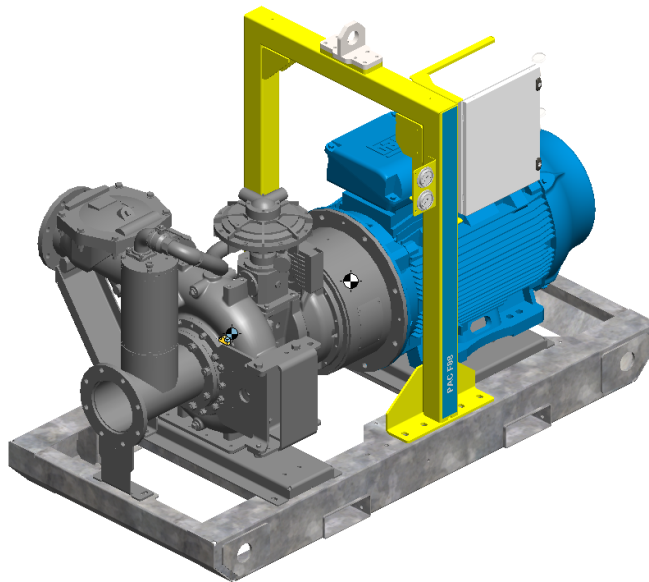


Product reference - 8381064431

# PAC F88 E 150HP

Diesel - Qmax 3,950 USgpm - Hmax 200 ft



Indicative picture of the product

## PAC Flow series

The pump system consists of a centrifugal pump and a separator, which enables air to be separated from the liquid and be sucked by a vacuum pump - making automatic priming possible. Even with suction heights of several feet the machine rapidly evacuates the air from the suction pipe and starts to pump. The PAC range is also suitable for pumping liquids with solids in suspension with best possible efficiency.

## Applications

The PAC F88 Atlas Copco pump is designed to withstand toughest applications and delivers best in class pumping efficiency. One of the most common area of utilization is the mining and Oil & Gas segment where reliability, efficiency and versatility is the key to provide a customized solution. Other suitable applications within Construction and General dewatering, Municipal as well as General Industry are ideal for the PAC F88 pump. Atlas Copco pumps are packed with features that not only meet, but exceed the needs of our customers.

## Benefits

### Efficiency

The 12" impeller with 82% efficiency at B.E.P. provides best pumping result with minimal efforts

### Solids handling

Closed impeller type with solids handling capability of 3" for trouble free operation

### Easy maintenance

Hinged cover for direct access to the impeller and pump volute

# PAC F88 E 150HP

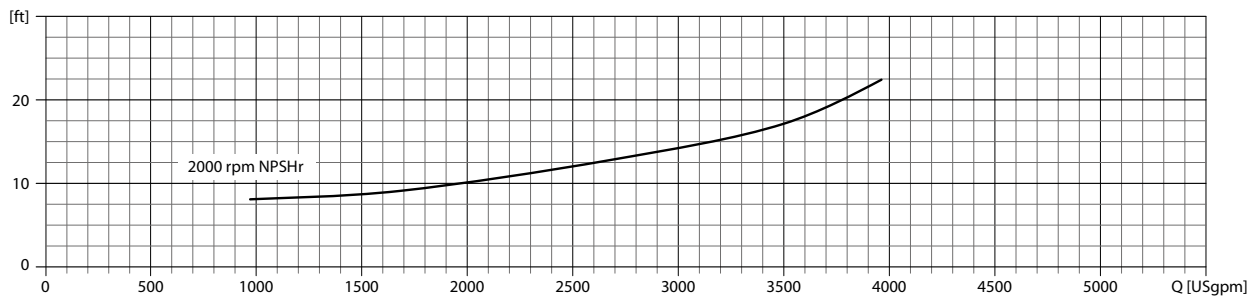
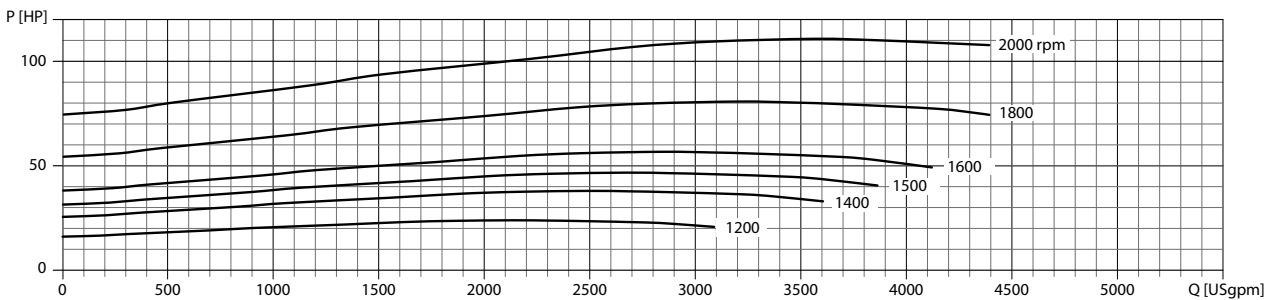
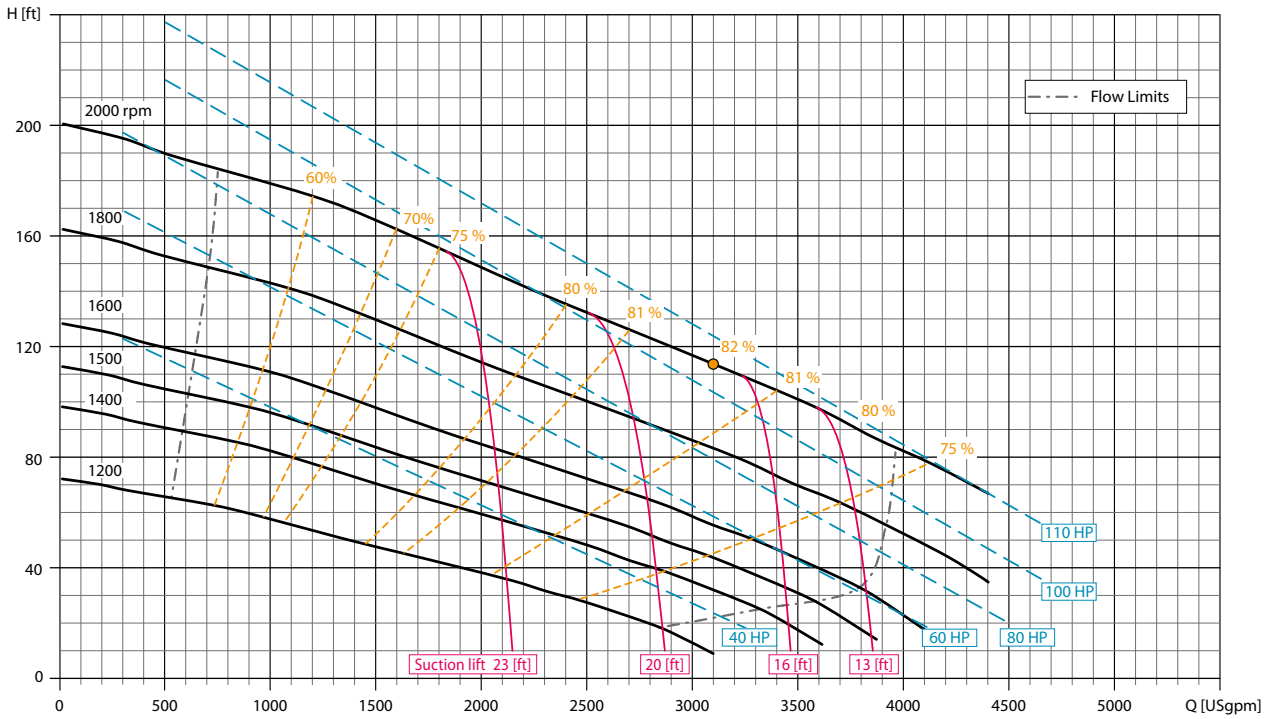
## Performance curves

Test according to UNI EN ISO 9906 standard - level 2B

Test liquid: clean water, density 62.43 lb/ft<sup>3</sup> (8.345 lb/gal)

Losses from priming system and check valve not included

| Speed   | Impeller Dia. | Style  | Solids Dia. | Ns       | Suction     | Discharge   | No. Vanes |
|---------|---------------|--------|-------------|----------|-------------|-------------|-----------|
| Various | 12" / 315 mm  | Closed | 3" / 76 mm  | 2000 rpm | 8" / 200 mm | 8" / 200 mm | 2         |



# PAC F88 E 150HP

## Technical data

### Pump

| Model                 | PAC F88                                   |
|-----------------------|---|
| Qmax                  | 3,950 USgpm                               |
| Hmax                  | 200 ft                                    |
| Q max eff.            | 3,100 USgpm                               |
| Eff. max              | 82 %                                      |
| Suction port          | 8" Flange - ANSI class 150                |
| Delivery port         | 8" Flange - ANSI class 150                |
| Impeller type         | Closed, 2 vane                            |
| Impeller diameter     | 12"                                       |
| Solids handling       | 3"  |
| Material              |   |
| Casing                | ASTM A536 ductile iron                    |
| Impeller              | ASTM A536 ductile iron                    |
| Wear ring             | ASTM A48 Class 20 grey iron               |
| Wear plate            | ASTM A48 Class 20 grey iron               |
| Shaft                 | AISI 630 stainless steel                  |
| Mechanical Seal faces | Silicon carbide / Silicon carbide / VITON |
| Elastomers            | NBR + VITON                               |
| Lubrication           | Grease (bearings)                         |
| Check Valve           | ASTM A536 ductile iron + NBR rubber flap  |
| Separator             | Aluminium alloy                           |

### Priming system

| Vacuum pump          |             |
|----------------------|-------------|
| Vacuum pump type     | Diaphragm   |
| Nominal air capacity | 50 cfm      |
| Max vacuum           | - 26.6 inHg |
| Drives               | Link belt   |

### Motor

| Make               | Weg                            |
|--------------------|--------------------------------|
| Type               | Three Phase Induction Motor    |
| Cooling method     | IC411 - TEFC                   |
| No. poles          | 4                              |
| Tension supply     | 460 V                          |
| Frequency          | 60 Hz                          |
| Rated power        | 150 HP                         |
| Rated speed        | 1,784 rpm                      |
| Rated current      | 116 A                          |
| Efficiency class   | W22 NEMA premium efficiency    |
| Max efficiency     | 95.4 %                         |
| Protection rating  | IP55                           |
| Insulation class   | F                              |
| Thermal protection | Thermistors 2 Wires - 311 degF |
| Duty cycle         | Continuous - S1                |

### Arrangement

| Technical data |   |
|----------------|---|
| Material       | ASTM A36 steel  |
| Coatings       | Epoxy powder, average thickness of 3 MIL                          |
| Features       | Lifting beam. Fork lift pockets. Pump access through hinged door. |
| Dry weight     | - lbs   |

## Dimensional drawing

[in]

# DATA SHEET



## Three Phase Induction Motor - Squirrel Cage

Customer : VARISCO S.P.A. ( ATLAS COPCO GROUP

Product line : W22 - IE3 Premium Efficiency Multivoltage Product code : 12881580

|                      |                    |                                 |                         |
|----------------------|--------------------|---------------------------------|-------------------------|
| Frame                | : 315S/M           | Cooling method                  | : IC411 - TEFC          |
| Insulation class     | : F                | Mounting                        | : B35T                  |
| Duty cycle           | : S1               | Direct of rotation <sup>1</sup> | : Both                  |
| Ambient temperature  | : -20 °C to +40 °C | Starting method                 | : Direct On Line        |
| Altitude             | : 1000 m.a.s.l     | Approx. weight <sup>3</sup>     | : 982 kg                |
| Degree of protection | : IP55             | Moment of inertia (J)           | : 2.89 kgm <sup>2</sup> |
| Design               | : N                |                                 |                         |

| Output                   | 110 kW (150 HP) | 110 kW (150 HP) | 110 kW (150 HP) | 110 kW (150 HP) |
|--------------------------|-----------------|-----------------|-----------------|-----------------|
| Poles                    | 4               | 4               | 4               | 4               |
| Frequency                | 50 Hz           | 50 Hz           | 50 Hz           | 60 Hz           |
| Rated voltage            | 380/660 V       | 400/690 V       | 415 V           | 460 V           |
| Rated current            | 201/116 A       | 195/113 A       | 193 A           | 170 A           |
| L. R. Amperes            | 1286/741 A      | 1365/791 A      | 1428 A          | 1326 A          |
| LRC (p.u.)               | 6.4             | 7.0             | 7.4             | 7.8 x Code H    |
| No load current          | 62.0/35.7 A     | 69.4/40.2 A     | 76.2 A          | 63.4 A          |
| Rated speed              | 1488 rpm        | 1489 rpm        | 1490 rpm        | 1791 rpm        |
| Slip                     | 0.80 %          | 0.73 %          | 0.67 %          | 0.50 %          |
| Rated torque             | 706 Nm          | 706 Nm          | 705 Nm          | 587 Nm          |
| Locked rotor torque      | 210 %           | 230 %           | 250 %           | 260 %           |
| Breakdown torque         | 230 %           | 260 %           | 280 %           | 290 %           |
| Service factor           | 1.00            | 1.00            | 1.00            | 1.25            |
| Noise level <sup>2</sup> | 71.0 dB(A)      | 71.0 dB(A)      | 71.0 dB(A)      | 75.0 dB(A)      |
| Locked rotor time        | 38 s (hot)      | 35 s (hot)      | 33 s (hot)      | 42 s (hot)      |
|                          | 68 s (cold)     | 63 s (cold)     | 59 s (cold)     | 76 s (cold)     |
| Efficiency (%)           | 50%             | 95.0            | 94.7            | 94.4            |
|                          | 75%             | 95.5            | 95.5            | 95.4            |
|                          | 100%            | 95.5            | 95.6            | 95.5            |
| Power factor             | Start           | 0.38            | 0.38            | 0.39            |
|                          | 50%             | 0.76            | 0.72            | 0.71            |
|                          | 75%             | 0.83            | 0.81            | 0.79            |
|                          | 100%            | 0.87            | 0.85            | 0.83            |

|                      |                  |                      |                               |
|----------------------|------------------|----------------------|-------------------------------|
|                      | <u>Drive end</u> | <u>Non drive end</u> | Foundation loads              |
| Bearing type         | 6319-C3          | 6316-C3              | Maximum traction : 10735 N    |
| Lubrication interval | 11000 h          | 13000 h              | Maximum compression : 20369 N |
| Lubricant amount     | 45 g             | 34 g                 |                               |
| Lubricant type       | MOBIL POLYREX EM |                      |                               |

This revision replaces and cancels the previous one, which must be eliminated.

- (1) When viewed from the drive end.
- (2) Measured at 1m and with tolerance of +3dB(A).
- (3) Approximate weight subject to changes after manufacturing process.
- (4) At the rated point.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in IEC 60034-1.

| Rev.         | Summary of changes | Performed | Checked | Date          |
|--------------|--------------------|-----------|---------|---------------|
|              |                    |           |         |               |
| Performed by | cheikh             |           |         | 205556/2021   |
| Checked by   | AUTOMATICO         |           |         | Page Revision |
| Date         | 27/07/2021         |           |         | 1/19 0        |

# DATA SHEET



## Three Phase Induction Motor - Squirrel Cage

Customer : VARISCO S.P.A. ( ATLAS COPCO GROUP

Product line : W22 - IE3 Premium Efficiency Multivoltage Product code : 12881580

### Thermal protection

| ID | Application | Type                 | Quantity  | Switching temperature |
|----|-------------|----------------------|-----------|-----------------------|
| 01 | Winding     | Thermistor - 2 Wires | 1 x Phase | 155 °C                |

|           |                             |                          |
|-----------|-----------------------------|--------------------------|
| Standards | Specification : IEC 60034-1 | Vibration : IEC 60034-14 |
|           | Tests : IEC 60034-2         | Tolerance : IEC 60034-1  |
|           | Noise : IEC 60034-9         |                          |

| Rev.         | Summary of changes | Performed | Checked | Date          |
|--------------|--------------------|-----------|---------|---------------|
|              |                    |           |         |               |
| Performed by | cheikh             |           |         | 205556/2021   |
| Checked by   | AUTOMATICO         |           |         | Page Revision |
| Date         | 27/07/2021         |           |         | 2/19 0        |

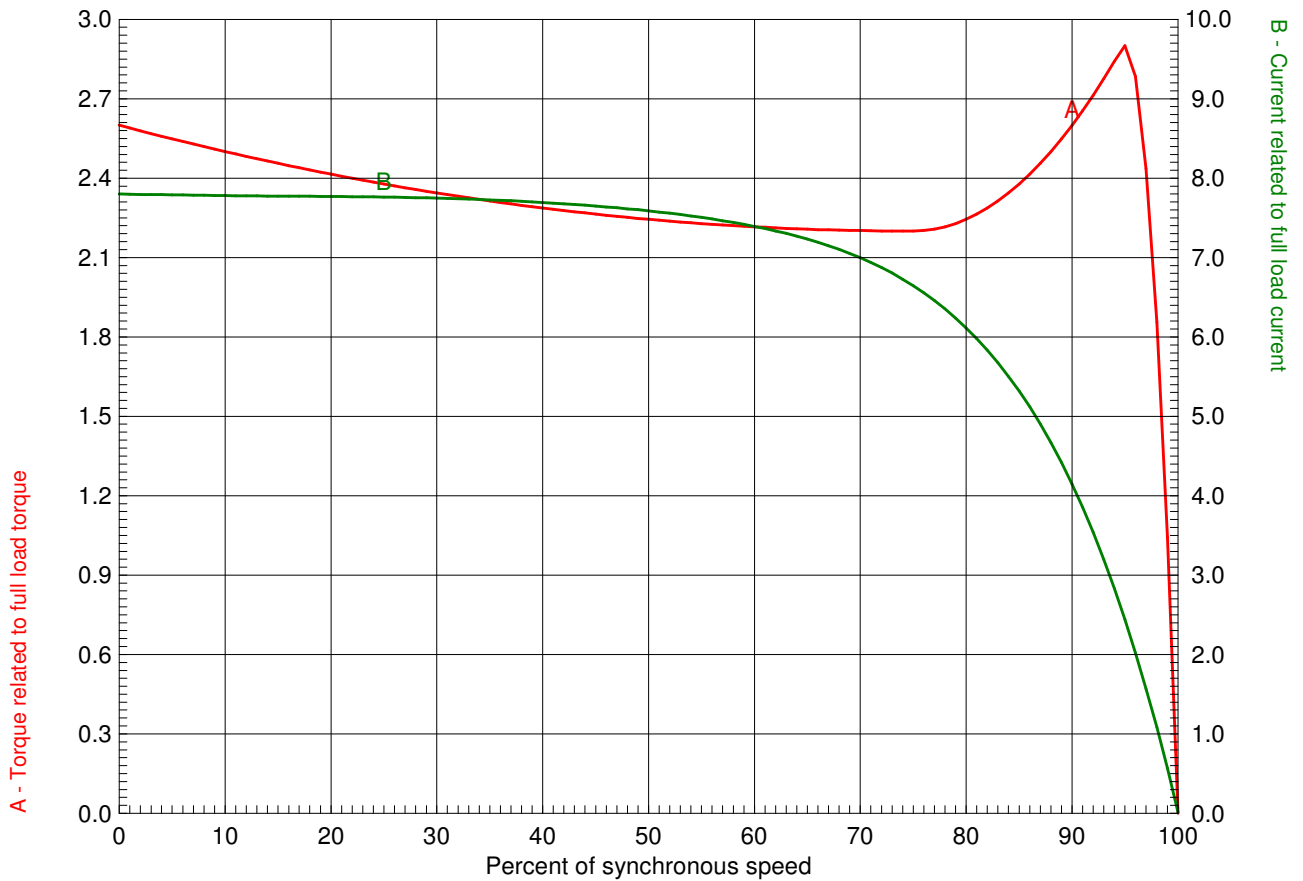
# TORQUE AND CURRENT X SPEED CURVE



## Three Phase Induction Motor - Squirrel Cage

Customer : VARISCO S.P.A. ( ATLAS COPCO GROUP

Product line : W22 - IE3 Premium Efficiency Multivoltage Product code : 12881580



Performance : 110 kW (150 HP) 460 V 60 Hz 4P 315S/M

|                             |   |
|-----------------------------|---|
| Rated current : 170 A       | Moment of inertia (J) : 2.89 kgm <sup>2</sup> |
| LRC (p.u.) : 7.8 Code H     | Duty cycle : S1                               |
| Rated torque : 587 Nm       | Insulation class : F                          |
| Locked rotor torque : 260 % | Service factor : 1.25                         |
| Breakdown torque : 290 %    | Temperature rise : 80 K                       |
| Rated speed : 1791 rpm      | Design : N                                    |

Locked rotor time 100% : 42 s (hot) 76 s (cold)  
 Load inertia (J=GD<sup>2</sup>/4) : 2.89325 kgm<sup>2</sup>

| Rev.         | Summary of changes | Performed      | Checked | Date         |               |
|--------------|--------------------|----------------|---------|--------------|---------------|
|              |                    |                |         |              |               |
| Performed by | cheikh             | 205556/2021-T6 |         | Page<br>6/19 |               |
| Checked by   | AUTOMATICO         |                |         |              | Revision<br>0 |
| Date         | 27/07/2021         |                |         |              |               |

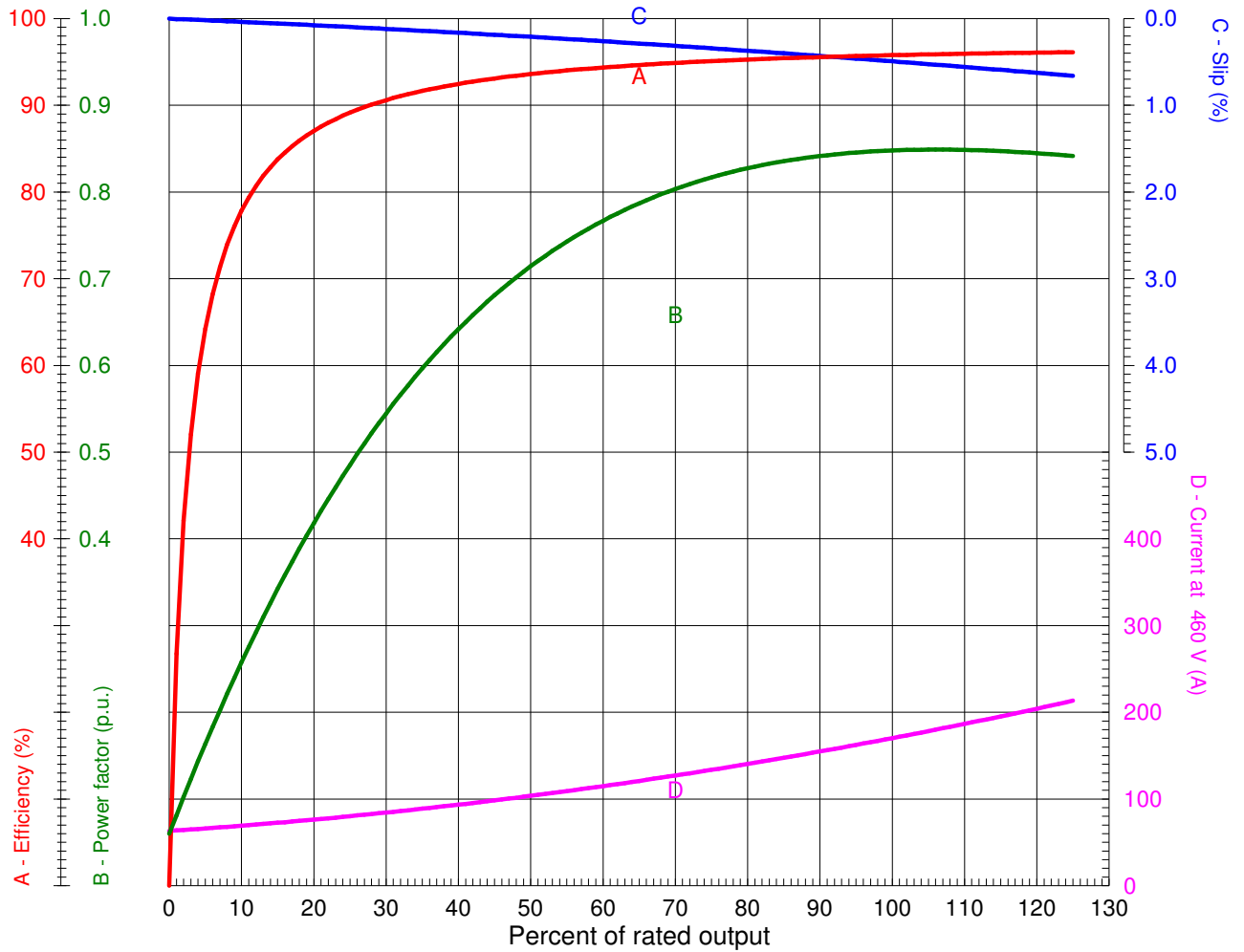
# LOAD PERFORMANCE CURVE



## Three Phase Induction Motor - Squirrel Cage

Customer : VARISCO S.P.A. ( ATLAS COPCO GROUP

Product line : W22 - IE3 Premium Efficiency Multivoltage Product code : 12881580



Performance : 110 kW (150 HP) 460 V 60 Hz 4P 315S/M

|                     |              |                       |                         |
|---------------------|--------------|-----------------------|-------------------------|
| Rated current       | : 170 A      | Moment of inertia (J) | : 2.89 kgm <sup>2</sup> |
| LRC (p.u.)          | : 7.8 Code H | Duty cycle            | : S1                    |
| Rated torque        | : 587 Nm     | Insulation class      | : F                     |
| Locked rotor torque | : 260 %      | Service factor        | : 1.25                  |
| Breakdown torque    | : 290 %      | Temperature rise      | : 80 K                  |
| Rated speed         | : 1791 rpm   | Design                | : N                     |

| Rev.         | Summary of changes | Performed      | Checked | Date |          |
|--------------|--------------------|----------------|---------|------|----------|
|              |                    |                |         |      |          |
| Performed by | cheikh             | 205556/2021-T6 |         | Page |          |
| Checked by   | AUTOMATICO         |                |         |      | Revision |
| Date         | 27/07/2021         |                |         |      | 10/19    |

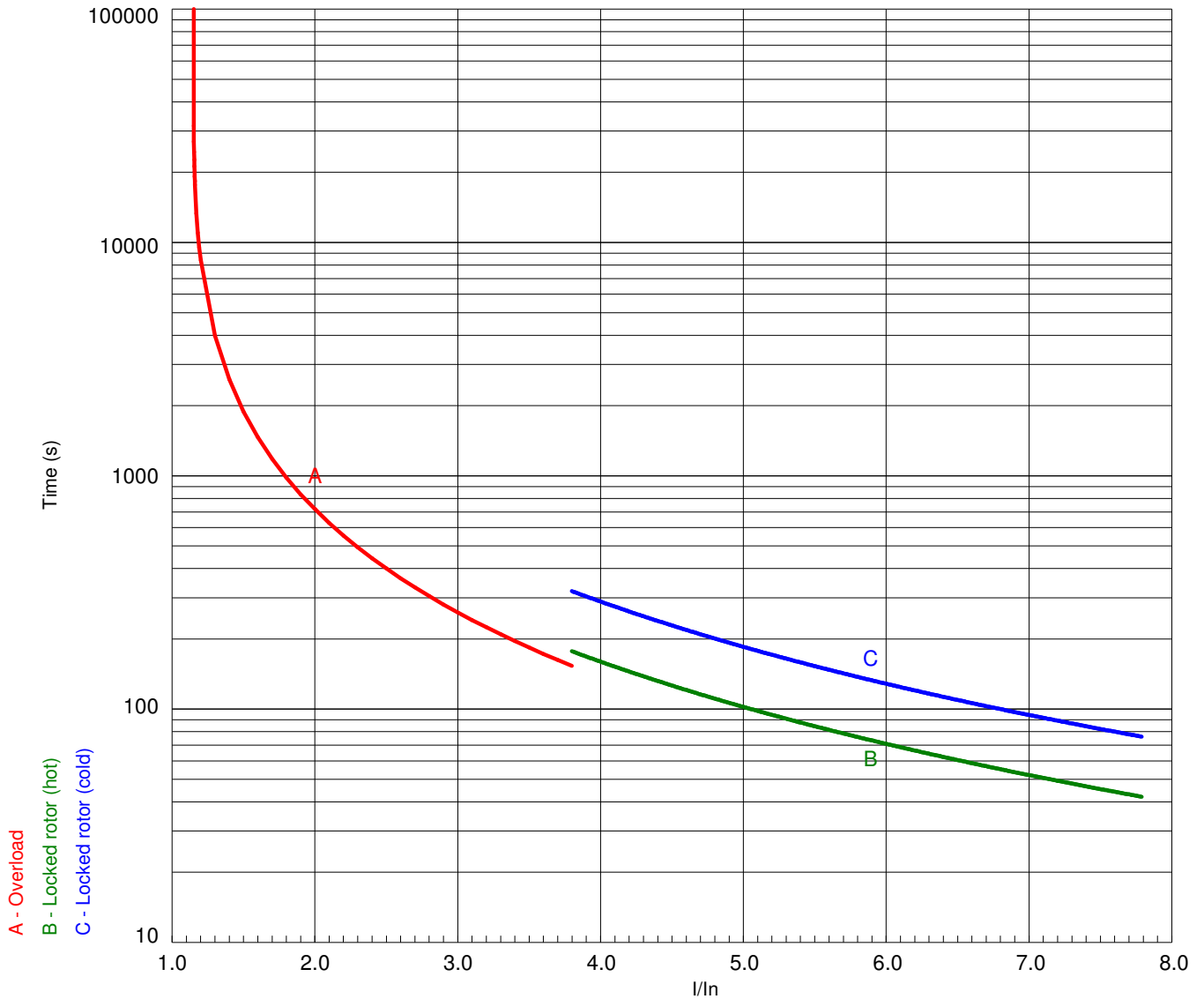
# THERMAL LIMIT CURVE



## Three Phase Induction Motor - Squirrel Cage

Customer : VARISCO S.P.A. ( ATLAS COPCO GROUP

Product line : W22 - IE3 Premium Efficiency Multivoltage Product code : 12881580



Performance : 110 kW (150 HP) 460 V 60 Hz 4P 315S/M

|                             |   |
|-----------------------------|---|
| Rated current : 170 A       | Moment of inertia (J) : 2.89 kgm <sup>2</sup> |
| LRC (p.u.) : 7.8 Code H     | Duty cycle : S1                               |
| Rated torque : 587 Nm       | Insulation class : F                          |
| Locked rotor torque : 260 % | Service factor : 1.25                         |
| Breakdown torque : 290 %    | Temperature rise : 80 K                       |
| Rated speed : 1791 rpm      | Design : N                                    |

Heating constant : 34.8 min  
Cooling constant : 104.4 min

| Rev.         | Summary of changes | Performed      | Checked | Date          |
|--------------|--------------------|----------------|---------|---------------|
|              |                    |                |         |               |
| Performed by | cheikh             | 205556/2021-T6 |         | Page Revision |
| Checked by   | AUTOMATICO         |                |         |               |
| Date         | 27/07/2021         |                |         |               |
|              |                    | 14/19          | 0       |               |



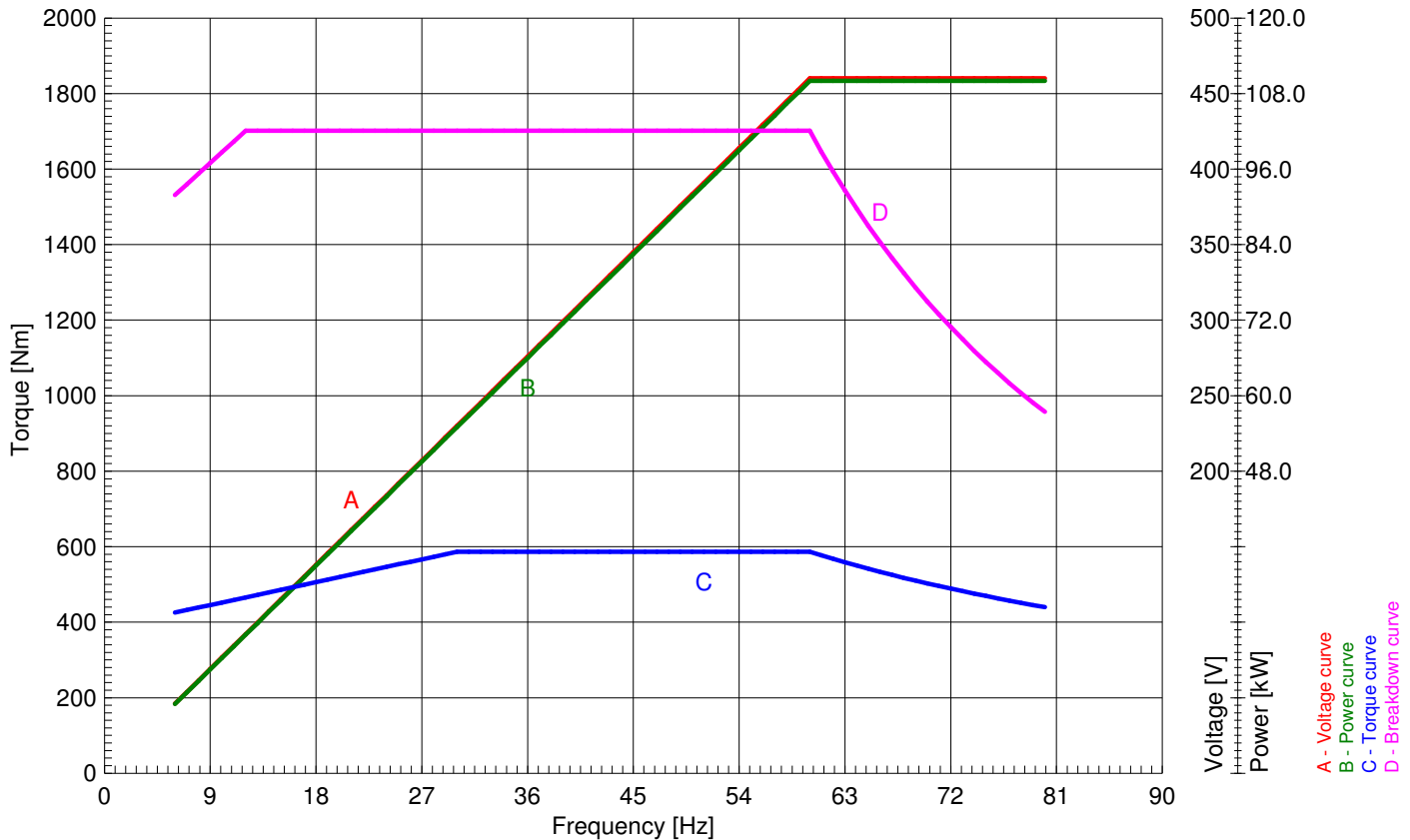
# VFD OPERATION CURVE



## Three Phase Induction Motor - Squirrel Cage

Customer : VARISCO S.P.A. ( ATLAS COPCO GROUP

Product line : W22 - IE3 Premium Efficiency Multivoltage Product code : 12881580



Performance : 110 kW (150 HP) 460 V 60 Hz 4P 315S/M

|                             |   |
|-----------------------------|---|
| Rated current : 170 A       | Moment of inertia (J) : 2.89 kgm <sup>2</sup> |
| LRC (p.u.) : 7.8 Code H     | Duty cycle : S1                               |
| Rated torque : 587 Nm       | Insulation class : F                          |
| Locked rotor torque : 260 % | Service factor : 1.25                         |
| Breakdown torque : 290 %    | Temperature rise : 80 K                       |
| Rated speed : 1791 rpm      | Design : N                                    |
|                             | Maximum peak voltage phase-to-phase <= 1600 V |
|                             | dV/dt <= 5200 V/μs                            |
|                             | Rise time >= 0,1 μs                           |

| Rev.         | Summary of changes |  | Performed | Checked        | Date     |
|--------------|--------------------|--|-----------|----------------|----------|
|              |                    |  |           |                |          |
| Performed by | cheikh             |  |           | 205556/2021-T6 |          |
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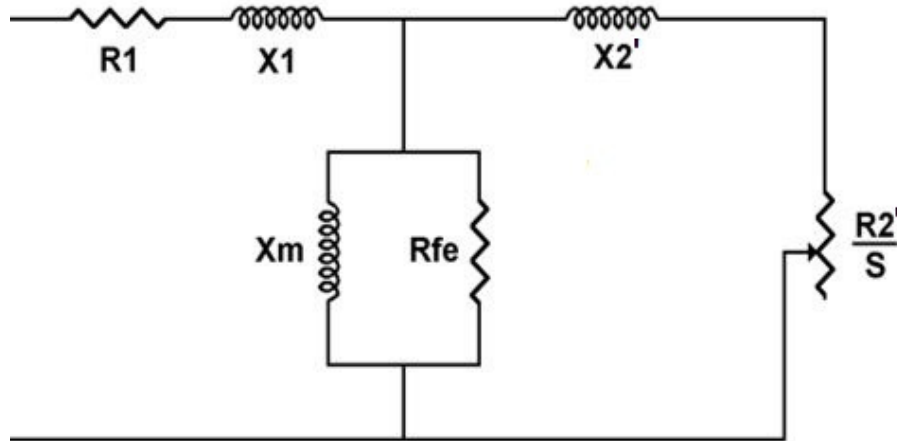
# EQUIVALENT CIRCUIT



## Three Phase Induction Motor - Squirrel Cage

Customer : VARISCO S.P.A. ( ATLAS COPCO GROUP

Product line : W22 - IE3 Premium Efficiency Multivoltage Product code : 12881580



| Rated      |                               |            |                           |
|------------|-------------------------------|------------|---------------------------|
| <b>R1</b>  | 0.0357 ohms / 0.0272 p.u.     | <b>X1</b>  | 0.3005 ohms / 0.2289 p.u. |
| <b>R2'</b> | 0.0175 ohms / 0.0133 p.u.     | <b>X2'</b> | 0.4268 ohms / 0.3251 p.u. |
| <b>Rfe</b> | 271.4585 ohms / 206.7940 p.u. | <b>Xm</b>  | 8.3905 ohms / 6.3918 p.u. |

| Locked rotor |                               |            |                            |
|--------------|-------------------------------|------------|----------------------------|
| <b>R1</b>    | 0.0380 ohms / 0.0289 p.u.     | <b>X1</b>  | 0.2707 ohms / 0.2062 p.u.  |
| <b>R2'</b>   | 0.1246 ohms / 0.0949 p.u.     | <b>X2'</b> | 0.1805 ohms / 0.1375 p.u.  |
| <b>Rfe</b>   | 255.4111 ohms / 194.5693 p.u. | <b>Xm</b>  | 10.6134 ohms / 8.0852 p.u. |

|              |             |                 |                           |
|--------------|-------------|-----------------|---------------------------|
| <b>T"do</b>  | 1.2122 s    | <b>X/R</b>      | 7.9629 p.u.               |
| <b>T"d</b>   | 0.0629 s    | <b>RS</b>       | 0.0150 ohms / 0.0114 p.u. |
| <b>Ta</b>    | 0.0253 s    | <b>X"d = Xs</b> | 0.4513 ohms / 0.3438 p.u. |
| <b>Zbase</b> | 1.3127 ohms | <b>X2(-)</b>    | 0.2548 ohms / 0.1941 p.u. |

All parameters reflected to stator side.  
Per phase values, for T connection.  
Resistances at 20.0 °C, reactances at rated voltage and frequency.

Performance : 110 kW (150 HP) 380 V 50 Hz 4P 315S/M

|       |                            |          |                                   |
|-------|----------------------------|----------|-----------------------------------|
| R1    | = Stator resistance        | T"do     | = Open circuit AC time constant   |
| R2'   | = Rotor resistance         | T"d      | = Short circuit AC time constant  |
| Rfe   | = Core loss resistance     | Ta       | = Short circuit DC time constant  |
| X1    | = Stator leakage reactance | X/R      | = X/R Ratio                       |
| X2'   | = Rotor leakage reactance  | RS       | = Supplementary losses resistance |
| Xm    | = Magnetizing reactance    | X"d = Xs | = Subtransient reactance          |
| Zbase | = Base impedance           | X2(-)    | = Negative sequence reactance     |

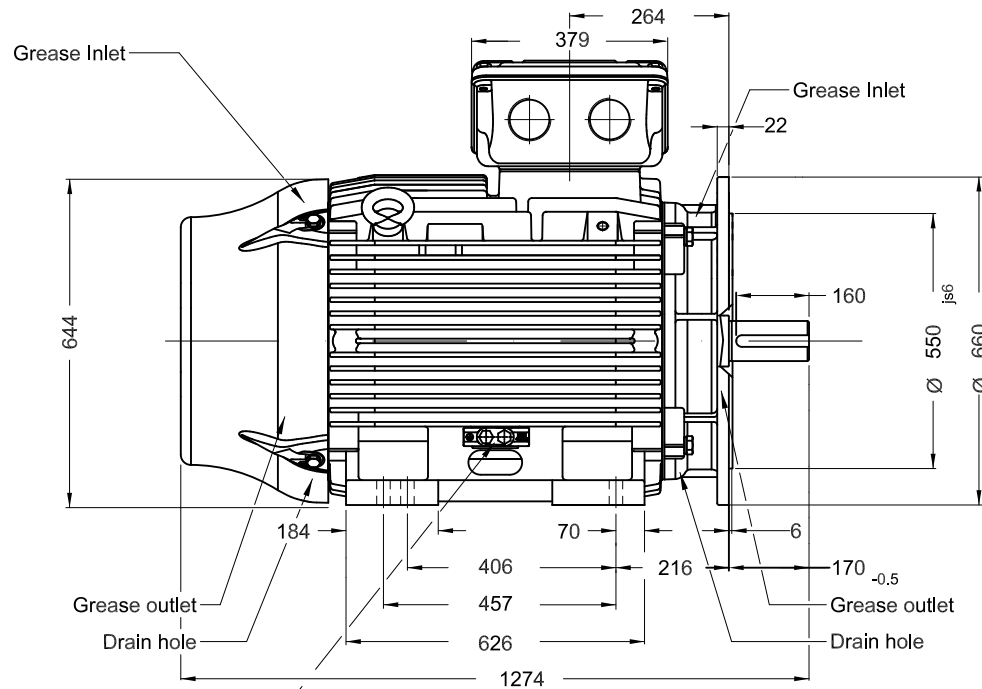
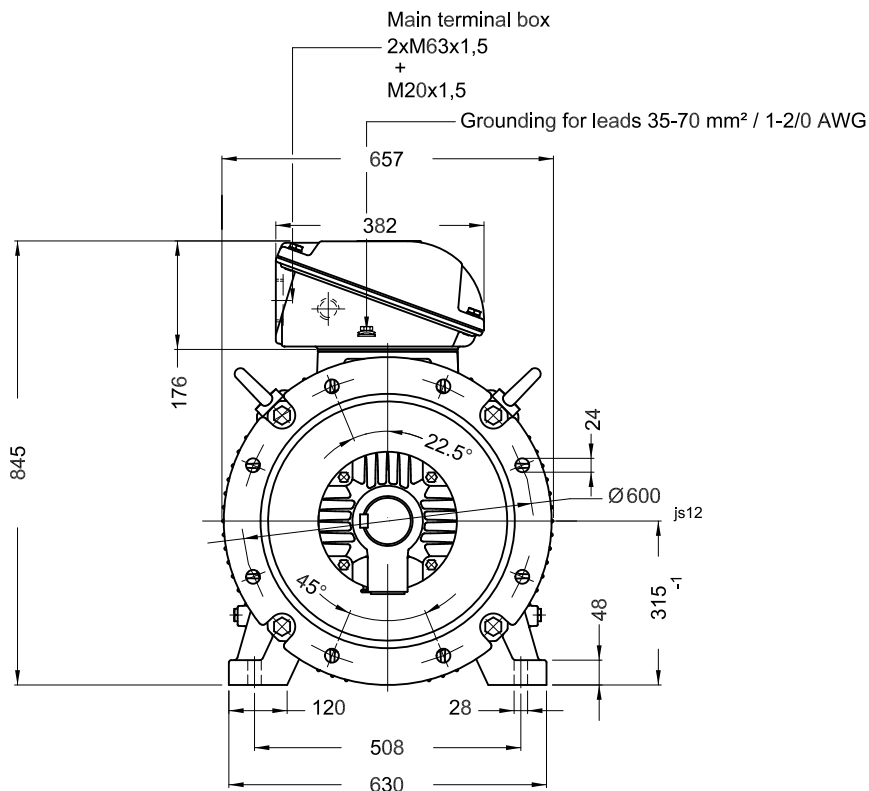
| Rev.         | Summary of changes |  | Performed | Checked | Date          |
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|              |                    |  |           |         |               |
| Performed by | cheikh             |  |           |         | 205556/2021   |
| Checked by   | AUTOMATICO         |  |           |         | Page Revision |
| Date         | 27/07/2021         |  |           |         | 19/19 0       |

1 2 3 4 5 6

A

B

C

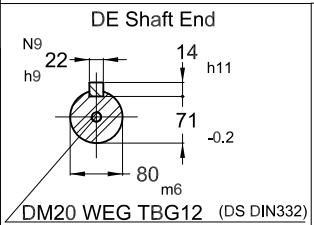


Grounding for leads 25-185 mm<sup>2</sup> / 3AWG-350MCM

D

E

- Without vertical jackscrews
- NDE endshield with electrically insulated bearing hub
- Color RAL 5009
- Painting plan 203A
- Mounting B35T



110 kW 04 Poles 50 Hz A

| ECM      | LOC       | SUMMARY OF MODIFICATIONS            | EXECUTED            | CHECKED | RELEASED | DATE | VER |
|----------|-----------|-------------------------------------|---------------------|---------|----------|------|-----|
| EXECUTED | PIRWBUSER | THREE PHASE W22 MOTOR - PREMIUM EFF |                     |         |          |      |     |
| CHECKED  |           | FRAME 315S/M IP55 TEFC              |                     |         |          |      |     |
| RELEASED |           |                                     |                     |         |          |      |     |
| REL DT.  | WMO       | Jaragua do Sul                      | Product Engineering | SHEET   | 1 / 1    |      |     |

PREVIEW  
WDD

