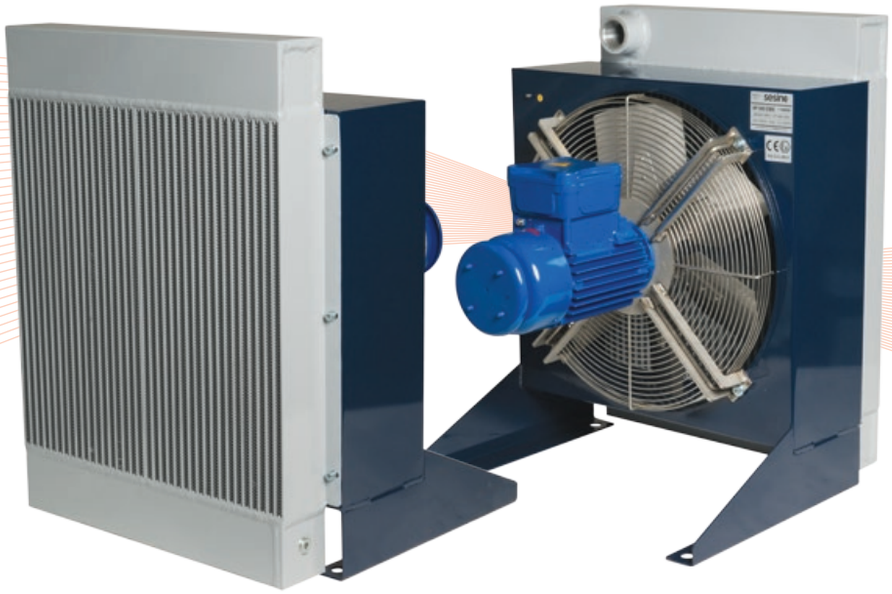
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP580EMX50	100-250	11,5	400	50	180	0,67	3500	56	79	62	400	-20/+40
3RAP580EMX60	100-250	11,5	460	50	180	0,59	3700	56	81	62	400	-20/+40

AP 680 EMX



PURCHASE CODES

AP 680 EMX three-phase 400V 50HZ	3RAP680EMX50
AP 680 EMX three-phase 460V 60HZ	3RAP680EMX60

SPARE PARTS

Cooling element	3RNL680A
Frame	3CNAP680EMX.1
Electric fan 400V 50Hz	1VNAP680EMX50
Electric fan 460V 60Hz	1VNAP680EMX60

PERFOMANCE DIAGRAM

kr [kcal/ h°C]	kW [kW/°C]
950	1,1
925	
900	1,05
875	
850	1
825	0,95
775	0,9
750	
725/75	l/min

100	125	150	175	200	225	250	275	300	325

PRESSURE DROP DIAGRAM

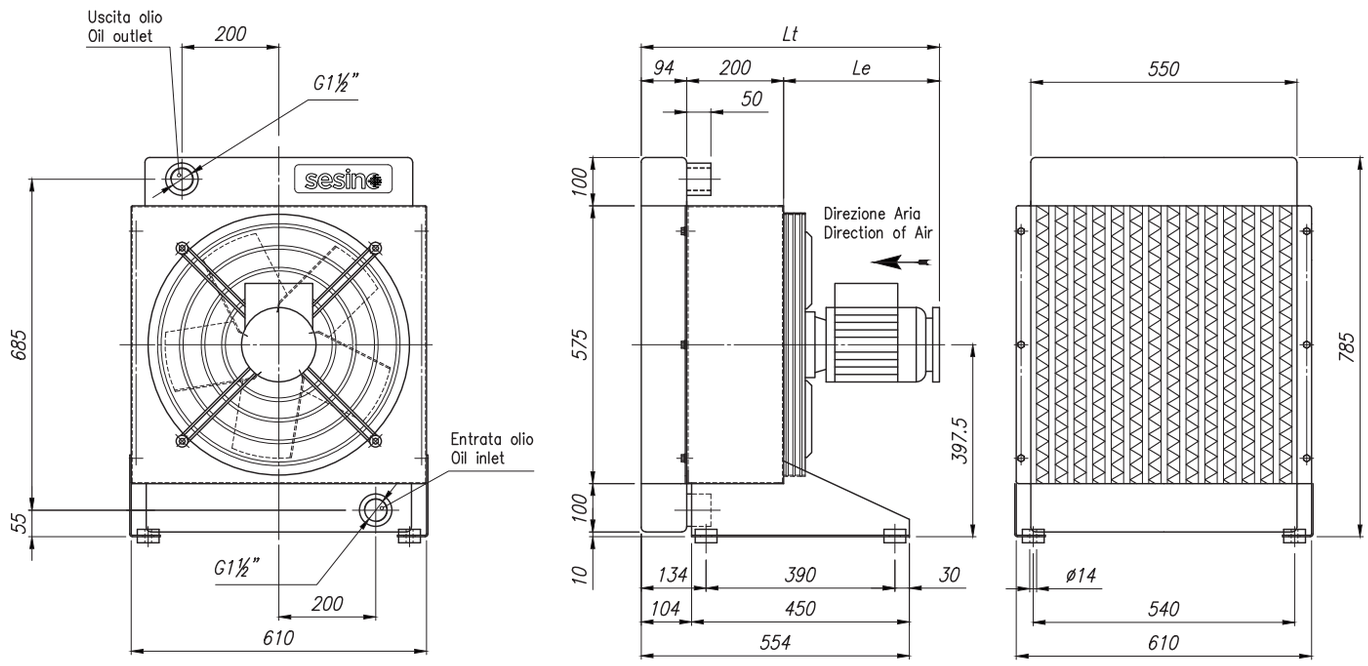
Bar	
2	
1,75	
1,5	
1,25	
1	
0,75	
0,5	
0,25	
0/75	l/min

100	125	150	175	200	225	250	275	300	325

CORRECTION FACTOR

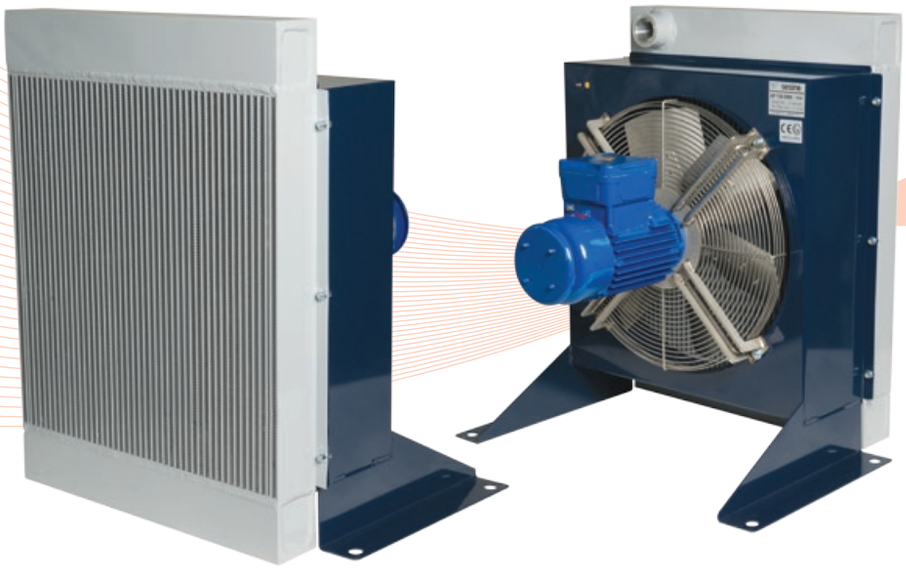
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.	DIMENSION	
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C	Le	Lt
3RAP680EMX50	100-300	15	400	50	550	1,6	7500	56	86	89	500	-20/+40	322	616
3RAP680EMX60	100-300	15	460	60	750	1,79	7900	56	86	89	500	-20/+40	364	658

AP 730 EMX



PURCHASE CODES

AP 730 EMX three-phase 400V 50HZ	3RAP730EMX50
AP 730 EMX three-phase 460V 60HZ	3RAP730EMX60

SPARE PARTS

Cooling element	3RNL730A
Frame	3CNAP730EMX.1
Electric fan 400V 50Hz	1VNAP680EMX50
Electric fan 460V 60Hz	1VNAP680EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
1300	
1250	
1200	1,4
1150	
1100	1,3
1050	
1000	1,2
950	
900	1,1

850/50	100	150	200	250	300	350	400	l/min

PRESSURE DROP DIAGRAM

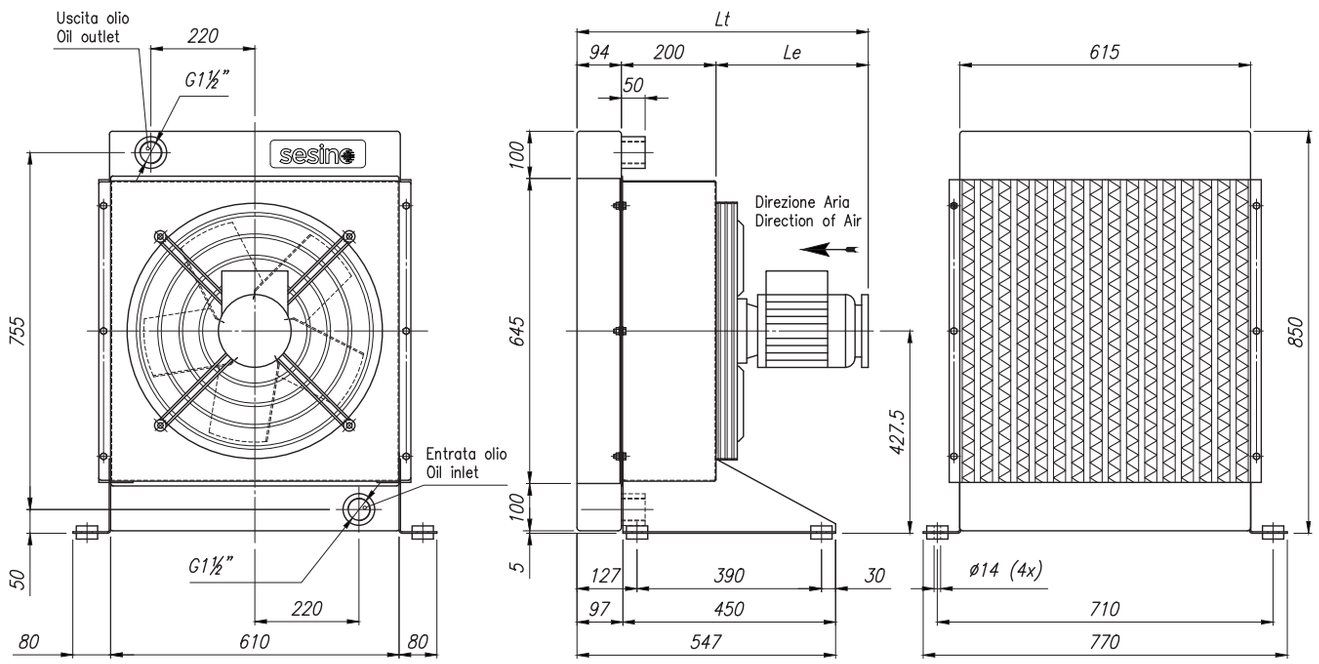
Bar	
2,25	
2	
1,75	
1,5	
1,25	
1	
0,75	
0,5	
0,25	

0/75	100	150	200	250	300	350	400	l/min

CORRECTION FACTOR

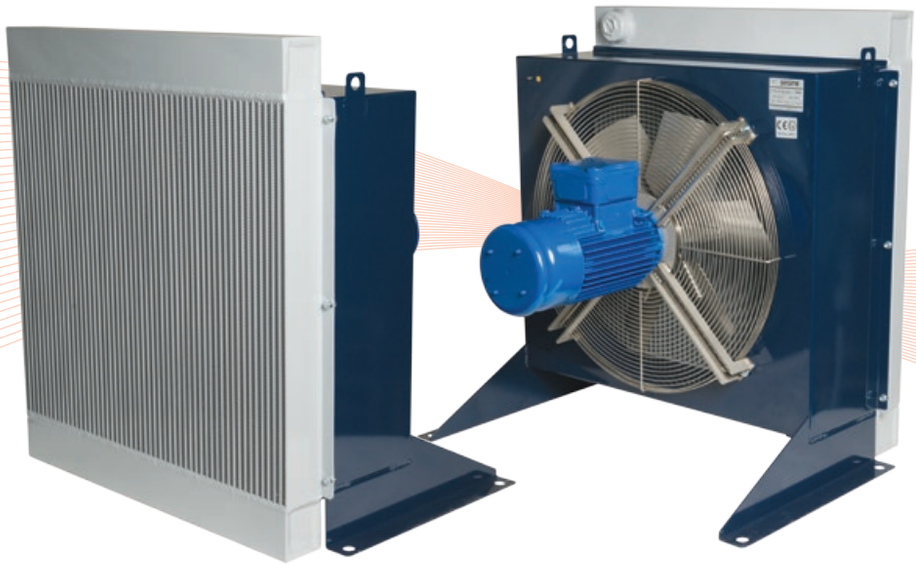
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.	DIMENSION	
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C	Le	Lt
3RAP730EMX50	100-300	16	400	50	550	1,6	7800	56	86	98	500	-20/+40	322	616
3RAP730EMX60	100-300	16	460	60	750	1,79	8200	56	86	98	500	-20/+40	364	658

AP 830 EMX



PURCHASE CODES

AP 830 EMX three-phase 400V 50HZ	3RAP830EMX50
AP 830 EMX three-phase 460V 60HZ	3RAP830EMX60

SPARE PARTS

Cooling element	3RNL830A
Frame	3CNAP830EMX.1
Electric fan 400V 50Hz	1VNAP830EMX50
Electric fan 460V 60Hz	1VNAP830EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
2000	
1925	2,2
1850	2,1
1775	2
1700	1,9
1625	1,8
1550	1,7
1475	

140/100	150	200	250	300	350	400	450	l/min

PRESSURE DROP DIAGRAM

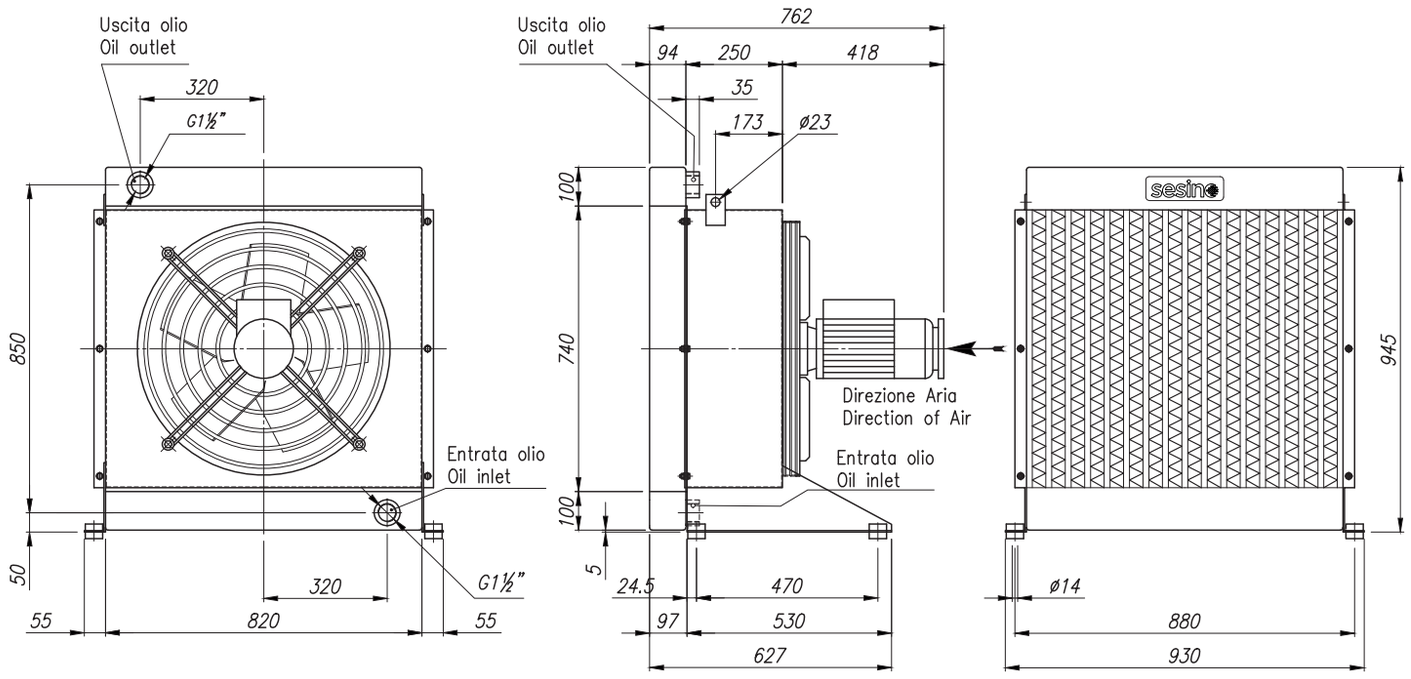
Bar
2,25
2
1,75
1,5
1,25
1
0,75
0,5
0,25

0/100	150	200	250	300	350	400	450	l/min

CORRECTION FACTOR

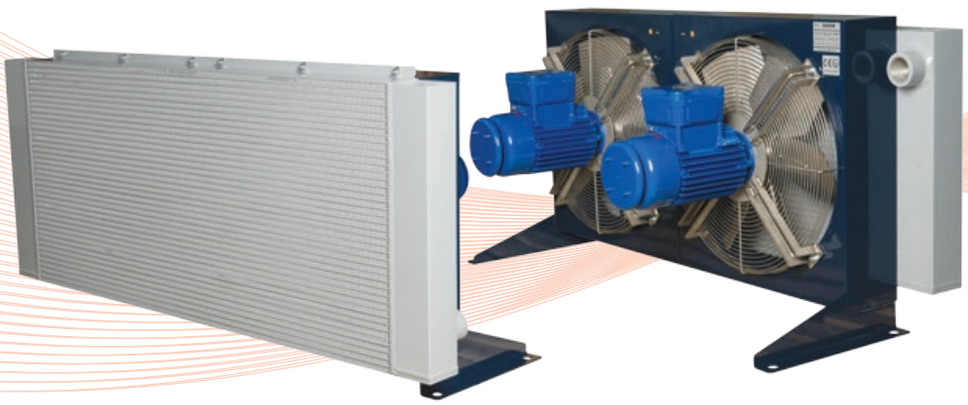
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP830EMX50	150-400	20	400	50	1100	2,58	10000	56	87	115	560	-20/+40
3RAP830EMX60	150-400	20	460	60	1100	2,24	10600	56	87	115	560	-20/+40

AP 2/680 EMX



PURCHASE CODES

AP 2/680 EMX three-phase 400V 50HZ	3RAP2/680EMX50
AP 2/680 EMX three-phase 460V 60HZ	3RAP2/680EMX60

SPARE PARTS

Cooling element	3RNL2/680A
Frame	3CNAP2/680EMX.1
Electric fan 400V 50Hz	1VNAP680EMX50
Electric fan 460V 60Hz	1VNAP680EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
2100	
2025	2,37
1950	2,25
1875	2,12
1800	2
1725	1,87
1650	
1575	
1500/0	l/min

50 100 150 200 250 300 350 400

PRESSURE DROP DIAGRAM

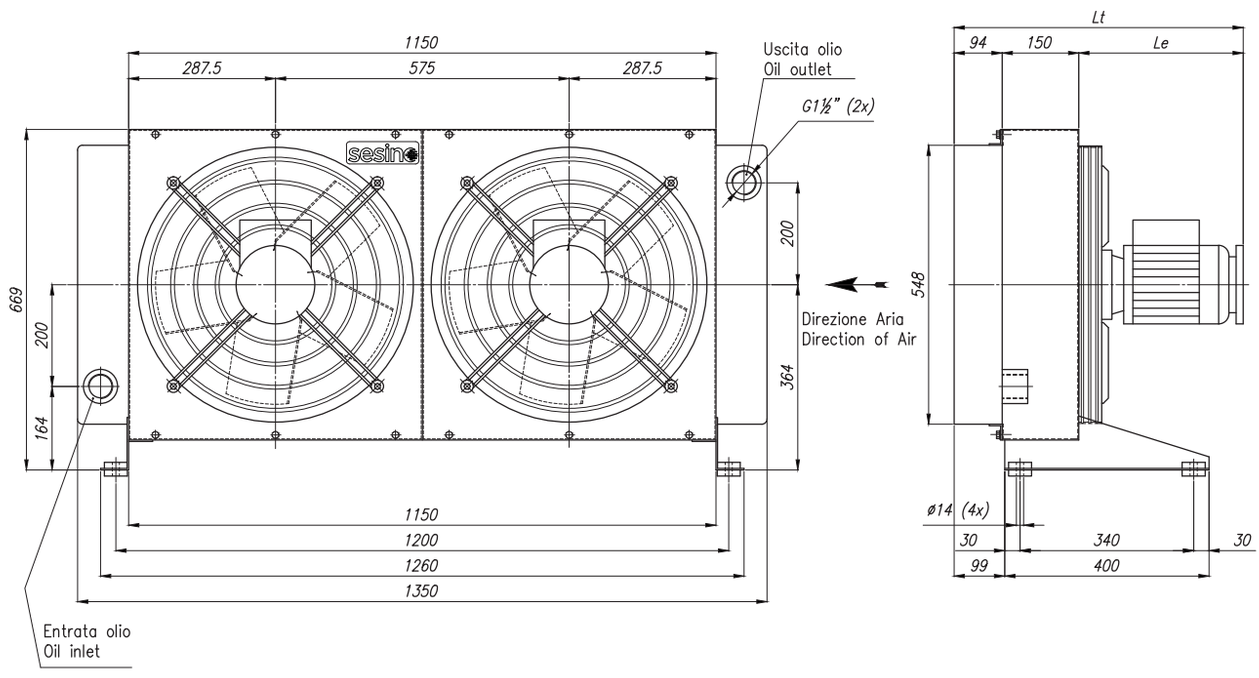
Bar
3
2,75
2,5
2,25
2
1,75
1,5
1,25
1
0,75
0,50
0,25
0

50 100 150 200 250 300 350 400 l/min

CORRECTION FACTOR

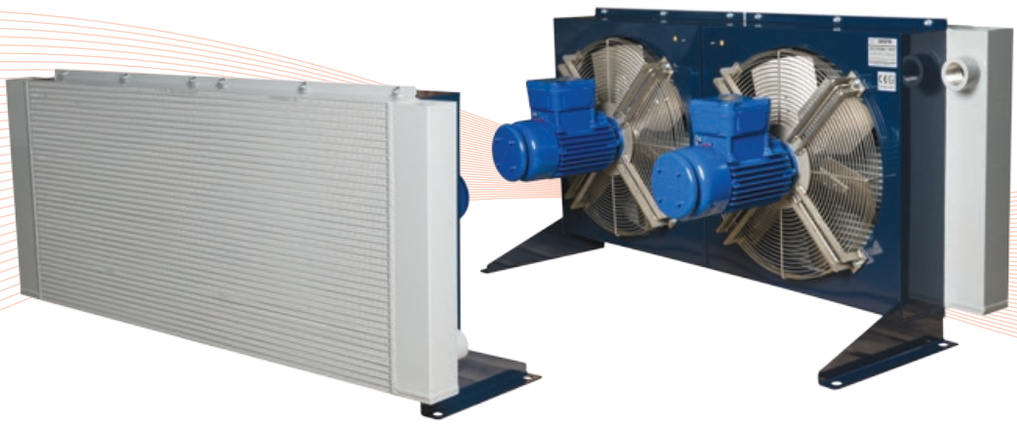
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.	DIMENSION	
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C	Le	Lt
3RAP2/680EMX50	100-300	28	400	50	2x 550	2x 1,6	2x 7500	56	87	185	500	-20/+40	322	566
3RAP2/680EMX60	100-300	28	460	60	2x 750	2x 1,79	2x 7900	56	87	185	500	-20/+40	364	608

AP 2/730 EMX



PURCHASE CODES

AP 2/730 EMX three-phase 400V 50HZ	3RAP2/730EMX50
AP 2/730 EMX three-phase 460V 60HZ	3RAP2/730EMX60

SPARE PARTS

Cooling element	3RNL2/730A
Frame	3CNAP2/730EMX.1
Electric fan 400V 50Hz	1VNAP680EMX50
Electric fan 460V 60Hz	1VNAP680EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
2750	
2650	
2550	3
2450	
2350	2,75
2250	
2150	2,5
2050	
1950	2,25
1850/0	l/min

50 100 150 200 250 300 350 400

PRESSURE DROP DIAGRAM

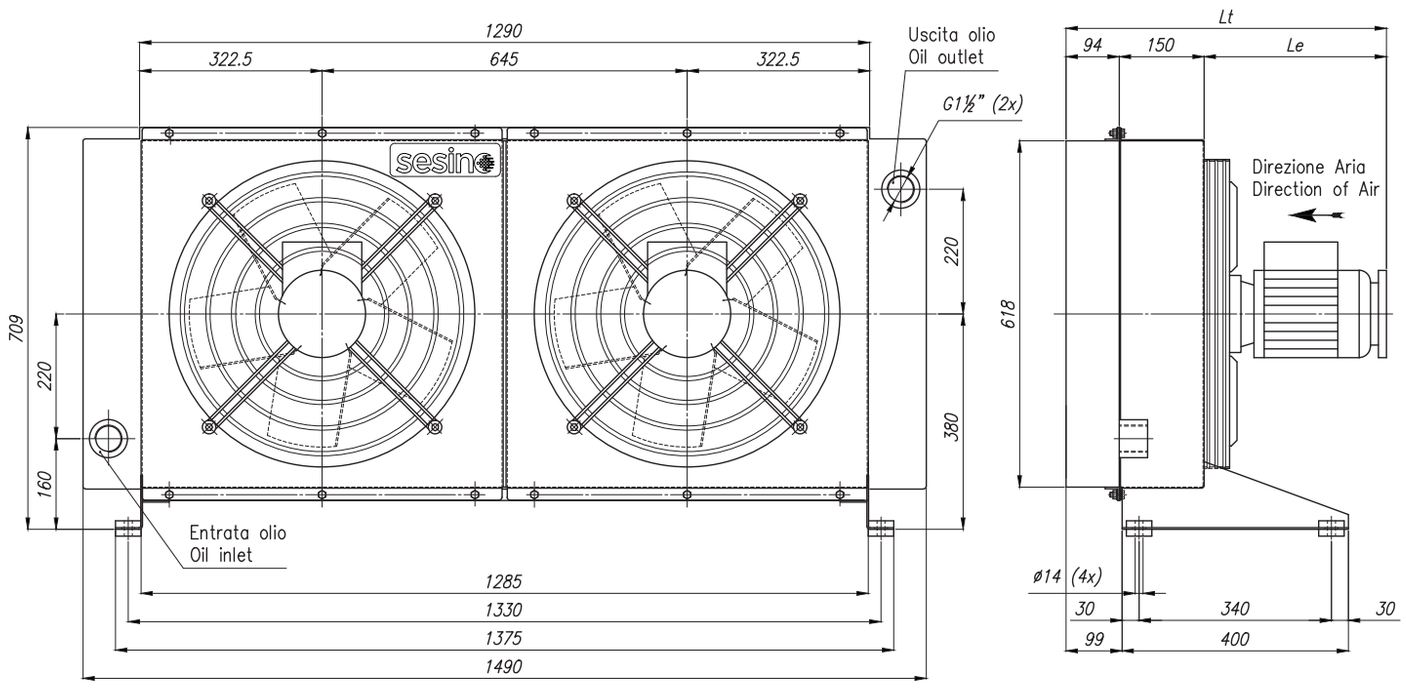
Bar
3,5
3
2,5
2
1,5
1
0,50
0

50 100 150 200 250 300 350 400 l/min

CORRECTION FACTOR

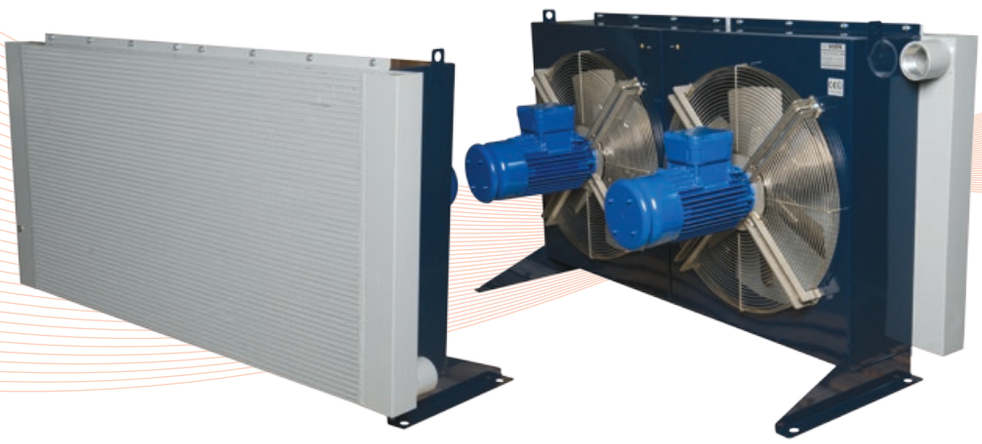
cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding



CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.	DIMENSION	
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C	Le	Lt
3RAP2/730EMX50	100-350	30	400	50	2x 550	2x 1,6	2x 7800	56	87	193	500	-20/+40	322	566
3RAP2/730EMX60	100-350	30	460	60	2x 750	2x 1,79	2x 8200	56	88	193	500	-20/+40	364	608

AP 2/830 EMX



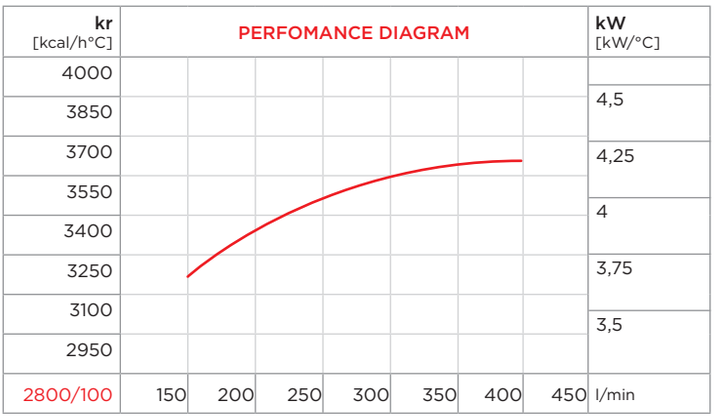
PURCHASE CODES

AP 2/830 EMX three-phase 400V 50HZ	3RAP2/830EMX50
AP 2/830 EMX three-phase 460V 60HZ	3RAP2/830EMX60

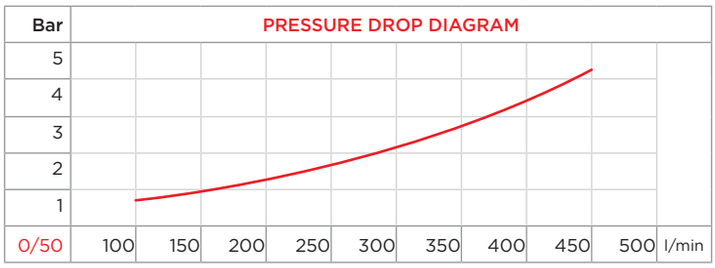
SPARE PARTS

Cooling element	3RNL2/830A
Frame	3CNAP2/830EMX.1
Electric fan 400V 50Hz	1VNAP830EMX50
Electric fan 460V 60Hz	1VNAP830EMX60

PERFOMANCE DIAGRAM



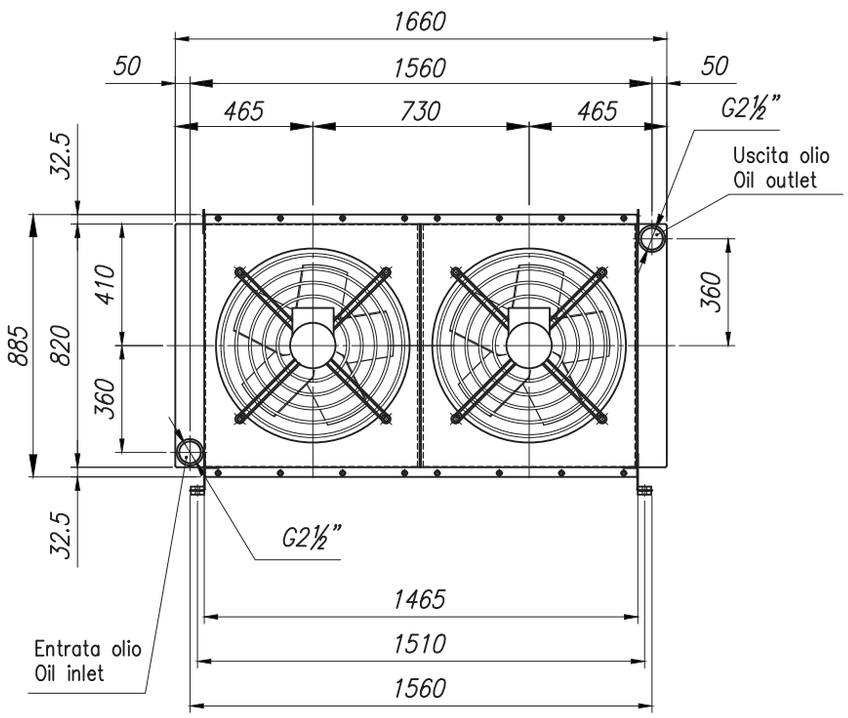
PRESSURE DROP DIAGRAM

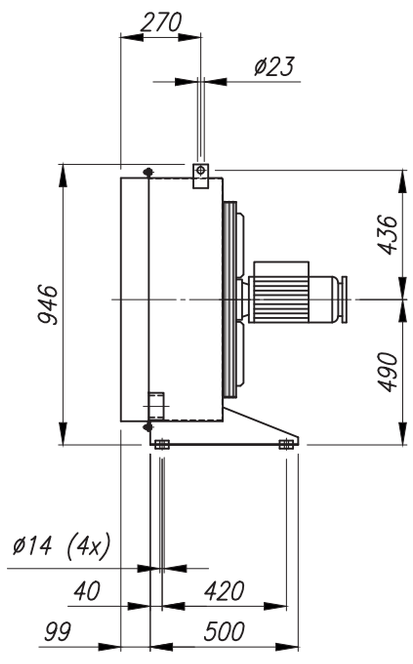


CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding





CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP2/830EMX50	150-400	40	400	50	2x 550	2x 1,6	2x 7800	56	89	193	500	-20/+40
3RAP2/830EMX60	150-400	40	460	60	2x 750	2x 1,79	2x 8200	56	89	193	500	-20/+40

AP 3/830 EMX

PURCHASE CODES

AP 3/830 EMX three-phase 400V 50HZ	3RAP3/830EMX50
AP 3/830 EMX three-phase 460V 60HZ	3RAP3/830EMX60

SPARE PARTS

Cooling element	3RNL3/830A
Frame	3CNAP3/830EMX.1
Electric fan 400V 50Hz	1VNAP830EMX50
Electric fan 460V 60Hz	1VNAP830EMX60

PERFOMANCE DIAGRAM

kr [kcal/h°C]	kW [kW/°C]
5700	
5550	6,5
5400	6,25
5250	6
5100	
4950	5,75
4800	5,5
4650	

4500/100	150	200	250	300	350	400	450	l/min

PRESSURE DROP DIAGRAM

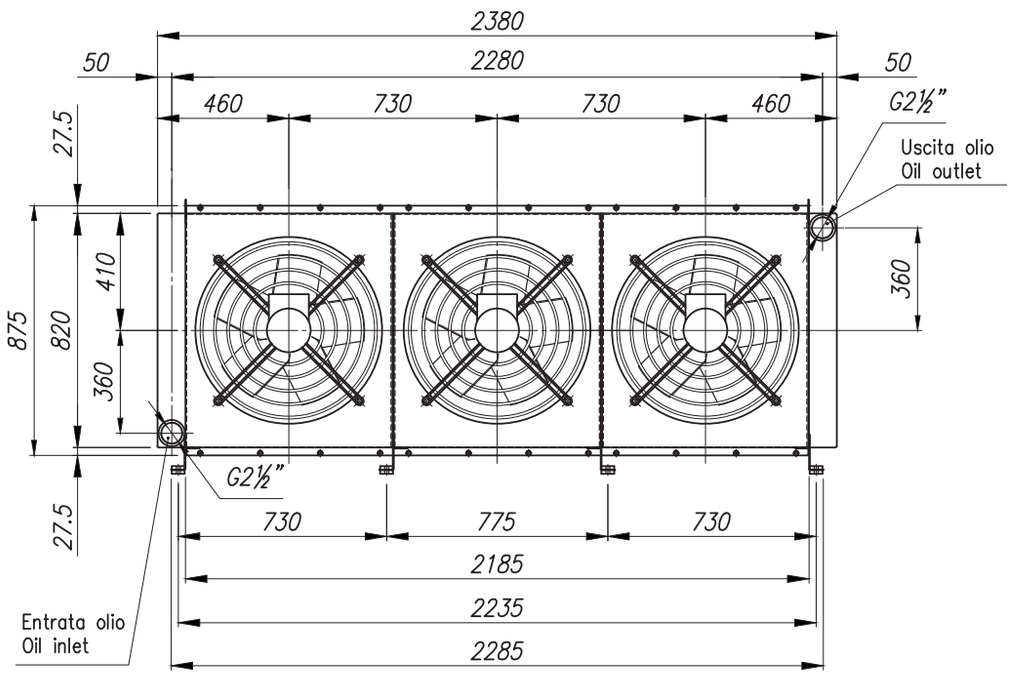
Bar	
7,5	
6	
4,5	
3	
1,5	

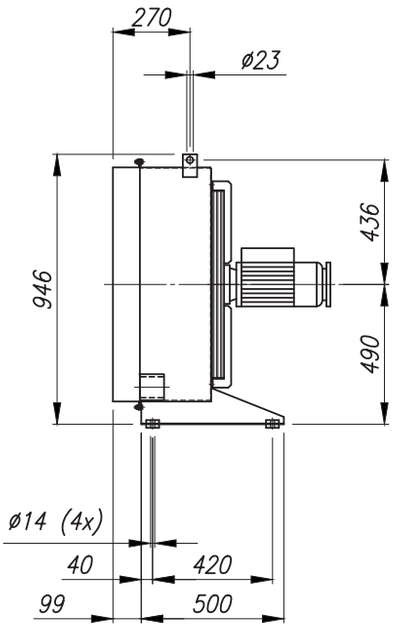
0/50	100	150	200	250	300	350	400	450	500	l/min

CORRECTION FACTOR

cSt	22	30	46	68	100	150	220
f	0,6	1	1,5	2,3	3,5	5	7

- Dimensions and technical characteristics are not binding





CODE	OIL FLOW	CAPACITY	VOLT.	FREQ.	POWER	CURRENT	AIR FLOW	PROTECTION	NOISE LEV.	WEIGHT	ø FAN	TEMP.
	l/min	l	V	Hz	W	A	m³/h	IP	dB(A)	kg	mm	°C
3RAP3/830EMX50	150-400	60	400	50	3x 1100	3x 2,58	2x 10000	56	90	360	560	-20/+40
3RAP3/830EMX60	150-400	60	460	60	3x 1100	3x 2,24	2x 10600	56	91	360	560	-20/+40

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