1. BASIC INFORMATION

1.1. Handling

THE MOTOR MUST NOT BE HANDLED WHILST ROTATING OR WHEN SWITCHED ON.

Electrical machines form part of industrial installations using electricity, and during operation some of their components carry dangerous voltages, whilst others rotate mechanically. Both of these may cause serious personal or material harm if the necessary precautions are not followed, if they are used incorrectly or if the required maintenance is not carried out.

1.2 Technical Personnel

Mounting and installation must be carried out by responsible specialists. Careful attention must be paid to the electrical data in this catalogue and/or any specific quotation, mounting and connection conditions, environment, protection grade and motor service conditions so that both machine and motor operate correctly and harmoniously.

1.3 Basic Description

MAC motors are intended for industrial installations and comply with EN60034 harmonised standards.
Their use in areas with an explosion hazard is prohibited.

These low voltage motors are components for machines in accordance with Machines Directive 89/392/CEE. They may not be started until a check has been made that the final product complies with this Directive (see EN600204-1).

IP23S is the protection grade of MAC-QI standard version motors. Caution must be taken when installing them in dusty or damp environments or under adverse climatic conditions.

The standard versions of the MAC-QE and MAC-R series motors comply with the protection grade IP54 and as a result they may be installed in damp or dusty environments.

Unless otherwise indicated, the power given for all the series for continuous service (S1), corresponds to an environmental temperature of between –20º and +40ºC, and to an operational altitude of 1000 metres above sea level.

1.4 Dispatch and Reception

The products are dispatched in sealed packaging with a wooden pallet base.

For motor handling two eyebolts are provided. Therefore, the motor should never be raised either on its shaft or on the fan enclosure.

2. SITING

The motor must be sited so that nothing impairs the air both entering and leaving the ventilating fan, and so that there is no recirculation of hot air in the direction of the air intake.

Motors must be mounted on a solid base and perfectly aligned.

Specific bearings must be provided for vertically -mounted motors to function correctly.

The outside of the motor stator can reach temperatures of over 60º C, so the necessary precautions must be taken (indicated on the plate)

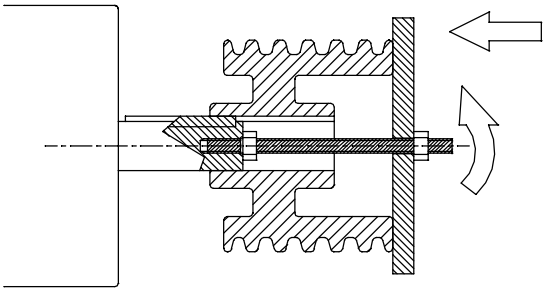
3. COUPLING TO THE MACHINE

This should be undertaken with extreme care as it has a significant effect on motor life. Foot-mounting must be by 4 screws matching the diameter of the holes in the base. For flange-mounted motors, the anti-rust varnish on the motor flange must first be removed, and the two flanges screwed together using screws of suitable diameter. The motor shaft protection varnish must be removed before fitting the coupling medium on the machine (direct drive, pulley, etc.) onto the motor shaft. Tolerances used must be those specified for each motor type.

If the motors work in direct drive, it is necessary to fit an elastic coupling to compensate alignment mistakes and radial effects. If elastic coupling is not used, perfect shaft alignment is absolutely necessary.

Rotors or armatures have been dynamically balanced with a half-key at the shaft end (in accordance with standard EN60034-14), and the transmission medium, pulley or coupling, must also be balanced in this way.

Installation or coupling must be performed without blows or knocks, by either the prior heating of the pulley or using the appropriate tools (see figure).



4. ELECTRICAL INSTALLATION

4.1 Electrical connections

All work must be carried out by qualified personnel, with the motors completely at rest and isolated from the mains supply.
Check there is no voltage!

There is a conduit box on the motor containing a terminal plate for electrical connections, using connection screws and fittings suitable for the current rating of each motor. Motor connections must be made with wire appropriate to the nominal current of the motor and in accordance with the diagram inside the terminal box of each motor.

The earthing conductor must be connected to the terminal provided for this purpose.

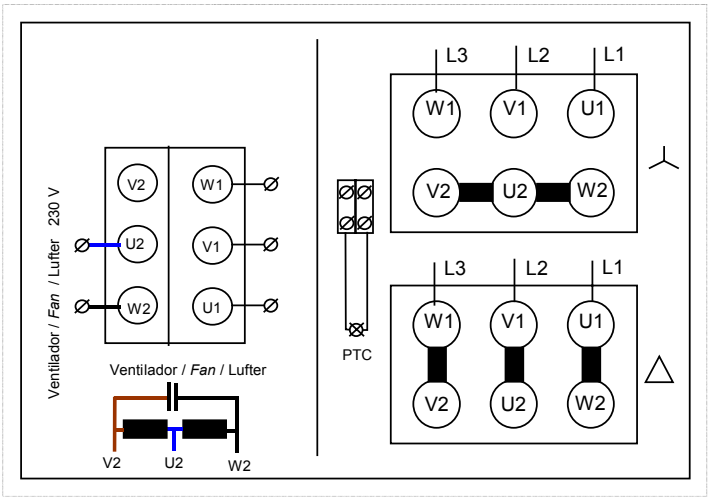
The fan motor wiring must be connected in accordance with the voltage indicated on the blower motor nameplate (MAC-QI motors) or motor nameplate MAC-QE and MAC –R motors)

If there is a brake, it must be wired in accordance with the voltage specified on the motor nameplate.

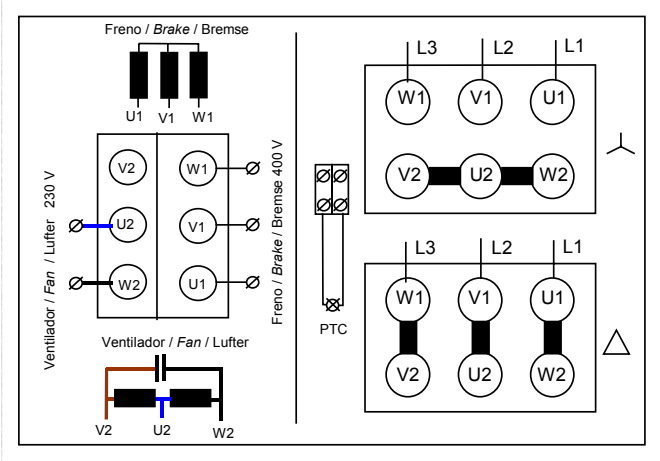
If there is an encoder, it must be wired in accordance to the diagram inside the terminal box.

4.2 Motor Connection Diagrams

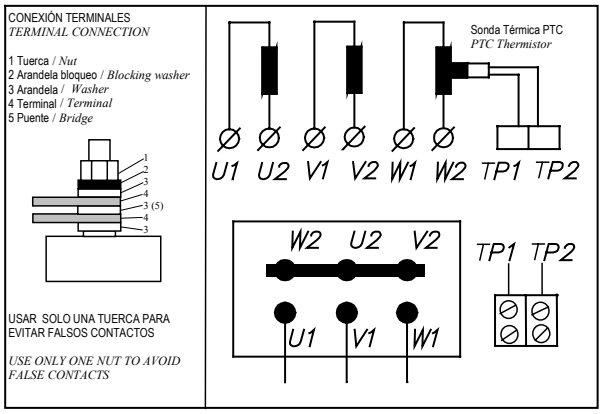
MAC R CONNECTIONS



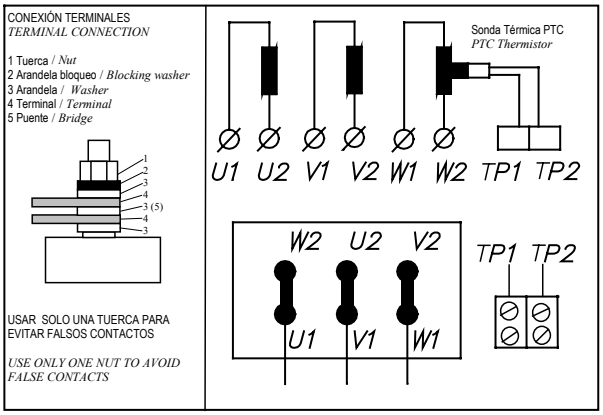
MAC R BRAKED MOTOR CONNECTION



MAC Q Winding Code XX1



MAC Q Winding Code XX2



5. START-UP

5.1 Inspection

First make sure that all motor, thermal probe and ventilating fan connections have been correctly made, and that the supply voltages are suitable in each case.

Ensure that the direction of rotation of the ventilating fan is as per the arrow on the casing.

Ensure that fixing to the base is firm and correct.

Check brake operation (if fitted).

Please, assure all personnel is informed before starting up the machine.

5.2 Checking

During start-up verify that:

- The frequency converter is set to the particular technical specifications of the motor selected, in respect of voltage, speed, current and frequency for both maximum and minimum values.
- Both mechanical and electrical protections are functioning perfectly.
- There is no excessive heating or any noise with the motor unloaded at low rpm.
- The bearings are not running too hot, and that there is no vibration caused by faulty motor alignment.
- The motor runs correctly at its rated speed.

6. MAINTENANCE

All cleaning and maintenance work has to be done with the motor switched off and at rest. This work must be carried out by qualified personnel and following the health and safety rules of the machine where the motor will be fitted.

6.1 Cleaning the air filter

MAC-QI series motors are fitted with an air intake filter which needs periodic cleaning, depending on the particular working environment.

Filters may be cleaned using compressed air or washed with a detergent solution. They must be replaced after 4 or 5 washings. The filter is NGB 290/4 or equivalent.

6.2 Bearings

Motor sizes 63 to 200 are fitted with sealed ball bearings which are greased for life.

The bearings from size 250-355 (optionally also sizes 200 and 160) are electrically insulated and must be greased periodically.

The grease to be used in insulated bearings as well as ball bearings, must be ESSO UNIREX N3 or equivalent.

Bearings must be replaced after 20,000 working hours.

6.2.1. Bearing replacement

Once the motor has been removed from its location and placed on a safe and clean site, proceed as follows:

1. Dismantle the motor accessories (brake and/or encoder if fitted), being careful not to damage them or the terminal box and fan.
2. Unscrew the motor covers and the bearing fixing plate/grease seal and take them off.
3. Remove the rotor from the inside of stator, being careful not to damage the stator windings.
4. Place the rotor on a stable surface so that it cannon turn.
5. Remove the bearing blocking SEEGER washers.
6. Remove the shaft bearing using an extractor, taking care not to damage the shaft.
7. Heat the new bearing to 70ºC to expand it and make it easier to insert in the shaft.
8. Insert the new bearing in the shaft. The heated bearing has to reach the butt without using any force. This operation must be done as quickly as possible. Do not let the bearing cool.
9. Introduce the blocking SEEGER washers
10. Fit the rotor into the stator taking care not to damage the windings.
11. Assemble and screw on covers and bearing fixing plate.
12. Assemble motor accessories.

On the following pages the bearing specifications used in each type of MAC Motor are shown.

6.2.2. Bearing in MAC R Motors

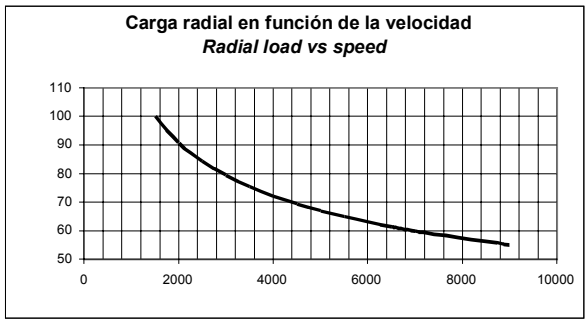
Tipo de motor *Motor Type*	Rodamiento *Bearing*		n max rpm	n rpm	L10h h	C N	P max N	A mm	B mm	Xmax mm	Fr max N (**)
MAC R 080.070	*D.E.*	*6204 ZZ*	*15000*	1500	20000	*12700*	1044	15	180	40	600
	N.D.E.	*6204 ZZ*	*15000*	1500	20000	*12700*	1044	15	180	40	2700
MAC R 090.100	*D.E.*	*6205 ZZ*	*12000*	1500	20000	*14000*	1151	17	205	50	700
	N.D.E.	*6205 ZZ*	*12000*	1500	20000	*14000*	1151	17	205	50	2800
MAC R 100.120	*D.E.*	*6206 ZZ*	*10000*	1500	20000	*19500*	1603	20	226	60	900
	N.D.E.	*6206 ZZ*	*10000*	1500	20000	*19500*	1603	20	226	60	3600
MAC R 112.140	*D.E.*	*6206 ZZ*	*10000*	1500	20000	*19500*	1603	20	240	60	1000
	N.D.E.	*6206 ZZ*	*10000*	1500	20000	*19500*	1603	20	240	60	3800
MAC R 132.125	*D.E.*	*6208 ZZ*	*8500*	1500	20000	*30700*	2524	25	268	80	1500
	N.D.E.	*6208 ZZ*	*8500*	1500	20000	*30700*	2524	25	268	80	5200
MAC R 132.170	*D.E.*	*6208 ZZ*	*8500*	1500	20000	*30700*	2524	25	306	80	1500
	N.D.E.	*6208 ZZ*	*8500*	1500	20000	*30700*	2524	25	306	80	5900
MAC R 160 M	*D.E.*	*6209 ZZ*	*8000*	1500	20000	*33200*	2729	30	375	110	1600
	N.D.E.	*6209 ZZ*	*8000*	1500	20000	*33200*	2729	30	375	110	5800
MAC R 160 L	*D.E.*	*6209 ZZ*	*8000*	1500	20000	*33200*	2729	30	420	110	1600
	N.D.E.	*6209 ZZ*	*8000*	1500	20000	*33200*	2729	30	420	110	6600

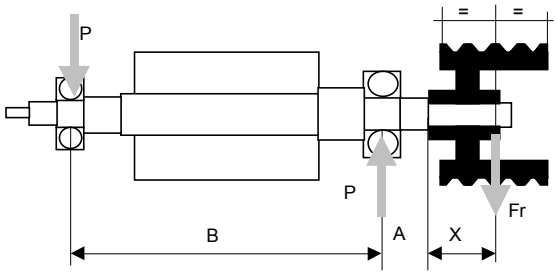
DE = Delantero / *Drive end* ; N.D.E. = Trasero / *Non Drive End*

(**) El esfuerzo radial máximo en la polea es el menor de los valores del juego de rodamientos seleccionado
The maximum radial load on the pulley is the minimum value for the selected couple of bearings

Los rodamientos de bolas con placas de obturación ZZ están engrasados de por vida.
Ball bearings with obturating plates type ZZ are greased for life

n max	Velocidad maxima / *Maximum speed*
n	Velocidad de trabajo / *Working Speed*
L10h	Vida util del rodamiento, en h / *Bearing Life in hours*
C	Carga dinámica nominal del rodamiento / *Rated Dynamic Load*
Pmax	Carga radial admisible en el rodamiento para L10h y n *Max. Radial load on the bearing for L10h and n*
Fr max	Esfuerzo radial máximo en la polea / *Maximum radial load on the pulley*





6.2.3. Bearings in MAC QE/QI/QX Motors

Tipo de motor *Motor Type*	Rodamiento *Bearing*		n max rpm	n rpm	L10h h	C N	P max N	A mm	B mm	Xmax mm	Fr max N (**)
MAC QE 063	D.E.	6203 ZZ	15000	1500	20000	9500	781	12	180	30	500
	N.D.E.	6203 ZZ	15000	1500	20000	9500	781	12	180	30	2700
MAC QE 071	D.E.	6204 ZZ	15000	1500	20000	12700	1044	15	180	40	600
	N.D.E.	6204 ZZ	15000	1500	20000	12700	1044	15	180	40	2700
MAC QE 080	D.E.	6205 ZZ	12000	1500	20000	14000	1151	17	205	50	700
	N.D.E.	6205 ZZ	12000	1500	20000	14000	1151	17	205	50	2800
MAC QE 090	D.E.	6206 ZZ	10000	1500	20000	19500	1603	20	226	60	900
	N.D.E.	6206 ZZ	10000	1500	20000	19500	1603	20	226	60	3600
MAC QE/QI 100	D.E.	6308ZZC3	7500	1500	20000	41000	3370	26,5	314	80	2000
	N.D.E.	6207ZZC3	9000	1500	20000	25500	2096	26,5	314	80	4900
MAC QE/QI 132	D.E.	6310ZZC3 N310 (*)	6300 5000	1500 1500	20000 20000	61800 110000	5080 11609	36,5	310,5	110	2800 6300
	N.D.E.	6208ZZC3	8500	1500	20000	30700	2524	36,5	310,5	110	4300
MAC QE/QI 160	D.E.	6312ZZC3 N312 (*)	5000 4300	1500 1500	20000 20000	81900 151000	6733 15937	35,5	503	110	4200 9900
	N.D.E.	6310ZZC3	6300	1500	20000	61800	5080	35,5	503	110	14100
MAC QI/QE 200	D.E.	6316ZZC3 N316 (*)	4000 3200	1500 1500	20000 20000	122000 260000	10029 27440	40,5	556,5	140	6100 16600
	N.D.E.	6312ZZC3	5000	1500	20000	114000	9372	40,5	556,5	140	23100
MAC QI 250	D.E.	6320 C3 (***) N320 (*)	3000 2400	1500 1500	20000 20000	163000 391000	13400 41266	58,5	691	170	8100 24800
	N.D.E.	6316 C3 (***)	3800	1500	20000	122000	10029	58,5	691	170	24300
MAC QI 280	D.E.	6224 C3 (***) N224 (*)	3000 2400	1500 1500	20000 20000	146000 335000	12002 35356	70	800	210	7100 21000
	N.D.E.	6224C3 (***)	3800	1500	20000	146000	12002	70	800	210	27400
MAC QI 355	D.E.	6230C3 (***) N230 (*)	2900 2400	1500 1500	20000 20000	176000 440000	14468 46438	80	900	250	8500 27200
	N.D.E.	6230C3 (***)	3800	1500	20000	176000	14468	80	900	250	31600

DE = Delantero / *Drive end* ; N.D.E. = Trasero / *Non Drive End*

(*) Ejecución con rodamiento de rodillos bajo pedido / *Roller bearing under request*

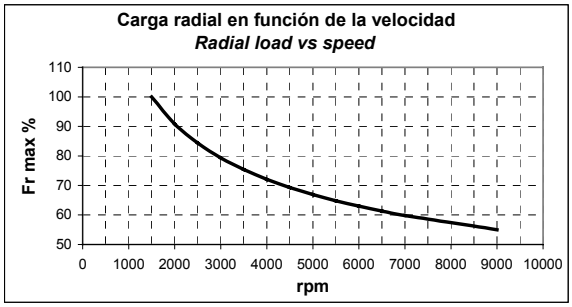
(**) El esfuerzo radial máximo en la polea es el menor de los valores del juego de rodamientos seleccionado
The maximum radial load on the pulley is the minimum value for the selected couple of bearings

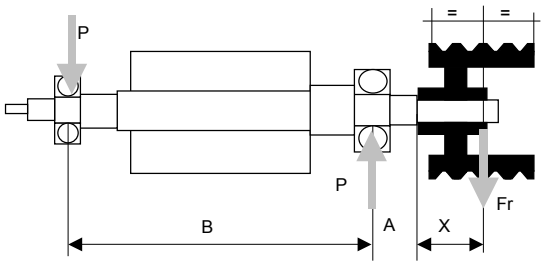
(***) Rodamientos de bolas aislados sin placas de obturación. / *Insulated ball bearings without obturating plates*

Los rodamientos de bolas con placas de obturación ZZ están engrasados de por vida.
Ball bearings with obturating plates type ZZ are greased for life

Los rodamientos de rodillos y los de bolas sin placas de obturación deben ser engrasados regularmente con grasa ESSO UNIREX N3.
Roller bearings and ball bearings without obturating plates must be greased regularly with ESSO UNIREX N3 grease.

n max	Velocidad maxima / *Maximum speed*
n	Velocidad de trabajo / *Working Speed*
L10h	Vida util del rodamiento, en h / *Bearing Life in hours*
C	Carga dinámica nominal del rodamiento / *Rated Dynamic Load*
Pmax	Carga radial admisible en el rodamiento para L10h y n / *Max. Radial load on the bearing for L10h and n*
Fr max	Esfuerzo radial máximo en la polea / *Maximum radial load on the pulley*





6.2.4. Bearings in MAC QS Motors

Standard Version

Tipo de motor *Motor Type*	Rodamiento *Bearing*		n max rpm	n rpm	L10h h	C N	P max N	A mm	B mm	Xmax mm	Fr max N (**)
MAC QS 132	*D.E.*	*6310 M C3*	*8500*	1500	20000	*61800*	5080	36.5	310.5	110	2800
	N.D.E.	*6208 M C3*	*10000*	1500	20000	*30700*	2524	36.5	310.5	110	4300
MAC QS 160	*D.E.*	*6312 M C3*	*7500*	1500	20000	*81900*	6733	35.5	503	110	4200
	N.D.E.	*6310 M C3*	*8500*	1500	20000	*61800*	5080	35.5	503	110	14100
MAC QS 200	*D.E.*	*6316 C3 (*)*	*6000*	3500	20000	*122000*	7562	40.5	556.5	140	4600
	N.D.E.	*6316 C3 (*)*	*6000*	3500	20000	*122000*	7562	40.5	556.5	140	18700
MAC QS 250	*D.E.*	*6316 C3 (*)*	*6000*	3500	20000	*122000*	7562	60	775	140	4800
	N.D.E.	*6316 C3 (*)*	*6000*	3500	20000	*122000*	7562	60	775	140	23400

Pair bearings version

Tipo de motor *Motor Type*	Rodamientos Apareados Cerámicos Ceramic Pair *Bearings*		n max rpm	n rpm	L10h h	C N	P max N	A mm	B mm	Xmax mm	Fr max N (**)
MAC QS 132	*D.E.*	2 x 50BNR10HTV1VDBELP3	*10000*	3500	11900	*12200*	899	36.5	310.5	110	500
	N.D.E.	2 x 40BNR10HTV1VDBELP3	*10000*	3500	14200	*10600*	736	36.5	310.5	110	1200
MAC QS 160	*D.E.*	2 x 60BNR10HTV1VDBELP3	*10000*	3500	9800	*15600*	1226	35.5	503	110	800
	N.D.E.	2 x 50BNR10HTV1VDBELP3	*10000*	3500	11900	*12200*	899	35.5	503	110	2500
MAC QS 200	*D.E.*	2 x 80BNR19HTXV1VDBELP3	*10000*	3500	7500	*22000*	1891	40.5	556.5	140	1100
	N.D.E.	2 x 80BNR19HTXV1VDBELP3	*10000*	3500	7500	*22000*	1891	40.5	556.5	140	4700
MAC QS 250	*D.E.*	2 x 80BNR19HTXV1VDBELP3	*10000*	3500	7500	*22000*	1891	60	775	140	1200
	N.D.E.	2 x 80BNR19HTXV1VDBELP3	*10000*	3500	7500	*22000*	1891	60	775	140	5900

Engrasados por vida / Greased for life

DE = Delantero /*Drive end* ; N.D.E. = Trasero /*Non Drive End*

Rodamientos de bolas sin placas de obturación. Deben ser engrasados regularmente con grasa Klüber KLÜBERQUIET BQ72-72 o equivalente.
Ball bearings without obturating plates. Must be greased regularly with Klüber KLÜBERQUIET grease or equivalent.

(**) El esfuerzo radial máximo en la polea es el menor de los valores del juego de rodamientos seleccionado
The maximum radial load on the pulley is the minimum value for the selected couple of bearings

(*) rodamientos de bolas aislados sin placas de obturación. /*Insulated ball bearings without obturating plates*

n max	Velocidad maxima /*Maximum speed*
n	Velocidad de trabajo /*Working Speed*
L10h	Vida util del rodamiento, en h /*Bearing Life in hours*
C	Carga dinámica nominal del rodamiento /*Rated Dynamic Load*
Pmax	Carga radial admisible en el rodamiento para L10h y n /*Max. Radial load on the bearing for L10h and n*
Fr max	Esfuerzo radial máximo en la polea /*Maximum radial load on the pulley*