RAEL
MOTORI ELETTRICI

Flame proof motors

Ex d IIB

ADPE Series

ALUMINIUM

Petrol station motors

COMPANY PRESENTATION

RAEL, founded in Genoa in 1969, is specialized since 1978 in the study, planning and production of electric motors for potentially explosive atmospheres.

From 1986 the company grew considerably and moved itself to Predosa in province of Alessandria where are placed both the offices and the production; the occupied total area of the company is 9990 m²; 4537 m² of this area are covered and divided in the following manner: production department 3337 m², offices 371 m², warehouse 829 m².

The company from 2003 is certified and ISO 9001: 2000 and it obtained the Product Quality Assurance Notification according to Directive ATEX 94/9/CE.

The main products are: explosion-proof motors ADPE for fuel dispenser and explosion-proof motors RL unified series.

CONTENTS

1. INTRODUCTION

1.0 SI Units

Base units

Base quantity	Base quantity symbol	SI Name	SI Symbol
length	*l*	meter	m
mass	*m*	kilogram	kg
time	*t*	second	s
electric current	*I, i*	ampere	A
thermodynamic temperature	*T*	Kelvin	K
amount of substance	*n*	mole	mol
luminous intensity	I_V	candela	cd

Derived units

Derived quantity	Derived quantity symbol	SI Name	SI symbol	Expression in terms of other SI units	Expression in terms of SI base units
frequency	hertz	Hz	-	-	s^{-1}
force	F	newton	N	-	$kg \cdot m \cdot s^{-2}$
pressure, stress	p	pascal	Pa	$N \cdot m^{-2}$	$kg \cdot m^{-1} \cdot s^{-2}$
energy, work, quantity of heat	E	joule	J	$N \cdot m$	$kg \cdot m^{2} \cdot s^{-2}$
power	P, W	watt	W	$J \cdot s^{-1}$	$kg \cdot m^{2} \cdot s^{-3}$
electric charge	q	coulomb	C		$A \cdot s$
electric potential difference, electromotive force	v	volt	V	$J \cdot C^{-1}$	$m^{2} \cdot kg \cdot s^{-3} \cdot A^{-1}$
electric resistance	R	ohm	Ω	$V \cdot A^{-1}$	$m^{2} \cdot kg \cdot s^{-3} \cdot A^{-2}$
electric conductance	G	siemens	S	$A \cdot V^{-1}$	$s^{3} \cdot A^{2} \cdot m^{-2} \cdot kg^{-1}$
capacitance	C	farad	F	$C \cdot V^{-1}$	$s^{4} \cdot A^{2} \cdot m^{-2} \cdot kg^{-1}$
magnetic flux density	B	tesla	T	$V \cdot s \cdot m^{-2}$	$kg \cdot s^{-2} \cdot A^{-1}$
magnetic flux	Φ(B)	weber	Wb	$V \cdot s$	$m^{2} \cdot kg \cdot s^{-2} \cdot A^{-1}$
inductance	L	henry	H	$V \cdot s \cdot A^{-1}$	$m^{2} \cdot kg \cdot s^{-2} \cdot A^{-2}$
Celsius temperature	T	degree Celsius	°C	K	
plane angle	φ,θ	radiant	rad	1	$m \cdot m^{-1}$
luminance		lux	lx	$cd \cdot sr \cdot m^{-2}$	

Other derived quantities

area	A				m^{2}
volume	V				m^{3}
speed, velocity	v				$m \cdot s^{-1}$
angular velocity	ω				s^{-1} $rad \cdot s^{-1}$
acceleration	a				$m \cdot s^{-2}$
Torque, moment of force	M			$N \cdot m$	$m^{2} \cdot kg \cdot s^{-2}$
moment of inertia	J				$Kg\ m^{2}$
mass density	ρ				$kg \cdot m^{-3}$
specific volume					$m^{3} \cdot kg^{-1}$
dynamic viscosity	ρ			$N \cdot s \cdot m^{-2}$ $Pa \cdot s$	$m^{-1} \cdot kg \cdot s^{-1}$

1.1 Standards of reference

RAEL motors are constructed in compliance with the following standard.

Title	EU CENELEC	International IEC
Rotating electrical machines Part 1: Rating and performance	EN 60034-1	IEC 60034-1
Rotating electrical machines Part 2-1:Standard methods for determining losses and efficiency from tests (excluding machines for traction vehicles)	EN 60034-2	IEC 60034-2
Rotating electrical machines. Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code). Classification	EN 60034-5	IEC 60034-5
Rotating electrical machines Part 6: Methods of cooling (IC Code)	EN 60034 -6	IEC 60034 -6
Rotating electrical machines Part 7: Classification of types of construction, mounting arrangements and terminal box position (IM Code)	EN 60034-7	IEC 60034-7
Rotating electrical machines Part 9: Noise limits	EN 60034-9	IEC 60034-9
Rotating electrical machines Part 12: Starting performance of single-speed three-phase cage induction motors	EN 60034-12	IEC 60034-12
Rotating electrical machines Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher - Measurement, evaluation and limits of vibration severity	EN 60034-14	IEC 60034-14
General purpose three-phase induction motors having standard dimensions and outputs. Frame numbers 56 to 315 and flange numbers 65 to 740	EN 50347	IEC 60072-1
Degrees of protection provided by enclosures (IP Code)	EN 60259	IEC 60529
Electrical apparatus for explosive gas atmospheres Part 0: General requirements	EN 60079-0	IEC 60079-0
Electrical apparatus for explosive gas atmospheres Part 1: Flameproof enclosures 'd'	EN 60079-1	IEC 60079-1

1.2 Hazardous places

DIRECTIVE 1999/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres.

'Explosive atmosphere' means a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapours, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture.

The directive gives information regarding '**Classification of places where explosive atmosphere may occur'.**

The classification of hazardous places in zones competes to the customer whose working centres and activities contain or gives place to such dangers.

The safety against explosion can be only reached with the contribution, and the mutual informative exchange, both the manufacturer and the final users.

INDICATIONS REGARDING THECLASSIFICATION OF PLACES WHERE EXPLOSIVE ATMOSPHERES MAY OCCUR

For the classification of the areas reference to the relative harmonized technical norms regarding the specific fields:

- EN 60079-10 (IEC 60079-10) Electrical apparatus for explosive gas atmospheres.
  Part 10: Classification of hazardous areas.
- EN 61241-10 (IEC61241-10) Electrical apparatus for use in the presence of combustible dust
  Part 10: Classification of areas where combustible dusts are or may be present.

Zone 0
A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is present continuously or for long periods or frequently.
Note: In general, said conditions, when they present, they interest the inside of tanks, tubes and containers, etc.

Zone 1
A place in which an explosive atmosphere consisting of a mixture with air or flammable substances in the form of gas, vapour or mist is likely to occur in normal operation occasionally.
Note: such zone can also comprise:
- places in the immediate vicinities of zone 0;
- places in the immediate vicinities of the feeding openings;
- places in the immediate vicinities of the filling openings and emptying;
- places in the immediate vicinities of apparatuses, systems of protection and fragile components of glass, ceramics and analogous materials;
- places in the immediate vicinities of glands not sufficiently sealing, as an example on pumps and valves with glands.

Zone 2
A place in which an explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
Note: such zone can also comprise, surrounding places zones 0 or 1.

Zone 20
A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is present continuously, or for long periods or frequently.
Note: In general, said conditions, when they present, they interest the inside of tanks, tubes and containers, etc.

Zone 21
A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is likely to occur in normal operation occasionally.
Note: such zone can also comprise, for example, places in the immediate vicinities of loading points and powder emptying and places in which powder layers are formed or that, during the normal operation, could produce one explosive combustible powder concentration in mixture with the air.

Zone 22
A place in which an explosive atmosphere in the form of a cloud of combustible dust in air is not likely to occur in normal operation but, if it does occur, will persist for a short period only.
Note: such zone can also comprise, places in proximity of apparatuses, systems of protection and components containing powders, from which the powders can leak out because of losses and to form layers of powders (for example salt from milling, in which the powder leak from the mills and it is deposited).

Notes:
1. Layers, deposits and heaps of combustible dust must be considered as any other source which can form an explosive atmosphere.
2. 'Normal operation' means the situation when installations are used within their design parameters.

1.3 Classification of the equipment for areas where explosive atmosphere may occur

GROUPS AND CATEGORIES OF APPARATUSES

Within the directive 94/9/CE, the apparatuses, comprised if necessary the devices and the components are divided in two groups.

Group I comprises equipment intended for use in the underground parts of mines, and to those parts of surface installations of such mines, likely to become endangered by firedamp and/or combustible dust.
It is sub-divided into 2 Categories, as shown below:

Category M1: very high level of protection
Category M2: high level of protection

Group II comprises equipment intended for use in other places likely to become endangered by explosive atmospheres.
It is sub-divided into 3 Categories, as shown below

Category 1: very high level of protection
Category 2: high level of protection
Category 3: normal level of protection

For the type of protection "d", "i", "nC" and "nL", the electrical apparatus of Group II are subdivided in IIA, IIB and IIC, like prescribed in the relative specific European Norms regarding these types of protection.

How much higher is the possibility that an explosive atmosphere can take place, much higher must be the level of the adopted safety measures.

CRITERIA FOR THE CHOICE OF THE APPARATUSES AND THE SYSTEMS OF PROTECTION

In case the document on the protection against explosion based on the risk assessment does not preview otherwise, in all the areas in which explosive atmospheres can be formed are used apparatuses and systems of protection correspondents to the categories as per directive 94/9/CEE.
In particular, in such areas the following categories of apparatuses are used, provided that adapted, to second of the cases, to gas, vapours or fogs and/or powders:

- in zone 0 or zone 20, apparatuses of category 1;
- in zone 1 or zone 21, apparatuses of category 2;
- in zone 2 or zone 22, apparatuses of category 3;

Below you can find an outline for the choice of means of protection in function of the use zone.

GRUOP	CATEGORY	Means of protection			Explosive atmosphere presence	Zone
		Level	Characteristic of protection (All. I)	Characteristic of protection (All. II)		
II	1	Very high	In case of breakdown of means of protection, the level of safety is guaranteed from at least a second independent mean of protection. Moreover, the level of safety is guaranteed even if two independent anomalies are manifested	They must be planned and manufactured so that the sources of ignition are not activated, not even in case of exceptional anomalies of the apparatus	continuously or for long periods	0 1 2 20 21 22
	2	High	The level of safety is guaranteed also in presence of recurrent anomalies or defects of operation of the apparatuses of which it is habitually necessary to hold account.	They must be planned and manufactured so as to avoid sources of ignition, also in case of recurrent anomalies or defects of operation of the apparatuses of which it is habitually necessary to hold account.	Intermediate situation between previous and the successive one	1 2 21 22
	3	Normal	The level of safety is guaranteed in the normal operation.	They must be planned and manufactured so as to avoid sources of ignition expectable during the normal operation.	Scarce probability and if it take place is of short duration	2 22

1.4 Temperature Classes

Due to the type of motor we are speaking about (for fuel dispensers) we will focus our attention on

Explosive atmosphere consisting of a mixture with air of flammable substances in the form of gas, vapour or mist (GAS)

Ignition temperature of an explosive gas atmosphere

Lowest temperature of a heated surface which, under specified conditions according to IEC 60079-4, will ignite a flammable substance in the form of a gas or vapour mixture with air.

Maximum surface temperature

Highest temperature which is attained in service under the most adverse conditions (but within the specified tolerances) by any part or surface of an electrical apparatus, which would be able to produce an ignition of the surrounding explosive atmosphere.

Group II electrical apparatus, in function of their maximum surface temperature shall be marked either classified in a temperature class given in Table below:

Classification of maximum surface temperatures for Group II electrical apparatus

Temperature class	Maximum surface temperature (°C)
T1	450
T2	300
T3	200
T4	135
T5	100
T6	85

The maximum surface temperature shall not exceed the lowest ignition temperature of the explosive atmospheres concerned.

As far as the electric motors the maximum surface temperature will be referred to the temperature of:

the **external surface** of the enclosure as far as the *Flameproof enclosures 'd'* (EN 60079-1, IEC 60079-1) and *Equipment protection by pressurized enclosures 'p'* (EN 60079-2, IEC 60079-2)

all the surfaces both external and internal as far as the *Increased safety "e"* (EN 60079-7, IEC60079-7) and the *Construction, test and marking of type of protection 'n' electrical apparatus* (EN 60079-15, IEC 60079-15).

Below there is a representing table of the main inflammable gaseous substances subdivided for group of gas with relative temperatures of ignition and classes of temperature.

Main inflammable substances subdivided for group of gas (IIA, IIB, IIC) and temperature of ignition.

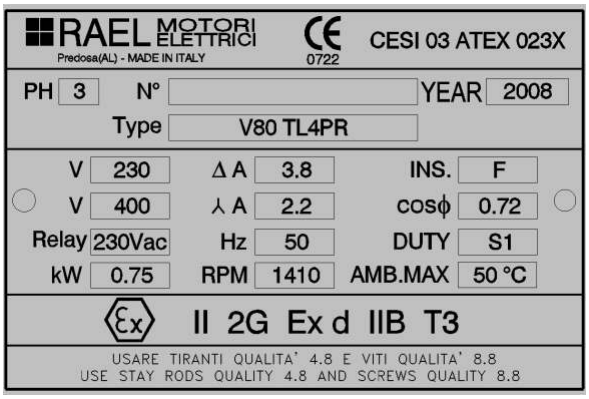
Inflammable substance	Group of GAS	temperature of ignition	Class of Temperature (°C)	Inflammable substance	Group of GAS	temperature of ignition	Class of Temperature (°C)
2-Methylpentane	IIA	300	T2	Ethyl formate	IIA	440	T2
Amyl acetate	IIA	360	T2	Methyl formate	IIA	450	T1
Butyl-n acetate	IIA	425	T2	Natural gas	IIA	482	T1
Ethyl acetate	IIA	426	T2	Isobutane	IIA	460	T1
Isobutyl acetate	IIA	420	T2	Isoheptane	IIA	220	T3
Methyl acetate	IIA	502	T1	Isohexane	IIA	264	T3
Propil acetate	IIA	430	T2	Isooctane	IIA	410	T2
Vinyl acetate	IIA	425	T2	Isoprene	IIA	220	T3
Acetone	IIA	465	T1	Methane	IIA	537	T1
Methanol	IIA	464	T1	Methylcyclopentane	IIA	258	T3
Brome thane	IIA	511	T1	Methylamine	IIA	430	T2
Butane	IIA	287	T3	Methylmetacrylate	IIA	430	T2
Butane - 1	IIA	384	T2	Paraldehyde	IIA	239	T3
Butane - 2	IIA	325	T2	Pentane	IIA	258	T3
Cycloexano	IIA	259	T3	Pyridine	IIA	483	T1
Cycloexanol	IIA	300	T2	Propane	IIA	470	T1
Cyclohexanone	IIA	419	T2	Propylamine	IIA	318	T2
Cyclohexene	IIA	244	T3	Propylbenzene	IIA	450	T1
Cyclopropane	IIA	498	T1	Propylene	IIA	455	T1
Cymene (p)	IIA	436	T2	Styrene	IIA	490	T1
Chloro-benzene	IIA	637	T1	Toluene	IIA	480	T1
Acetyl chloride	IIA	390	T2	m-Xylene	IIA	522	T1
Allyl chloride	IIA	390	T2	o-Xylene	IIA	464	T1
Chlorbutane	IIA	240	T3	p-Xilene	IIA	528	T1
Chloroethane	IIA	495	T1	1,2 Butadiene	IIB	430	T2
Vinyl chloride	IIA	472	T1	1,3 Butadiene	IIB	430	T2
Dichlorobenzene	IIA	648	T1	Dioxane	IIB	245	T3
Dichloroethylene 1,1	IIA	570	T1	Diethyl ether	IIB	160	T4
Dichloroethylene 1,2	IIA	441	T2	Ethyl vinyl ether	IIB	200	T3
Diethylamine	IIA	312	T2	Methyl vinyl ether	IIB	350	T2
Dimethylamine	IIA	400	T2	Acrylate ethyl	IIB	350	T2
Dimethylaniline	IIA	371	T2	Ethylene	IIB	425	T2
Dimethylbutane 2,3	IIA	405	T2	LPG	IIB	365	T2
Dimethylpentane 2,3	IIA	330	T2	Sulphurated Hydrogen	IIB	260	T3
Heptane	IIA	215	T3	Methylacrylate	IIB	415	T2
Hexane	IIA	233	T3	Carbon monoxide	IIB	605	T1
Heptane	IIA	515	T1	Ethylene oxide	IIB	435	T2
Ethylacetoacetate	IIA	350	T2	Propylene oxide	IIB	430	T2
Ethylamine	IIA	385	T2	Acetylene	IIC	305	T2
Ethylmercaptane	IIA	295	T3	Hydrogen	IIC	500	T1
Butyl formate	IIA	320	T2	Carbon disulfide	IIC	95	T6

1.5 Electric motor choice

After speaking about classification of areas with explosion atmosphere, motors groups and categories and classes of temperature, we can enter in the detail of the choice of the type of protection of the motor and the reading of the motor marking.

Explosive atmosphere type				Motor Marking				
	Area Classification	Presence of explosive atmosphere	Protection	Category	Group	Type of Protection	Gas Group	Temperature Class
GAS	Zone 1	Probable	High	II	2G	Ex d	IIB	T3
	Zone 2	Improbable	Normal	II	2G	Ex d	IIB	T3

Description of the marking on motor plate



CE	Marking of conformity in compliance with the European Directives
0722	Number of Notified Body that gives the Product Quality Assurance Notification
Ex	Specific marking of explosion protection
II	Group (surface plants different from mines)
2	Category (high protection)
G	Explosive atmosphere for the presence of flammable gas, vapour or mist (GAS)
Ex d	Type of protection for explosive atmosphere for the presence of flammable gas
IIB	GAS Group
T3	Temperature class of the motor (GAS)
Amb Max	Max Ambient Temperature
CESI 03 ATEX 023X	Type Certificate Number

a) Motors marked with gas group IIB are suitable to be used also when are requested gas groups IIA.

b) Motors with temperature class T3 (gas) are suitable to be used also when are requested temperature classes T2, T1.

c) Room temperature range:

Certificate CESI 03 ATEX 023X: -20° +50°C

Certificate CESI 02 ATEX 145X: -20° +50°C (is possible to have -20° +60°C)

Example of choice of motors and their own marking

- Motor for surface plant in explosive atmosphere (different from mines)
- zone 1
- explosive atmosphere consisting of a mixture with air of Diethyl ether (gas group IIB ignition temp. 160°C)
- Max ambient temperature 50°C

The marking **II 2G Ex d IIB T3** is suitable for such application

2. GENERAL INFORMATION

2.1 Range of Motors

Motors RL series are manufactured in compliance with all the European standards concerning equipment and protective systems for potentially explosive atmosphere in compliance with the European Directive ATEX 94/9/CE (better known as ATEX).
As we just told in par. 2.0 to be in compliance with ATEX Directive are necessary:

- EC type Certificate
- Product Quality assurance Notification

Such certificates are issued by notified bodies qualified to release them.

Motors ADPE series group II category 2G (GAS) are suitable for zone 1 and zone 2.

Motors projected to be installed inside the fuel dispensers, for this reason the terminal box is placed in the end shield of the motor while the cooling-fan is placed in the front shield. Motors type V80 (shaft height 80mm) or type V90 (shaft height 90mm) and V90A (shaft height 90mm and frame 20mm longer).

In the V80 version we can make motors without cooling fan that can be used for vapour recovery pumps or coupled with premix oil pumps.

Version	Frame size (mm)	Power (kW)	Poles	GAS Group	Temperature Class 2G motors	Ambient Temperature
Three phase 2 - 4 - 6 poli	80 – 90	0,25 – 2,2	2	IIB	T3	-20°C a +50°C
		0,25 – 1,8	4			
		0,25 – 1,25	6			
Single-phase 2 - 4 - 6 poli	80 - 90	0,25 – 1,8	2	IIB	T3	-20°C a +50°C
		0,25 – 1,1	4			
		0,25 – 0,8	6			

Here below we write the different type of 3-phase and single-phase motors and we will describe them in the details:

Three-phase motors:

V80S – V90S	3-phase motor with terminal board – 1 cable entry
V80MB – V90MB	3-phase motor with control relay inside the motor – 2 cable entries
V80MI – V90MI	3-phase motor with control contactor inside the motor – 2 cable entries
V90 5i	3-phase motor with control relay inside the motor – till 5 cable entries

Single-phase motors:

V80MA – V90MA	Single-phase motor with centrifugal switch and capacitors inside the motor – 1 cable entry
V80MB – V90MB	Single-phase motor with centrifugal switch inside the motor and external capacitors – 2 cable entries
V80MI – V90MI	Single-phase motor with centrifugal switch and relay inside the motor and external capacitors – 2 cable entries
V90 5i	Single-phase motor with centrifugal switch inside the motor and external capacitors – till 5 cable entries

Motors without ventilation:

V80 NV	Used to drive vapour recovery pumps inside the petrol stations and couplet with oil mix pump for mixing oil with petrol. Can be built with the following shapes: V80S - V80MB – V80MI – V80MA

2.2 Main features and options

2.2.1 Type V80S – V90S
Three-phase standard motor

Main features:
❶Three-phase motor equipped with terminal board.
❷One cable entry.
❸Complete with cable gland (indicate diameter of used cable).

Options:
❶Cable (indicate cable length).

2.2.2 Type V80MB – V90MB
Motor with short cover (Three-phase with internal relay – single-phase with external capacitor)

3-PHASE VERSION

Main features:
❶Motor complete with power relay for motor control. Relay voltage: 24Vdc, 24Vac, 230Vac (specials voltages on request 6-12-48-60-110-440 Vac e 6-12-48-60-110 Vdc).
❷Two cable entries.
❸Complete with cable gland/s and cable/s (indicate cable/s length/s).
For relay coil voltage < 230V built with one power cable and one control cable.
❹Thermal protection with automatic reset.

Options:
❶The motor can be equipped with RC filters.

1-PH VERSION

Main features:
❶Motor complete with internal centrifugal switch to cut off the start capacitor.
❷External run and start capacitors.
❸Two cable entries.
❹Complete with cable gland/s and cable/s (indicate cable/s length/s).

Options:
❶Thermal protection with automatic reset.

2.2.3 Type V80MI – V90MI
Motors with intermediate cover (Three-phase with internal contactor)

3-PHASE VERSION

Main features:
❶Motor complete with power mini-contactor for motor control. Contactor coil voltage: 24Vdc, 24Vac, 230Vac (specials voltages from 110V till 400V from 12Vdc till 110Vdc). Solution adopted to have a very high switching duty.
❷Two cable entries.
❸Complete with cable gland/s and cable/s (indicate cable/s length/s).
For contactor coil voltage < built with one power cable and one control cable. Thermal
❹protection with automatic reset.

Options:
❶The motor can be equipped with RC filters.

1-PH VERSION

Main features:
❶Motor complete with internal centrifugal switch to cut off the start capacitor.
❷External run and start capacitors.
❸Two cable entries.
❹Complete with cable gland/s and cable/s (indicate cable/s length/s).

Options:
❶Power relay for motor control. Relay voltage: 24Vdc, 24Vac, 230Vac (specials voltages on request 6-12-48-60-110-440 Vac e 6-12-48-60-110 Vdc).
❷Thermal protection with automatic reset.

2.2.4 Type V90 5l
Motor with 5 cable entries cover (cover can be used as a junction box)

Main features:

❶Till 5 cable outlet.
The standard version is with 3 cable entries and it is also possible to have 5 cable entries.
The backside cover can be used as a flameproof junction box
❷Complete with cable gland/s and cable/s (indicate cable/s length/s).

Options:

3-PHASE VERSION

❶Power relay for motor control. Relay voltage: 24Vdc, 24Vac, 230Vac (specials voltages on request 6-12-48-60-110-440 Vac e 6-12-48-60-110 Vdc).
❷Thermal protection with automatic reset.
❸The motor can be equipped with RC filters.

1-PH VERSION

❶Power relay for motor control. Relay voltage: 24Vdc, 24Vac, 230Vac (specials voltages on request 6-12-48-60-110-440 Vac e 6-12-48-60-110 Vdc).
❷Thermal protection with automatic reset.

2.2.5 Type V80MA – V90MA
Motors with long cover (Single-phase with internal capacitors)

Main features:

❶Motor complete with internal run and start capacitors and centrifugal switch to cut off the start capacitor.
❷One cable entry.
❸Complete with cable gland and cable (indicate cable length).

Options:

❶Power relay for motor control. Relay voltage: 24Vdc, 24Vac, 230Vac (specials voltages on request 6-12-48-60-110-440 Vac e 6-12-48-60-110 Vdc).
❷Thermal protection with automatic reset.

2.2.6 Type V80 NV
Motor frame 80 without ventilation

Main features:

This motors can be build with different configurations V80S, V80MA, V80MI, V80MA and is used as follow:

❶coupled (by pulley) with vapour recovery pumps inside the petrol pump station.

❷directly coupled with a oil-pump for mixing oil with petrol.

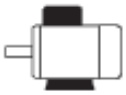
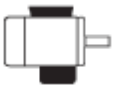
Depending on the configuration it has the characteristic of the motors that you can find in the paragraphs 2.2.1, 2.2.2, 2.2.3, 2.2.5.

3. MECHANICAL CHARACTERISTIC

3.1 Mounting arrangements

ADPE motors can be made in the mounting arrangements as shown in the table.

IM B3 IM B6, IM B7, IM B8, IM V5 o IM V6.

Basic mountings	Other mountings				
IM B3 IM 1001	IM V5 IM 1011	IM V6 IM 1031	IM B6 IM 1051	IM B7 IM 1061	IM B8 IM 1071
					

3.2 Materials

Materials of the main components.

Type of material

Shield frames flanges covers	Shaft	Rotor	Fan	Fan cover	Tie rods	Screw	Cable glands	Motor Plate
Aluminium	Steel 35S20	Die-cast Aluminium (squirrel cage)	Thermoplastic material or Aluminium	Zinc-plated steel	Steel 4.8	Steel 8.8	nickel-plated brass	Anodized aluminium

Bearings

The 2Z series bearings are lubricated for life and required not further lubrication. Nevertheless, we recommend in case of continuous running, long time stop, low temperature, radial and/or axial load, frequency inverter used, to control some time to time the ball bearings (40 000 hours for 4,6,8 pole motors and 20 000 hours for the 2 pole motors).

Motor		Bearing		Lubrication
Frame	Poles	Front	Rear	
V80S	2 - 4 - 6	6204 2Z	6201 2Z	No lubrication need
V90S	2 - 4 - 6	6204 2Z	6202 2Z	No lubrication need
V80MB	2 - 4 - 6	6204 2Z	6203 2Z	No lubrication need
V90MB	2 - 4 - 6	6204 2Z	6203 2Z	No lubrication need
V80MI	2 - 4 - 6	6204 2Z	6203 2Z	No lubrication need
V90MI	2 - 4 - 6	6204 2Z	6203 2Z	No lubrication need
V905I	2 - 4 - 6	6204 2Z	6203 2Z	No lubrication need
V80MA	2 - 4 - 6	6204 2Z	6203 2Z	No lubrication need
V90MA	2 - 4 - 6	6204 2Z	6203 2Z	No lubrication need

4. ELECTRICAL DATA

Below you can find the electrical data of the motors we normally produce for petrol pumps, vapour recovery pumps and mixing oil pumps.

On request we can manufacturer motors with special powers and voltages.

4.1 Three phase motors

- Three phase asynchronous motor, squirrel cage rotor, self ventilated (IC411).
- Duty S1, Insulation class "F", IP55, and 50 Hz.

Tipo Type	Potenza Power		poli poles	V	Hz	A (400V)	A (230V)	RPM	Cosϕ	Duty
	kW	Hp								
V80	**1,00**	**1,36**	**2**	230/400	50	-	4,2	2790	0.75	S1
V90	**1,50**	**2,00**	**2**	230/400	50	3,5	6,0	2840	0,72	S1
V90A	**2,20**	**3,00**	**2**	230/400	50	4,6	8,0	2840	0,8	S1
V80	**0,55**	**0,75**	**4**	230/400	50	1,7	2,9	1420	0,75	S1
V80	**0,75**	**1,00**	**4**	230/400	50	2,2	3,8	1410	0,72	S1
V90	**0,75**	**1,00**	**4**	230/400	50	1.8	3,1	1420	0.8	S1
V80	**1,00**	**1,36**	**4**	230/400	50	2,8	4,9	1390	0,8	S1
V90	**1,10**	**1,50**	**4**	230/400	50	2,9	5,0	1420	0,7	S1
V90	**1,50**	**2,00**	**4**	230/400	50	3,9	6,7	1390	0,8	S1
V90	**0,55**	**0,75**	**6**	230/400	50	1,8	3,1	920	0,7	S1
V90	**0,75**	**1,00**	**6**	230/400	50	4,5	2,5	900	0,7	S1
V90	**1,00**	**1,36**	**6**	240/415	50	2,8	4,8	930	0,78	S1
V90A	**1,25**	**1,70**	**6**	230/400	50	3,9	6,4	930	0,7	S1

- Three phase asynchronous motor, squirrel cage rotor, without ventilation (IC410).
- Duty S3, Insulation class "F", IP55, and 50 Hz.

Tipo Type	Potenza Power		poli poles	V	Hz	A (400V)	A (230V)	RPM	Cosϕ	Duty
	kW	Hp								
V80 NV	**0,25**	**0,35**	**2**	230/400	50	0,8	1,4	2800	0,7	S3
V80 NV	**0,37**	**0,50**	**2**	230/400	50	0,9	1,6	1420	0,68	S3
V80 NV	**0,25**	**0,35**	**4**	230/400	50	0,9	1,6	1410	0,7	S3
V80 NV	**0,37**	**0,50**	**4**	230/400	50	1,0	1,8	1420	0,68	S3

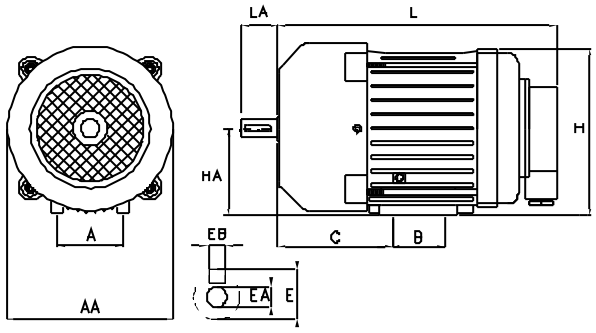
4.2 Single-phase motors

- Single-phase asynchronous motor, squirrel cage rotor, self ventilated (IC411).
- Duty S1, Insulation class "F", IP55, and 50 Hz.
- High starting torque

Tipo Type	Potenza Power		poli poles	V	Hz	A	C Run µf (450V)	C Start µF (250V)	RPM	Cosϕ	Duty
	kW	Hp									
V90	**1,00**	**1,36**	**2**	230	50	6,0	25	200	2900	0,90	S1
V90A	**1,80**	**2,50**	**2**	230	50	11,5	35	200	2880	0,90	S1
V80	**0,37**	**0,50**	**4**	230	50	2,7	16	40	1410	0.95	S1
V80	**0,55**	**0,75**	**4**	230	50	4,1	20	100	1440	0,95	S1
V90A	**1,00**	**1,36**	**4**	230	50	6,0	25	80	1430	0,90	S1
V90	**0,55**	**0,75**	**4**	230	50	3,8	20	80	1430	0,95	S1
V90	**0,75**	**1,00**	**4**	230	50	4,5	20	80	1450	0,90	S1
V90	**1,00**	**1,36**	**4**	230	50	6,1	25	90	1430	0,95	S1
V90A	**1,00**	**1,36**	**4**	230	50	6,0	25	80	1430	0,90	S1
V90A	**1,10**	**1,50**	**4**	230	60	7,0	25	80	1800	0,90	S1
V80	**0,55**	**0,75**	**6**	230	50	4,3	31,5	100	920	0,90	S1
V90	**0,75**	**1,00**	**6**	230	50	6,2	25	60	920	0,90	s1
V90A	**1,00**	**1,36**	**6**	230	50	7,1	30	90	940	0,90	S1

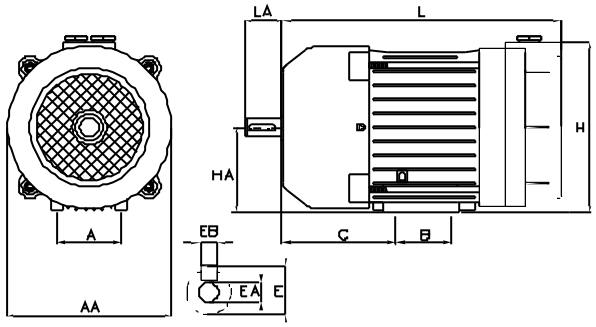
5. OVERALL DIMENSIONS

5.1 Type V80S – V90S



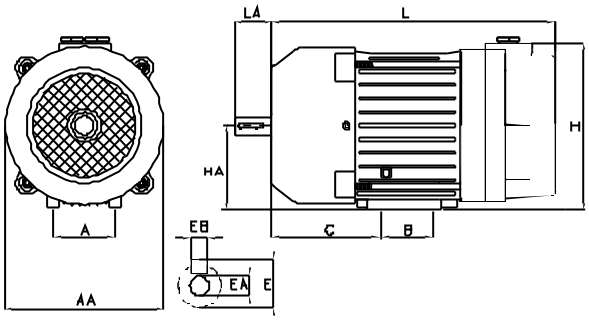
								Albero/Shaft 14mm				Albero/Shaft 19mm			
Type	HA	H	A	AA	B	C	L	LA	E	EA	EB	LA	E	EA	EB
V80	80	153	90	160	54	97	255	30	15.8	M5	5	40	21.3	M6	6
V90	90	168	90	176	54	98	255	30	15.8	M5	5	40	21.3	M6	6
V90A	90	168	90	176	54	98	275	30	15.8	M5	5	40	21.3	M6	6

5.2 Type V80MB – V90MB



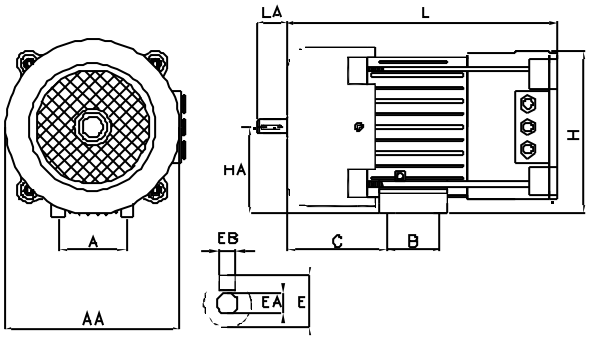
								Albero/Shaft 14mm				Albero/Shaft 19mm			
Type	HA	H	A	AA	B	C	L	LA	E	EA	EB	LA	E	EA	EB
V80	80	157	90	160	54	97	256	30	15.8	M5	5	40	21.3	M6	6
V90	90	184	90	176	54	98	263	30	15.8	M5	5	40	21.3	M6	6
V90A	90	184	90	176	54	98	283	30	15.8	M5	5	40	21.3	M6	6

5.3 Type V80MI – V90MI



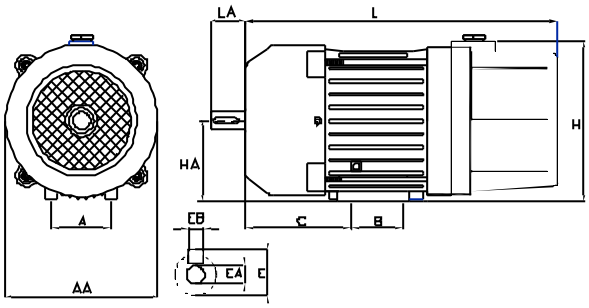
								Albero/Shaft 14mm				Albero/Shaft 19mm			
Type	HA	H	A	AA	B	C	L	LA	E	EA	EB	LA	E	EA	EB
V80	80	157	90	160	54	97	266	30	15.8	M5	5	40	21.3	M6	6
V90	90	184	90	176	54	98	278	30	15.8	M5	5	40	21.3	M6	6
V90A	90	184	90	176	54	98	298	30	15.8	M5	5	40	21.3	M6	6

5.4 Type V90 5l



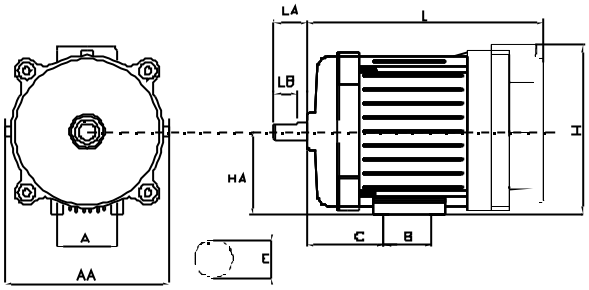
								Albero/Shaft 14mm				Albero/Shaft 19mm			
Type	HA	H	A	AA	B	C	L	LA	E	EA	EB	LA	E	EA	EB
V90	90	184	90	176	54	98	270	30	15.8	M5	5	40	21.3	M6	6
V90A	90	184	90	176	54	98	290	30	15.8	M5	5	40	21.3	M6	6

5.5 Type V80MA – V90MA



								Albero/Shaft 14mm				Albero/Shaft 19mm			
Type	HA	H	A	AA	B	C	L	LA	E	EA	EB	LA	E	EA	EB
V80	80	157	90	160	54	97	315	30	15.8	M5	5	40	21.3	M6	6
V90	90	184	90	176	54	98	315	30	15.8	M5	5	40	21.3	M6	6
V90A	90	184	90	176	54	98	335	30	15.8	M5	5	40	21.3	M6	6

5.6 Type V80 NV



								Albero / Shaft		
Configurazione	HA	H	A	AA	B	C	L	LA	LB	E
V80S	80	153	90	160	54	97	225	30	25	11,45
V80MB	80	157	90	160	54	97	226	30	25	11,45
V80MI	80	157	90	160	54	97	226	30	25	11,45
V80MA	80	157	90	160	54	97	285	30	25	11,45

6. SPARE PARTS

6.1 Personnel qualification

Overhauls and repairs must be only realised by qualified people in accordance with the standards EN 60079-17 or national standards (last edition). Qualified people must have knowledge about explosion protection.
Repairs must be made regarding the rules as define in EN 60079-19 standards.
These repairs can only be done under the control or agreement with RAEL Motori Elettrici by a repair shop designed by RAEL or a recognized laboratory.
In case these rules are not respected, RAEL liability is released.

6.2 List of spare parts

All motors components must be replaced by original spare parts. In these cases please contact RAEL directly and give the serial number of the motor so to ask the authorization to repair the motor too.

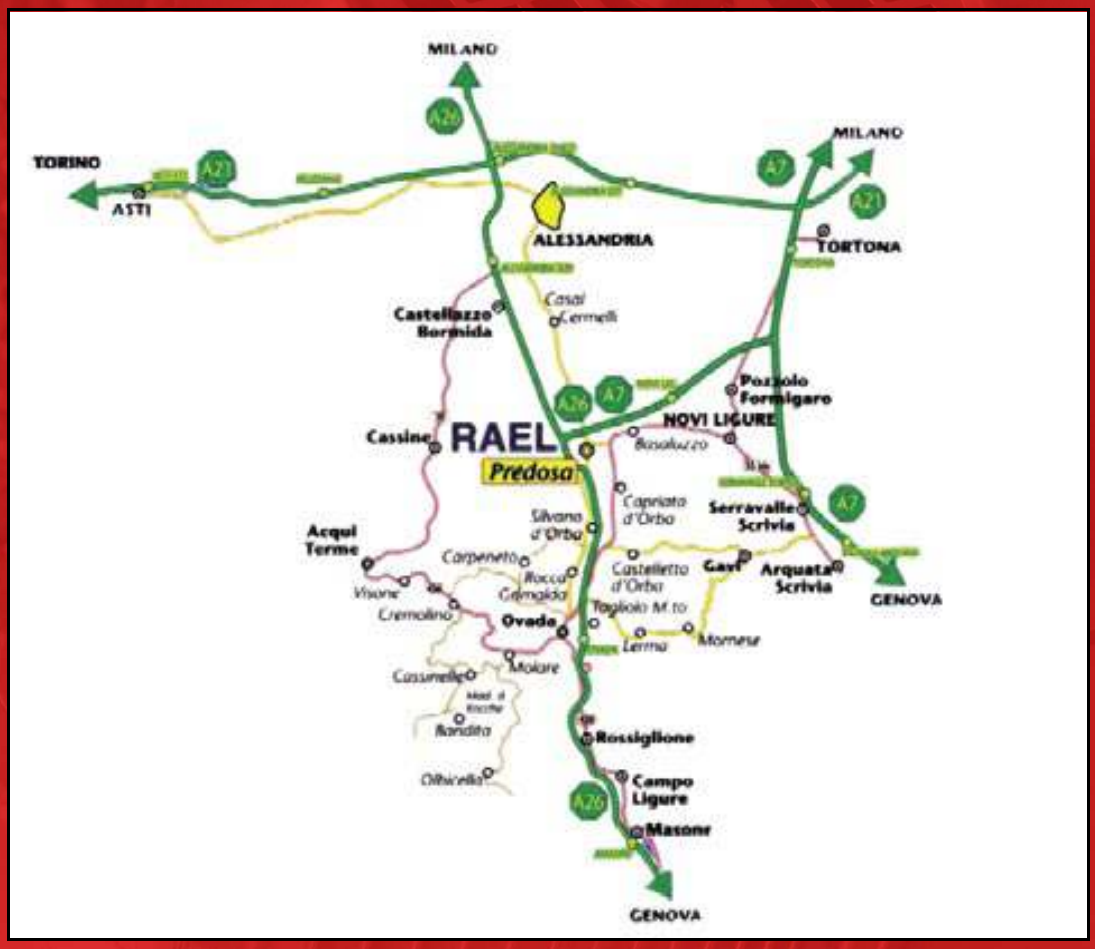
RAEL people will suggest you in choosing the right spare parts you need to order and here below we write a list of some parts:

- Power relay or contactor for motor control.
- Cable gland nuts, rubber rings and washers.
- Fancovers
- Centrifugal switches for single-phase motors.
- Capacitors for single-phase motors.

Certificates

RAEL Motori Elettrici S.r.l. is certified ISO9001:2000 from February 2003 and as we manufacture motors complying with Directive 94/9/CE we also have both the 'Product Quality Assurance Notification' and the CE certificates regarding motors RL series.

RAEL
MOTORI ELETTRICI



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