

Instruction Manual for AC Generators

SAPE UNIT

Instruction manual.....3

Circuit diagrams – Elektrische schema's – Schémas de circuits –
Schaltpläne – Esquema de conexiones – Kopplingsscheman –
Diagrammi dei circuiti – Kretsskjema – Kredsløbsdiagrammer –
Διαγράμματα κυκλωμάτων – Esquemas eléctricos – Sähkökaaviot....195

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ATLAS COPCO - PORTABLE AIR DIVISION
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Congratulations on the purchase of your SAPE unit. It is a solid, safe and reliable unit, built according to the latest technology. Follow the instructions in this booklet and we guarantee you years of trouble-free operation. Please read the following instructions carefully before starting to use your machine.

While every effort has been made to ensure that the information in this manual is correct, Atlas Copco does not assume responsibility for possible errors. Atlas Copco reserves the right to make changes without prior notice.

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1. SAFETY PRECAUTIONS

To be read attentively and acted accordingly before towing, lifting, operating, performing maintenance or repairing the SAPE unit.

1.1 INTRODUCTION

The policy of Atlas Copco is to provide the users of their equipment with safe, reliable and efficient products. Factors taken into account are among others:

- the intended and predictable future use of the products, and the environments in which they are expected to operate,
- applicable rules, codes and regulations,
- the expected useful product life, assuming proper service and maintenance,
- providing the manual with up-to-date information.

Before handling any product, take time to read the relevant instruction manual. Besides giving detailed operating instructions, it also gives specific information about safety, preventive maintenance, etc. Keep the manual always at the unit location, easy accessible to the operating personnel.

See also the safety precautions of the engine and possible other equipment, which are separately sent along or are mentioned on the equipment or parts of the unit.

These safety precautions are general and some statements will therefore not always apply to a particular unit.

Only people that have the right skills should be allowed to operate, adjust, perform maintenance or repair on Atlas Copco equipment. It is the responsibility of management to appoint operators with the appropriate training and skill for each category of job.

Skill level 1: Operator

An operator is trained in all aspects of operating the unit with the push-buttons, and is trained to know the safety aspects.

Skill level 2: Mechanical technician

A mechanical technician is trained to operate the unit the same as the operator. In addition, the mechanical technician is also trained to perform maintenance and repair, as described in the instruction manual, and is allowed to change settings of the control and safety system. A mechanical technician does not work on live electrical components.

Skill level 3: Electrical technician

An electrical technician is trained and has the same qualifications as both the operator and the mechanical technician. In addition, the electrical technician may carry out electrical repairs within the various enclosures of the unit. This includes work on live electrical components.

Skill level 4: Specialist from the manufacturer

This is a skilled specialist sent by the manufacturer or its agent to perform complex repairs or modifications to the equipment.

In general it is recommended that not more than two people operate the unit, more operators could lead to unsafe operating conditions. Take necessary steps to keep unauthorized persons away from the unit and eliminate all possible sources of danger at the unit.

When handling, operating, overhauling and/or performing maintenance or repair on Atlas Copco equipment, the mechanics are expected to use safe engineering practices and to observe all relevant local safety requirements and ordinances. The following list is a reminder of special safety directives and precautions mainly applicable to Atlas Copco equipment.

Neglecting the safety precautions may endanger people as well as environment and machinery:

- endanger people due to electrical, mechanical or chemical influences,
- endanger the environment due to leakage of oil, solvents or other substances,
- endanger the machinery due to function failures.

All responsibility for any damage or injury resulting from neglecting these precautions or by non-observance of ordinary caution and due care required in handling, operating, maintenance or repair, also if not expressly mentioned in this instruction manual, is disclaimed by Atlas Copco.

The manufacturer does not accept any liability for any damage arising from the use of non-original parts and for modifications, additions or conversions made without the manufacturer's approval in writing.

If any statement in this manual does not comply with local legislation, the stricter of the two shall be applied.

Statements in these safety precautions should not be interpreted as suggestions, recommendations or inducements that it should be used in violation of any applicable laws or regulations.

1.2 GENERAL SAFETY PRECAUTIONS

- 1 The owner is responsible for maintaining the unit in a safe operating condition. Unit parts and accessories must be replaced if missing or unsuitable for safe operation.
- 2 The supervisor, or the responsible person, shall at all times make sure that all instructions regarding machinery and equipment operation and maintenance are strictly followed and that the machines with all accessories and safety devices, as well as the consuming devices, are in good repair, free of abnormal wear or abuse, and are not tampered with.
- 3 Whenever there is an indication or any suspicion that an internal part of a machine is overheated, the machine shall be stopped but no inspection covers shall be opened before sufficient cooling time has elapsed; this to avoid the risk of spontaneous ignition of oil vapour when air is admitted.
- 4 Normal ratings (pressures, temperatures, speeds, etc.) shall be durably marked.
- 5 Operate the unit only for the intended purpose and within its rated limits (pressure, temperature, speeds, etc.).
- 6 The machinery and equipment shall be kept clean, i.e. as free as possible from oil, dust or other deposits.
- 7 To prevent an increase in working temperature, inspect and clean heat transfer surfaces (cooler fins, intercoolers, water jackets, etc.) regularly. See the maintenance schedule.
- 8 All regulating and safety devices shall be maintained with due care to ensure that they function properly. They may not be put out of action.
- 9 Pressure and temperature gauges shall be checked regularly with regard to their accuracy. They shall be replaced whenever outside acceptable tolerances.
- 10 Safety devices shall be tested as described in the maintenance schedule of the instruction manual to determine that they are in good operating condition.
- 11 Mind the markings and information labels on the unit.
- 12 In the event the safety labels are damaged or destroyed, they must be replaced to ensure operator safety.
- 13 Keep the work area neat. Lack of order will increase the risk of accidents.
- 14 When working on the unit, wear safety clothing. Depending on the kind of activities these are: safety glasses, ear protection, safety helmet (including visor), safety gloves, protective clothing, safety shoes. Do not wear the hair long and loose (protect long hair with a hairnet), or wear loose clothing or jewellery.
- 15 Take precautions against fire. Handle fuel, oil and anti-freeze with care because they are inflammable substances. Do not smoke or approach with naked flame when handling such substances. Keep a fire-extinguisher in the vicinity.

16a Portable generators (with earthing pin):

Earth the generator as well as the load properly.

16b Portable generators IT:

Note: This generator is built to supply a sheer alternating current IT network.

Earth the load properly.

1.3 SAFETY DURING TRANSPORT AND INSTALLATION

To lift a unit, all loose or pivoting parts, e.g. doors and towbar, shall first be securely fastened.

Do not attach cables, chains or ropes directly to the lifting eye; apply a crane hook or lifting shackle meeting local safety regulations. Never allow sharp bends in lifting cables, chains or ropes.

Helicopter lifting is not allowed.

It is strictly forbidden to dwell or stay in the risk zone under a lifted load. Never lift the unit over people or residential areas. Lifting acceleration and retardation shall be kept within safe limits.

- 1 Before towing the unit:
 - check the towbar, the brake system and the towing eye. Also check the coupling of the towing vehicle,
 - check the towing and brake capability of the towing vehicle,
 - check that the towbar, jockey wheel or stand leg is safely locked in the raised position,
 - ascertain that the towing eye can swivel freely on the hook,
 - check that the wheels are secure and that the tyres are in good condition and inflated correctly,
 - connect the signalisation cable, check all lights and connect the pneumatic brake couplers,
 - attach the safety break-away cable or safety chain to the towing vehicle,
 - remove wheel chocks, if applied, and disengage the parking brake.
- 2 To tow a unit use a towing vehicle of ample capacity. Refer to the documentation of the towing vehicle.
- 3 If the unit is to be backed up by the towing vehicle, disengage the overrun brake mechanism (if it is not an automatic mechanism).
- 4 Never exceed the maximum towing speed of the unit (mind the local regulations).
- 5 Place the unit on level ground and apply the parking brake before disconnecting the unit from the towing vehicle. Unclip the safety break-away cable or safety chain. If the unit has no parking brake or jockey wheel, immobilize the unit by placing chocks in front of and/or behind the wheels. When the towbar can be positioned vertically, the locking device must be applied and kept in good order.
- 6 To lift heavy parts, a hoist of ample capacity, tested and approved according to local safety regulations, shall be used.
- 7 Lifting hooks, eyes, shackles, etc., shall never be bent and shall only have stress in line with their design load axis. The capacity of a lifting device diminishes when the lifting force is applied at an angle to its load axis.
- 8 For maximum safety and efficiency of the lifting apparatus all lifting members shall be applied as near to perpendicular as possible. If required, a lifting beam shall be applied between hoist and load.
- 9 Never leave a load hanging on a hoist.
- 10 A hoist has to be installed in such a way that the object will be lifted perpendicular. If that is not possible, the necessary precautions must be taken to prevent load-swinging, e.g. by using two hoists, each at approximately the same angle not exceeding 30° from the vertical.
- 11 Locate the unit away from walls. Take all precautions to ensure that hot air exhausted from the engine and driven machine cooling systems cannot be recirculated. If such hot air is taken in by the engine or driven machine cooling fan, this may cause overheating of the unit; if taken in for combustion, the engine power will be reduced.
- 12 Units shall be stalled on an even, solid floor, in a clean location with sufficient ventilation. If the floor is not level or can vary in inclination, consult Atlas Copco.
- 13 The electrical connections shall correspond to local codes. The machines shall be earthed and protected against short circuits by fuses or circuit breakers.
- 14 Never connect the generator outlets to an installation which is also connected to a public mains.
- 15 Before connecting a load, switch off the corresponding circuit breaker, and check whether frequency, voltage, current and power factor comply with the ratings of the generator.

1.4 SAFETY DURING USE AND OPERATION

- 1 When the unit has to operate in a fire-hazardous environment, each engine exhaust has to be provided with a spark arrestor to trap incendiary sparks.
- 2 The exhaust contains carbon monoxide which is a lethal gas. When the unit is used in a confined space, conduct the engine exhaust to the outside atmosphere by a pipe of sufficient diameter; do this in such a way that no extra back pressure is created for the engine. If necessary, install an extractor. Observe any existing local regulations. Make sure that the unit has sufficient air intake for operation. If necessary, install extra air intake ducts.
- 3 When operating in a dust-laden atmosphere, place the unit so that dust is not carried towards it by the wind. Operation in clean surroundings considerably extends the intervals for cleaning the air intake filters and the cores of the coolers.
- 4 Never remove a filler cap of the cooling water system of a hot engine. Wait until the engine has sufficiently cooled down.
- 5 Never refill fuel while the unit is running, unless otherwise stated in the Atlas Copco Instruction Book (AIB). Keep fuel away from hot parts such as air outlet pipes or the engine exhaust. Do not smoke when fuelling. When fuelling from an automatic pump, an earthing cable should be connected to the unit to discharge static electricity. Never spill nor leave oil, fuel, coolant or cleansing agent in or around the unit.
- 6 All doors shall be shut during operation so as not to disturb the cooling air flow inside the bodywork and/or render the silencing less effective. A door should be kept open for a short period only e.g. for inspection or adjustment.
- 7 Periodically carry out maintenance works according to the maintenance schedule.
- 8 Stationary housing guards are provided on all rotating or reciprocating parts not otherwise protected and which may be hazardous to personnel. Machinery shall never be put into operation, when such guards have been removed, before the guards are securely reinstalled.
- 9 Noise, even at reasonable levels, can cause irritation and disturbance which, over a long period of time, may cause severe injuries to the nervous system of human beings.
When the sound pressure level, at any point where personnel normally has to attend, is:
 - below 70 dB(A): no action needs to be taken,
 - above 70 dB(A): noise-protective devices should be provided for people continuously being present in the room,
 - below 85 dB(A): no action needs to be taken for occasional visitors staying a limited time only,
 - above 85 dB(A): room to be classified as a noise-hazardous area and an obvious warning shall be placed permanently at each entrance to alert people entering the room, for even relatively short times, about the need to wear ear protectors,
 - above 95 dB(A): the warning(s) at the entrance(s) shall be completed with the recommendation that also occasional visitors shall wear ear protectors,
 - above 105 dB(A): special ear protectors that are adequate for this noise level and the spectral composition of the noise shall be provided and a special warning to that effect shall be placed at each entrance.
- 10 Insulation or safety guards of parts the temperature of which can be in excess of 80 °C (175 °F) and which may be accidentally touched by personnel shall not be removed before the parts have cooled to room temperature.
- 11 Never operate the unit in surroundings where there is a possibility of taking in flammable or toxic fumes.
- 12 If the working process produces fumes, dust or vibration hazards, etc., take the necessary steps to eliminate the risk of personnel injury.
- 13 When using compressed air or inert gas to clean down equipment, do so with caution and use the appropriate protection, at least safety glasses, for the operator as well as for any bystander. Do not apply compressed air or inert gas to your skin or direct an air or gas stream at people. Never use it to clean dirt from your clothes.
- 14 When washing parts in or with a cleaning solvent, provide the required ventilation and use appropriate protection such as a breathing filter, safety glasses, rubber apron and gloves, etc.

- 15 Safety shoes should be compulsory in any workshop and if there is a risk, however small, of falling objects, wearing of a safety helmet should be included.
- 16 If there is a risk of inhaling hazardous gases, fumes or dust, the respiratory organs must be protected and depending on the nature of the hazard, so must the eyes and skin.
- 17 Remember that where there is visible dust, the finer, invisible particles will almost certainly be present too; but the fact that no dust can be seen is not a reliable indication that dangerous, invisible dust is not present in the air.
- 18 Never operate the generator in excess of its limits as indicated in the technical specifications and avoid long no-load sequences.
- 19 Never operate the generator in a humid atmosphere. Excessive moisture causes worsening of the generator insulation.
- 20 Do not open electrical cabinets, cubicles or other equipment while voltage is supplied. If such cannot be avoided, e.g. for measurements, tests or adjustments, have the action carried out by a qualified electrician only, with appropriate tools, and ascertain that the required bodily protection against electrical hazards is applied.
- 21 Never touch the power terminals during operation of the machine.
- 22 Whenever an abnormal condition arises, e.g. excessive vibration, noise, odour, etc., switch the circuit breakers to OFF and stop the engine. Correct the faulty condition before restarting.
- 23 Check the electric cables regularly. Damaged cables and insufficient tightening of connections may cause electric shocks. Whenever damaged wires or dangerous conditions are observed, switch the circuit breakers to OFF and stop the engine. Replace the damaged wires or correct the dangerous condition before restarting. Make sure that all electric connections are securely tightened.
- 24 Avoid overloading the generator. The generator is provided with circuit breakers for overload protection. When a breaker has tripped, reduce the concerned load before restarting.
- 25 If the generator is used as stand-by for the mains supply, it must not be operated without control system which automatically disconnects the generator from the mains when the mains supply is restored.
- 26 Never remove the cover of the output terminals during operation. Before connecting or disconnecting wires, switch off the load and the circuit breakers, stop the machine and make sure that the machine cannot be started inadvertently or there is any residual voltage on the power circuit.
- 27 Running the generator at low load for long periods will reduce the lifetime of the engine.

1.5 SAFETY DURING MAINTENANCE AND REPAIR

Maintenance, overhaul and repair work shall only be carried out by adequately trained personnel; if required, under supervision of someone qualified for the job.

- 1 Use only the correct tools for maintenance and repair work, and only tools which are in good condition.
- 2 Parts shall only be replaced by genuine Atlas Copco replacement parts.
- 3 All maintenance work, other than routine attention, shall only be undertaken when the unit is stopped. Steps shall be taken to prevent inadvertent starting. In addition, a warning sign bearing a legend such as "work in progress; do not start" shall be attached to the starting equipment. On engine-driven units the battery shall be disconnected and removed or the terminals covered by insulating caps. On electrically driven units the main switch shall be locked in open position and the fuses shall be taken out. A warning sign bearing a legend such as "work in progress; do not supply voltage" shall be attached to the fuse box or main switch.
- 4 Prior to stripping an engine or other machine or undertaking major overhaul on it, prevent all movable parts from rolling over or moving.
- 5 Make sure that no tools, loose parts or rags are left in or on the machine. Never leave rags or loose clothing near the engine air intake.
- 6 Never use flammable solvents for cleaning (fire-risk).
- 7 Take safety precautions against toxic vapours of cleaning liquids.
- 8 Never use machine parts as a climbing aid.
- 9 Observe scrupulous cleanliness during maintenance and repair. Keep away dirt, cover the parts and exposed openings with a clean cloth, paper or tape.
- 10 Never weld on or perform any operation involving heat near the fuel or oil systems. Fuel and oil tanks must be completely purged, e.g. by steam-cleaning, before carrying out such operations. Never weld on, or in any way modify, pressure vessels. Disconnect the alternator cables during arc welding on the unit.
- 11 Support the towbar and the axle(s) securely if working underneath the unit or when removing a wheel. Do not rely on jacks.
- 12 Do not remove any of, or tamper with, the sound-damping material. Keep the material free of dirt and liquids such as fuel, oil and cleansing agents. If any sound-damping material is damaged, replace it to prevent the sound pressure level from increasing.
- 13 Use only lubricating oils and greases recommended or approved by Atlas Copco or the machine manufacturer. Ascertain that the selected lubricants comply with all applicable safety regulations, especially with regard to explosion or fire-risk and the possibility of decomposition or generation of hazardous gases. Never mix synthetic with mineral oil.
- 14 Protect the engine, alternator, air intake filter, electrical and regulating components, etc., to prevent moisture ingress, e.g. when steam-cleaning.
- 15 When performing any operation involving heat, flames or sparks on a machine, the surrounding components shall first be screened with non-flammable material.
- 16 Never use a light source with open flame for inspecting the interior of a machine.
- 17 When repair has been completed, the machine shall be barred over at least one revolution for reciprocating machines, several revolutions for rotary ones to ensure that there is no mechanical interference within the machine or driver. Check the direction of rotation of electric motors when starting up the machine initially and after any alteration to the electrical connection(s) or switch gear, to check that the oil pump and the fan function properly.
- 18 Maintenance and repair work should be recorded in an operator's logbook for all machinery. Frequency and nature of repairs can reveal unsafe conditions.
- 19 When hot parts have to be handled, e.g. shrink fitting, special heat-resistant gloves shall be used and, if required, other body protection shall be applied.
- 20 When using cartridge type breathing filter equipment, ascertain that the correct type of cartridge is used and that its useful service life is not surpassed.
- 21 Make sure that oil, solvents and other substances likely to pollute the environment are properly disposed of.

- 22 Before clearing the generator for use after maintenance or overhaul, submit it to a testrun, check that the AC power performance is correct and that the control and shutdown devices function correctly.

1.6 TOOL APPLICATIONS SAFETY

Apply the proper tool for each job. With the knowledge of correct tool use and knowing the limitations of tools, along with some common sense, many accidents can be prevented.

Special service tools are available for specific jobs and should be used when recommended. The use of these tools will save time and prevent damage to parts.

1.7 BATTERY SAFETY PRECAUTIONS

Batteries

When servicing batteries, always wear protecting clothing and glasses.

- 1 The electrolyte in batteries is a sulphuric acid solution which is fatal if it hits your eyes, and which can cause burns if it contacts your skin. Therefore, be careful when handling batteries, e.g. when checking the charge condition.
- 2 Install a sign prohibiting fire, open flame and smoking at the post where batteries are being charged.
- 3 When batteries are being charged, an explosive gas mixture forms in the cells and might escape through the vent holes in the plugs. Thus an explosive atmosphere may form around the battery if ventilation is poor, and can remain in and around the battery for several hours after it has been charged. Therefore:
 - never smoke near batteries being, or having recently been, charged,
 - never break live circuits at battery terminals, because a spark usually occurs.
- 4 When connecting an auxiliary battery (AB) in parallel to the unit battery (CB) with booster cables: connect the + pole of AB to the + pole of CB, then connect the - pole of CB to the mass of the unit. Disconnect in the reverse order.

2. INTRODUCTION

The “Stand Alone Paralleling Equipment” (SAPE) enables the connection of generators in parallel, provided that the generator is equipped with a paralleling device on the alternator and has the connector with the appropriate signals.



A standard generator must be provided with a 15 pole connector to be able to connect with a SAPE unit (the master generator as well as each of the slave generators).

It is possible to convert a standard generator using a conversion kit. This is necessary for generators built before may 2000.

The generators do not have to be of the same type for paralleling: any combination between QAS168, QAS228, QAS278 or QAS338 generators is possible.

The required number of SAPE units is equal to the number of generators to be paralleled.

It is also possible to connect a generator plus a SAPE unit with a dedicated generator (generator provided with integrated paralleling).

Parallel operation is used in those cases where the load exceeds the nominal load of one generator in operation. Using this option, generators can be connected in parallel in order to share the load proportionally.

This manual describes the principle of paralleling two generators with factory setting, using at least one SAPE unit.

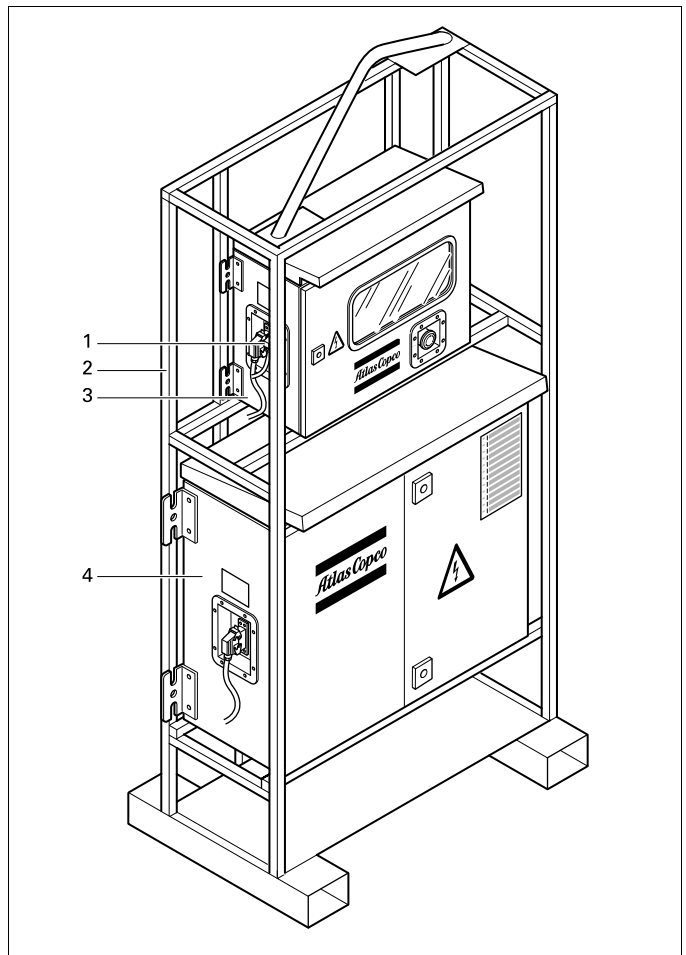
3. GENERAL DESCRIPTION

The “Stand Alone Paralleling Equipment” (SAPE) consists of connection cables (1), an optional frame (2) and two cubicles:

- The power control module (3)
- The contactor box (315 A, 500 A or 1000 A) (4)

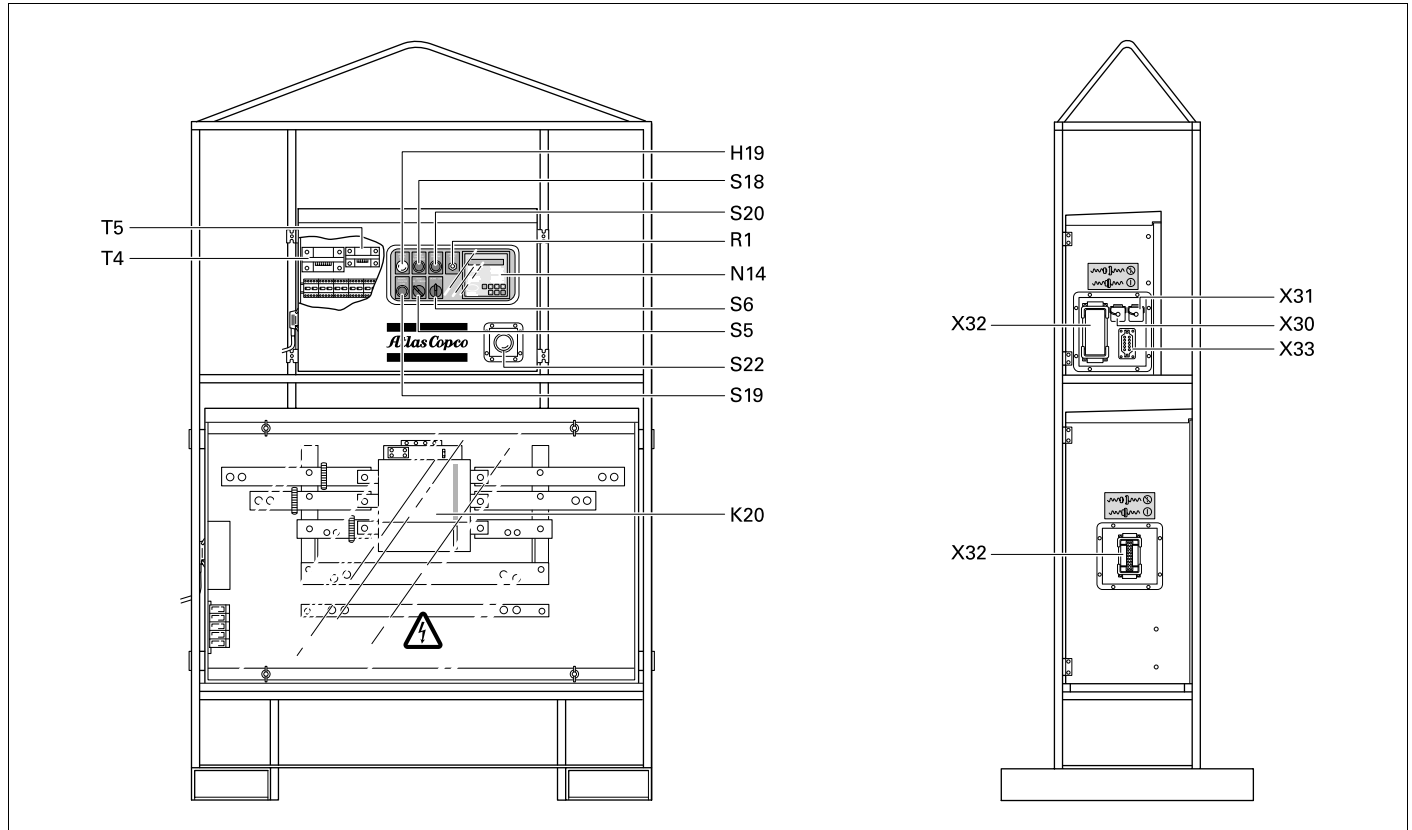
The two cubicles can be mounted on the generator or on the frame.

An overview of the main parts is given in the diagram below.



- 1 Connection cables
- 2 Frame
- 3 Power control module
- 4 Contactor box

4. COMPONENTS OF THE SAPE



4.1 POWER CONTROL CUBICLE

N14....Paralleling control module

The following features are available with the paralleling control module:

- Measurement, Annunciation, and Control Setup

The paralleling control module is provided with an integral Keypad/Display Panel.

Parameters are monitored, and setup performed by means of this panel.

- Auto-Synchronizing

The paralleling control module incorporates automatic synchronizing to match the frequency and phase of an incoming generator to the frequency and phase of the bus or another generator. The synchronizer compares the incoming generator to the frequency and phase to be matched and controls its speed and phase to assure synchronization within a minimum of time.

- Isochronous Load Sharing

The object of isochronous load sharing is to proportionally divide a common load between two or more generators in parallel while maintaining a fixed frequency. This means that the generators in the parallel connection will deliver equal percentages of their full load capacity. This also implies that due to the isochronous load sharing module and the proportional load sharing, the generators that are connected in parallel do not need to have the same rated output power.

The paralleling control module compares the load of its generator unit with the load applied to all other units in operation, through the paralleling lines, and either decreases or increases the engine fuel to maintain its proportional share of the total load.

- Load Commanding/Blending

Blending loads with the paralleling control module allows for soft loading, unloading and power setting of the controlled generator.



See the instruction manual of the Pow-R-Con for details.

H19....Lamp Breaker Closed

This lamp lights when the circuit breaker/contactors of the SAPE is closed.

R1.....Potmeter genset speed

Allows to adjust the frequency of the output voltage.

S5..... Selector switch ILS/Blend/Command

This switch allows for three positions:

- **ILS (Isochronous Load Sharing):** both connected generators give their full proportional load immediately
- **Blend:** the proportional load of the brought in generator is slowly built up (time adjustable between 2 s and 5 min), after selector switch S6 has been set to 'Load'
- **Command:** allows a fixed power output of the generator, irrespective of the load

S6..... Selector switch Unload/Load

This switch only applies to the 'Blend' mode (selector switch ILS/Blend/Command in position 'Blend').

The central position of the three position selector switch is used for 'ILS' mode. The other two positions are:

- **Unload:** one generator is enough to supply the full load, but to prevent the other generator from idling, it still supplies $\pm 10\%$ (adjustable value) while the other one supplies $\pm 90\%$ of the full load
- **Load:** both connected generators deliver equal percentages of their full load capacity

S18.... Breaker/Contactor close enable

Allows the circuit breaker/contactors of the second unit to be closed if all conditions are fulfilled.

S19.... Breaker/Contactor close

Manually closing of the circuit breaker/contactors of the first unit, after S18 (Breaker/Contactor close enable) has been pushed.

S20.... Breaker/Contactor open

Opens the circuit breaker/contactors of the unit.

S22.... Emergency stop button

Push the button to stop the unit in case of an emergency. When the button is pressed, it must be unlocked, by turning it anti-clockwise, before the unit can be restarted.

T4..... Transformer genset voltage

T5..... Transformer bus voltage

X30.... Connector X30

Connector for communication with the power control module of another SAPE unit or QAS with integrated paralleling.



Several SAPE units can be connected to each other, as the power control module of each SAPE unit has got two connectors (X30 and X31).

X31.... Connector X31

Connector for communication with the power control module of another SAPE unit or QAS with integrated paralleling.

X32.... Connector X32

Connector for communication between the SAPE power control module and the SAPE contactor.

X33.... Connector X33

Connector for communication between the power control module of the SAPE unit and the generator.

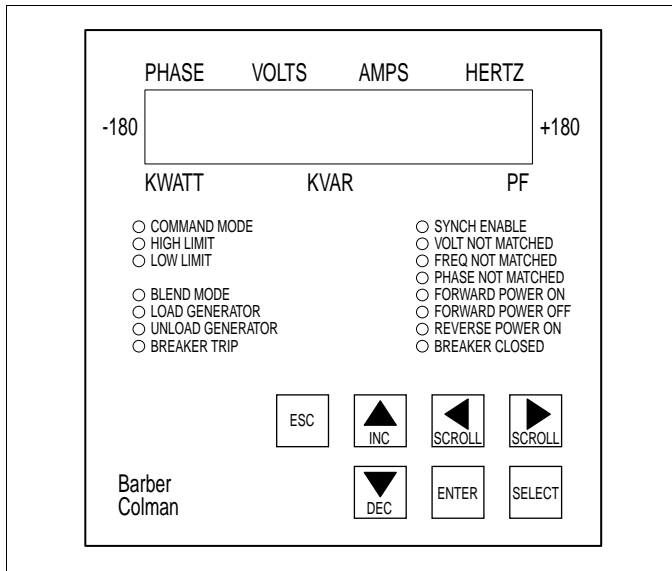
4.2 CONTACTOR BOX

K20.... Contactor for genset paralleling

X32.... Connector X32

Connector for communication between the SAPE power control module and the SAPE contactor.

4.3 KEYPAD / DISPLAY PANEL OPERATION



The following keys are provided for user monitoring and editing:

– ESC - Escape key

This key is used to select Monitor, Program, Review, or Setup modes. It may be pressed to return to the previous function at any time.

– SCROLL - Scroll key

From the automatic monitoring mode, pressing the left or right SCROLL key allows the desired phase-to-phase, phase-to-neutral, or average set of values to be displayed on the LCD. Press ESC to return to automatic monitoring.

In the Review, Program, or Setup modes, the Scroll key allows forward or reverse display of the various menu selections.

– SELECT - Select key

Pressing the Select key places the unit in the mode or data entry point shown on the LCD display.

– INCREASE / DECREASE - Increase and Decrease keys

When a data entry is selected, the value is changed by depressing the Increase or Decrease key.

– ENTER - Enter key

When a desired data entry value is displayed, pressing the ENTER key will place the value in the program.

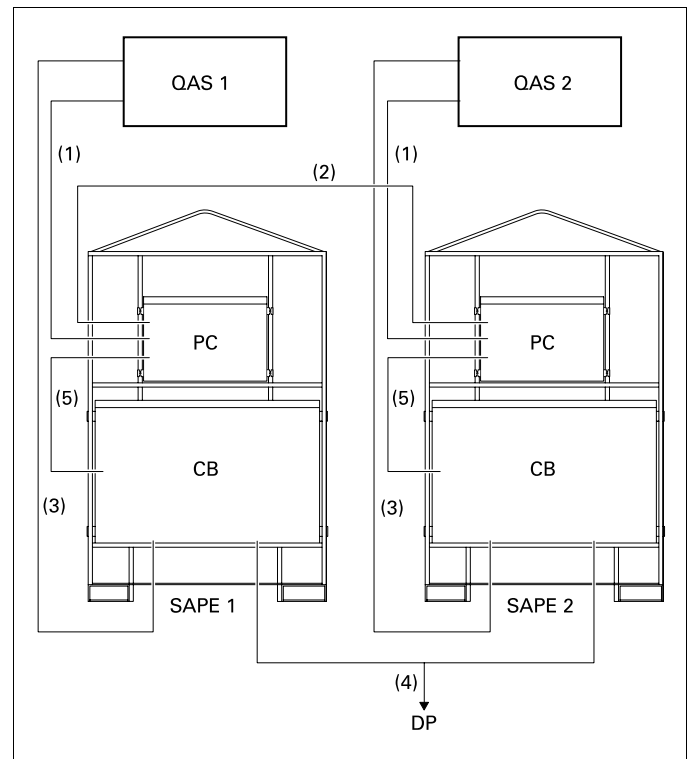
Also, pressing ENTER during the monitor mode will stop the display from scrolling. Pressing ENTER again causes scrolling to resume.

During initial power up, the Liquid Crystal Display (LCD) on the Keypad/Display Panel displays the panel revision level, then reverts to automatically scrolling through the measured phase-to-phase, phase-to-neutral, and average values.

5. OPERATING INSTRUCTIONS

5.1 CONNECTING GENERATORS AND SAPE UNITS

The following picture gives an overview of the connections to be made between two SAPE units and two QAS-generators.



PC.....Power control cubicle

CB.....Contactor box

DP.....To the site distribution panel



When connecting two standard generators in parallel, two SAPE units must be used.

Prior to starting parallel operation of two generators, following connections need to be made:

1. Connect the communication cable between the generator QAS 1 and the stand alone paralleling equipment SAPE 1 (socket X33). Do the same for QAS 2 and SAPE 2.
2. Connect the communication cable between SAPE 1 and SAPE 2 or QAS with integrated paralleling (socket X30 or X31).



Each SAPE has two of these connections, to enable paralleling more than two generators.

3. Route the power cables of the QAS through the bottom hole of the contactor box of the SAPE and connect them with the contactor (strips L1, L2, L3, N and PE on the left-hand side).



Always connect strips L1 with L1, L2 with L2 and L3 with L3!

4. Connect the load with the output of the contactor (strips 1L1, 1L2, 1L3, N and PE on the right-hand side).



Make sure that the load is connected correctly (to the strips on the right-hand side of the contactor). Do NOT connect the load with the generator.

Do NOT connect the output of the contactor with the second SAPE.

Go via the site distribution panel (to be installed by the customer) to connect the SAPE units with the load.

5. Connect the SAPE power control module with the SAPE contactor (sockets X32).

5.2 BEFORE STARTING PARALLEL OPERATION

5.2.1 Changing Parameters

If parameters are to be changed in the paralleling control module, proceed as follows:

1. Select the SETUP mode: press SELECT, press SCROLL until SETUP is reached and press SELECT.
2. Enter password: successively press the ENT, DEC, SCROLL (left), and SELECT keys for the password.
3. Select the SYSTEM screen.
4. Select the desired parameter by using the SCROLL (left or right) key.
5. Press the SELECT key.
6. If applicable: choose the desired digit by using the SCROLL (left or right) key.
7. Change the digit by using the INCREASE (up) or DECREASE (down) key.
8. Press the ENTER key to place the value in the program.



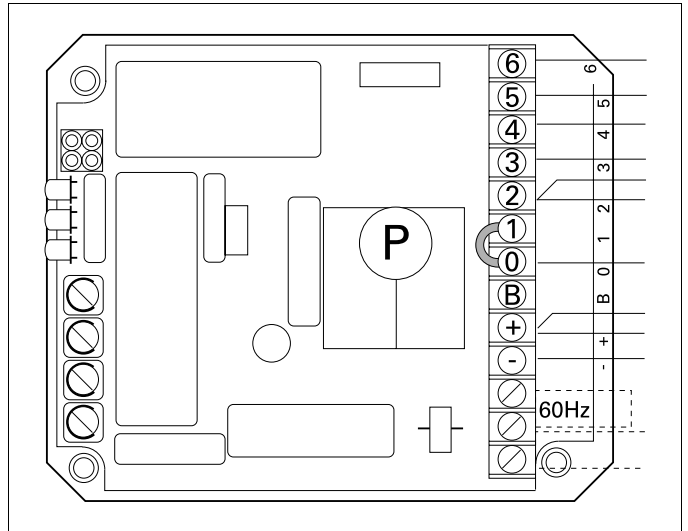
Pressing ESC allows for returning to the previous function at any time.

5.2.2 Generator Setup

- Set engine VSG min at 1425 rpm (for 50 Hz) or at 1710 rpm (for 60 Hz).
Set engine VSG max at 1575 rpm (for 50 Hz) or at 1810 rpm (for 60 Hz).

Use a DDEC reader to adjust the speed limits of a generator.

- Remove the bridge (between connections 0 and 1) on the AVR (Automatic Voltage Regulator) to activate the paralleling device.



- Check, and adapt if necessary, the voltage settings on transformers T4 and T5.
The connection on the primary side of transformer T4 must be connected to the correct terminals, dependent on the generator voltage.

5.2.3 Setup Procedure

Prior to starting up the system, the paralleling control module needs to know what size of QAS is going to be connected.

Therefore proceed as follows:

1. Go to 'SETUP' \Rightarrow 'PROGRAM' \Rightarrow
2. Voltage match: set at 5 %
3. Freq match: set at 0.25 Hz
4. Phase match: set at 20 deg
5. Go to 'SETUP' \Rightarrow 'SETUP' \Rightarrow
6. CT ratio A, B, C: primary current divided by secondary current



Note that the ratio needs to be entered, not the primary current rating,
e.g.: current transfo 600/5
 \rightarrow ratio to be entered = 120

7. PT ratio: 1
8. Gen Power: xxx kW: see technical specifications for nominal values



Note the difference between 50 and 60Hz,
e.g.: QAS168 50Hz = 120kW
60Hz = 144kW

9. Sys Volt: Bus voltage: 208 – 240V \Rightarrow 240V
400 – 480V \Rightarrow 480V
10. Bus Freq: 50 or 60Hz depending on what frequency the QAS is set up.

5.3 STARTING PARALLEL OPERATION



Make sure that the generators are connected correctly before starting operation.

- Put on both generators the selector switch “Single/Parallel” in the “Parallel” position.
- Start both generators.
- Run the engines for approximately 5 minutes to warm up and stabilize speed and voltage.
- Try to match frequency and voltage of both generators as close as possible.
- Switch on the main circuit breakers Q1 of both generators.
- Push the button “Breaker/Contactor close enable” on the SAPE of the first generator (master).
- Push the button “Breaker/Contactor close” on the SAPE of the first generator.
- Push the button “Breaker/Contactor close enable” on the SAPE of the second generator (slave).

When both generators are synchronized, the circuit breaker of the SAPE of the second generator is automatically closed and the second generator starts supplying power together with the first one.

The paralleling control modules will share the load evenly between the generators, according to the capacity of the units. It will also detect a circulating current and will deactivate one of the units if the circulating current exceeds the value set on the load sharing module. It is possible to lower the circulating current by better matching the voltages of the generators. Therefore adjust the voltage on one or more generators.

5.4 DURING OPERATION

- Refer to the manuals of the applicable generators for the check actions to be performed during operation.
- Regularly check the amperemeters on both generators and the clamp meter which measures the circulating current.

5.5 PARALLELING MORE THAN TWO GENERATORS

After connecting two generators in parallel, more generators can be added.



Do not connect more than 7 generators in parallel.

Once two (or more) generators are connected in parallel, they can be treated as if they were one unit.

- Shut down or disconnect the load or make sure that the load is stable.
- Shut down the generators that are already in operation. Make sure not to change the settings on these generators.
- Connect the extra generator to the parallel connection of the first generators, treating these generators as one unit.
- Make sure that all main circuit breakers Q1 are switched OFF.
- Carry out the actions described in “Before starting parallel operation” for the extra generator.
- Start up the first generator, close its circuit breaker Q1 and push the button “Breaker/Contactor close” on the corresponding SAPE.
- Start up the second (possibly third, fourth, ...) generator, close its circuit breaker(s) Q1 and push the button(s) “Breaker/Contactor close enable” on the corresponding SAPE unit(s). These units can now be considered as one unit.



Once the extra generator is synchronized, it can be used as a standby unit. If the load exceeds the nominal load of the first generator(s), the standby unit can be put in parallel operation by closing the circuit breaker of the corresponding SAPE.

5.6 STOPPING PARALLEL OPERATION

- Switch off and disconnect the load.
- Push the buttons “Breaker/Contactor open” on both SAPE units.
- Switch off the main circuit breakers Q1 of both generators.
- Let the engines run for about 5 minutes to cool them down.
- Shut down the generators one by one.

6. TROUBLE SHOOTING

| Symptom | Possible cause | Corrective action |
|--|--|--|
| <i>Display does not function.</i> | Connection between Pow-R-Con and display is faulty or absent. | Connect correctly. |
| <i>Measured and actual power do not match.</i> | CT ratio not entered correctly. | Enter the correct CT ratio. |
| | Connection between power control module and contactor box is faulty. | Connect the power control module and the contactor correctly (see 5.1 Connecting Generators and SAPE Units). |
| <i>Circulating current is too high.</i> | Parallel device is not or faultily connected. | Check the parallel device and the polarity. |
| | Voltages of the generators are not matched. | Adjust the voltage on one or more generators until the circulating current is minimal. |
| <i>One generator supplies active power to the other.</i> | Frequencies of the generators are not matched. | Adjust the frequency on a generator so that the power is zero. |
| | One of the connection cables is not connected. | Check all connections. |
| <i>Generator runs in idle speed.</i> | Selector switch “Single/Parallel” is in “Parallel” position, but the SAPE unit is not connected. | Put the switch in “Single” position if single mode is needed. |
| | | Connect the SAPE unit if parallel mode is needed. |
| <i>Potentiometer for frequency adjustment does not function.</i> | Selector switch “Single/Parallel” is in wrong position. | Put the switch in single mode if you want to use the frequency adjustment potentiometer on the control panel of the QAS. |
| | | Put the switch in parallel mode if you want to use the frequency adjustment potentiometer on the control panel of the SAPE unit. |

7. KEYPAD/DISPLAY PANEL MENU STRUCTURE

| MODE | SCROLL | DISPLAY READOUT | DESCRIPTION | RANGE | DEFAULT |
|--------|-----------|--------------------|--------------------------------|------------------|---------|
| Review | Sync | Phase Over = _% | Phase Overall Gain | 0-100 | 15 |
| | | Phas Prop = _% | Phase Proportional Gain | 0-100 | 35 |
| | | Phas Intg = _% | Phase Integral Gain | 0-100 | 80 |
| | | Freq Over = _% | Frequency Overall Gain | 0-100 | 20 |
| | | Freq Prop = _% | Frequency Proportional Gain | 0-100 | 40 |
| | | Freq Intg = _% | Frequency Integral Gain | 0-100 | 75 |
| | | Volt Match = _% | Voltage Match Window | $\pm 1 \pm 15$ | 5.0 |
| | | Freq Match = _ HZ | Frequency Match Window | $\pm 0.1 \pm 25$ | .25 |
| | | Phase Match = DEG | Phase Match Windows | $\pm 2 \pm 20$ | 20 |
| | Command | Pwr Input = POT | Power Set Select | Key,Pot | Pot |
| | | Pwr LO Limit = _% | Power Limit Low | 0-100 | 10 |
| | | Pwr HI Limit = _% | Power Limit High | 0-120 | 100 |
| | | Pwr Set Lvl = _% | Power Set Level | 0-120 | 50 |
| | | Trip Level= _% | Breaker Trip Level | 0-120 | 15 |
| | | Ramp Up = _SEC | Ramp Up Time | 0-300 | 40 |
| | | Ramp Down = _SEC | Ramp Down Time | 0-300 | 40 |
| | Blend | Pwr LO Limit= _% | Power Limit Low | 0-100 | 10 |
| | | Trip Level= _% | Power Set Level | 0-120 | 15 |
| | | Ramp Up = _SEC | Ramp Up Time | 0-300 | 40 |
| | | Ramp Down = _SEC | Ramp Down Time | 0-300 | 40 |
| | L/s Setup | Parall Volt = _V | Parallel Voltage | 1.5-4.5 | 3.000 |
| | | PT Ratio = _ | Potential Transformer Ratio | 1-600 | 1 |
| | | CT Ratio A = _ | Current Transformer Ratio A | 10-9999 | (*) |
| | | CT Ratio B = _ | Current Transformer Ratio B | 10-9999 | (*) |
| | | CT Ratio C = _ | Current Transformer Ratio C | 10-9999 | (*) |
| | | Gene Power = _KW | Nominal Generator Power | 0-2500 | (*) |
| | L/s Relay | Pwr ON Lvl = _% | Forward Preset Power Level On | 20-120 | 90 |
| | | Pwr OFF Lvl= _% | Forward Preset Power Level Off | 10-100 | 50 |
| | | Rev Pwr Lvl = _% | Reverse Preset Power Level | 0-40 | 20 |
| | | Fpwr ON Del = _SEC | Forward Power On Time | 0-300 | 10 |
| | | Fpwr OFF Del = SEC | Forward Power Off Time | 0-300 | 10 |

(*) Depending on the size of generator (see 5.2.3 Setup Procedure).

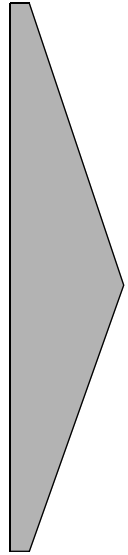
| MODE | SCROLL | DISPLAY READOUT | DESCRIPTION | RANGE | DEFAULT |
|---------|-----------|--------------------|--------------------------------|-------------|---------|
| Program | Sync | Phas Over = _% | Phase Overall Gain | 0-100 | 15 |
| | | Phas Prop = _% | Phase Proportional Gain | 0-100 | 35 |
| | | Phas Intg = _% | Phase Integral Gain | 0-100 | 30 |
| | | Freq Over = _% | Frequency Overall Gain | 0-100 | 28 |
| | | Freq Prop = _% | Frequency Proportional Gain | 0-100 | 50 |
| | | Freq Intg = _% | Frequency Integral Gain | 0-100 | 75 |
| | | Volt Match = _% | Voltage Match Window | ±1-±15 | 5.0 |
| | | Freq Match = _hz | Frequency Match Window | ±0.1-±25 | .2 |
| | | Phase Match = _DEG | Phase Match Windows | ±2-±20 | 20 |
| | Command | Pwr Input = _POT | Power Set Select | Key,Pot | Pot |
| | | Pwr LO Limit = _% | Power Limit Low | 0-100 | 10 |
| | | Pwr HI Limit = _% | Power Limit High | 0-120 | 100 |
| | | Pwr Set Lvl = _% | Power Set Level | 0-120 | 50 |
| | | Trip Level = _% | Breaker Trip Level | 0-120 | 15 |
| | | Ramp Up = _SEC | Ramp Up Time | 0-300 | 20 |
| | | Ramp Down = _SEC | Ramp Down Time | 0-300 | 20 |
| | Blend | Pwr LO Limit= _% | Power Limit Low | 0-100 | 10 |
| | | Trip Level = _% | Power Set Level | 0-120 | 15 |
| | | Ramp Up = _SEC | Ramp Up Time | 0-300 | 20 |
| | | Ramp Down = _SEC | Ramp Down Time | 0-300 | 20 |
| | L/s Setup | Parall Volt = _V | Parallel Volt | 0-4.5 | 3.000 |
| | | PT Ratio = _ | Potential Transformer Ratio | 1-600 | 1 |
| | | CT Ratio A = _ | Current Transformer Ratio A | 10-9999 | (*) |
| | | CT Ratio B = _ | Current Transformer B | 10-9999 | (*) |
| | | CT Ratio C = _ | Current Transformer Ratio C | 10-9999 | (*) |
| | | Gen Power = _KW | Nominal Gen Power | 0-2500 | (*) |
| | L/s Relay | Pwr ON Lvl = _% | Forward Preset Power Level On | 20-120 | 90 |
| | | Power OFF Lvl = _% | Forward Preset Power Level Off | 10-100 | 30 |
| | | Rev Pwr Lvl = _% | Reverse Preset Power Level | 0-30 | 20 |
| | | Fpwr ON De= _SEC | Forward Power On Time | 0-300 | 10 |
| | | Fpwr OFF De= _SEC | Forward Power Off Time | 0-300 | 10 |
| Setup | System | Gen Pwr = _KW | Generator Power | 0-2500 | (*) |
| | | Sys Volt = _VAC | System Voltage | 120,240,480 | (*) |
| | | Bus Freq = _Hz | Bus Frequency | 50,60 | (*) |
| | | PT Ratio = _ | Potential Transformer Ratio | 1-600 | 1 |
| | | CT Ratio A = _ | Current Transformer Ratio A | 10-9999 | (*) |
| | | CT Ratio B = _ | Current Transformer Ratio B | 10-9999 | (*) |
| | | CT Ratio C = _ | Current Transformer Ratio C | 10-9999 | (*) |
| | | Bridge Int = | Bridge Integrator | On,Off | Off |

(*) Depending on the size of generator (see 5.2.3 Setup Procedure).

8. TECHNICAL SPECIFICATIONS

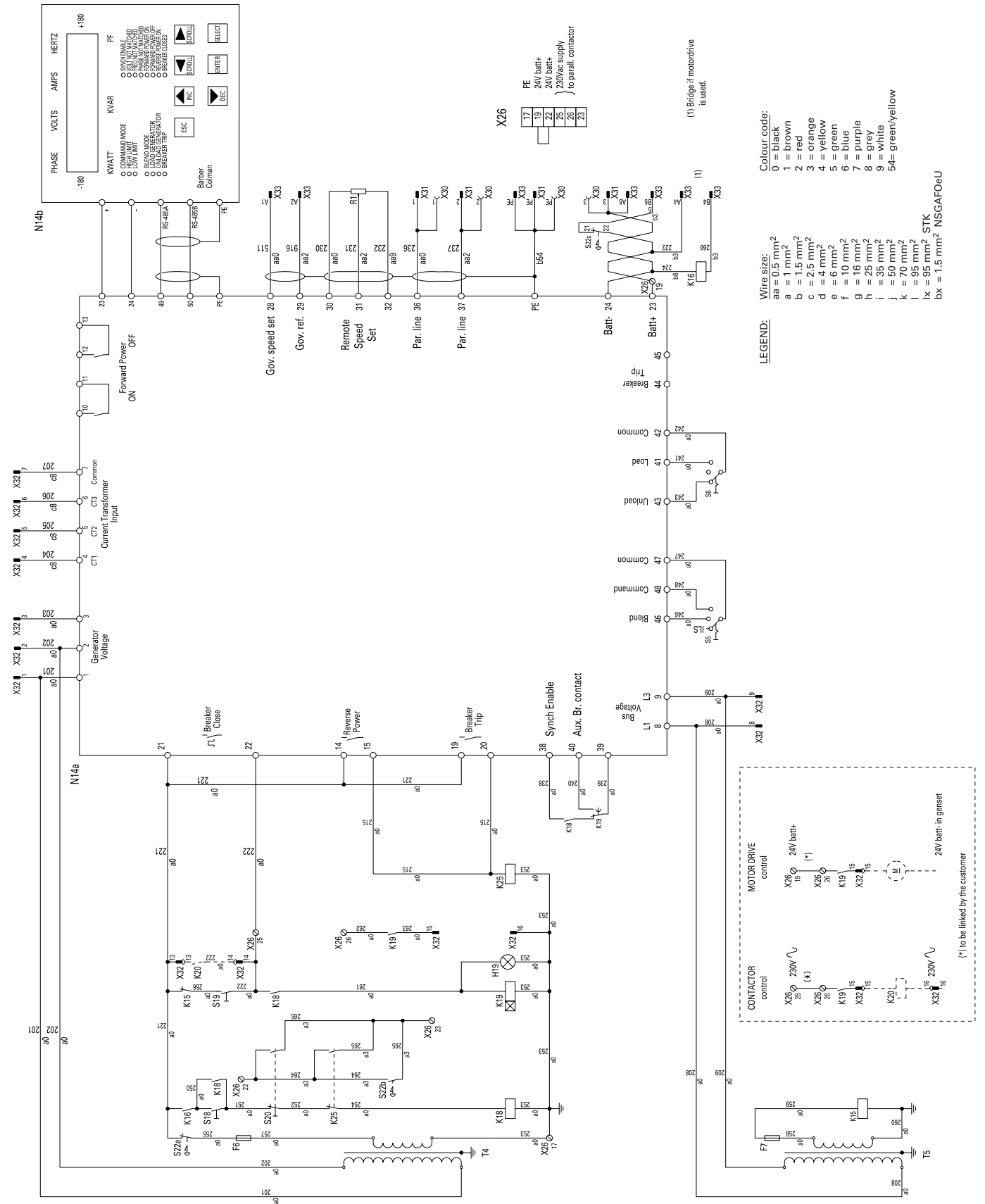
| | | |
|-----------------------------------|--------------------------------------|--|
| <i>Paralleling control module</i> | Frequency | 50 Hz/60 Hz |
| | Number of phases | 3 |
| | Voltage input | 120-480 VAC \pm 15% |
| | Current input | 5 A at Max. gen. load Burden 1.25 VA per phase at 5.0 A |
| | Load Sharing Accuracy | Within \pm 0.5% |
| | Output full load (Paralleling Lines) | 1.5-5.0 VDC |
| | Operating Temperature | -20 to 70 °C |
| | Shipping/Storage Temperature | -40 to 85 °C |
| | Fuse F6 | 4 A |
| | Fuse F7 | 2 A |
| | Dimensions (LxWxH) | 600 x 415 x 240 mm |
| | Fuse F1-5 | 4 A |
| <i>Contactors box</i> | | |
| <i>Contactors box 315 A</i> | Dimensions (LxWxH) | 600 x 635 x 240 mm |
| <i>Contactors box 500 A</i> | Dimensions (LxWxH) | 1000 x 795 x 330 mm |
| <i>Contactors box 1000 A</i> | Dimensions (LxWxH) | 1000 x 795 x 330 mm |
| <i>Frame</i> | Dimensions (LxWxH) | 1200 x 700 x 2070 mm |
| <i>SAPE unit 315 A</i> | Weight | \pm 130 kg |
| <i>SAPE unit 500 A, 1000 A</i> | Weight | \pm 170 kg |
| <i>Generator QAS 168</i> | Power (50 Hz/60 Hz) | 120 kW/144 kW |
| <i>Generator QAS 228</i> | Power (50 Hz/60 Hz) | 160 kW/192 kW |
| <i>Generator QAS 278</i> | Power (50 Hz/60 Hz) | 200 kW/240 kW |
| <i>Generator QAS 338</i> | Power (50 Hz/60 Hz) | 240 kW/288 kW |

Circuit diagrams
Elektrisch schema
Schéma de circuit
Schaltpläne
Esquema de conexiones
Kopplingsscheman
Diagrammi dei circuiti
Kretsskjema
Kredsløbsdiagrammer
Διαγράμματα κυκλωμάτων
Esquemas eléctricos
Sähkökaaviot



9822 0889 31

Applicable for SAPE 315A, 500A, 1000A



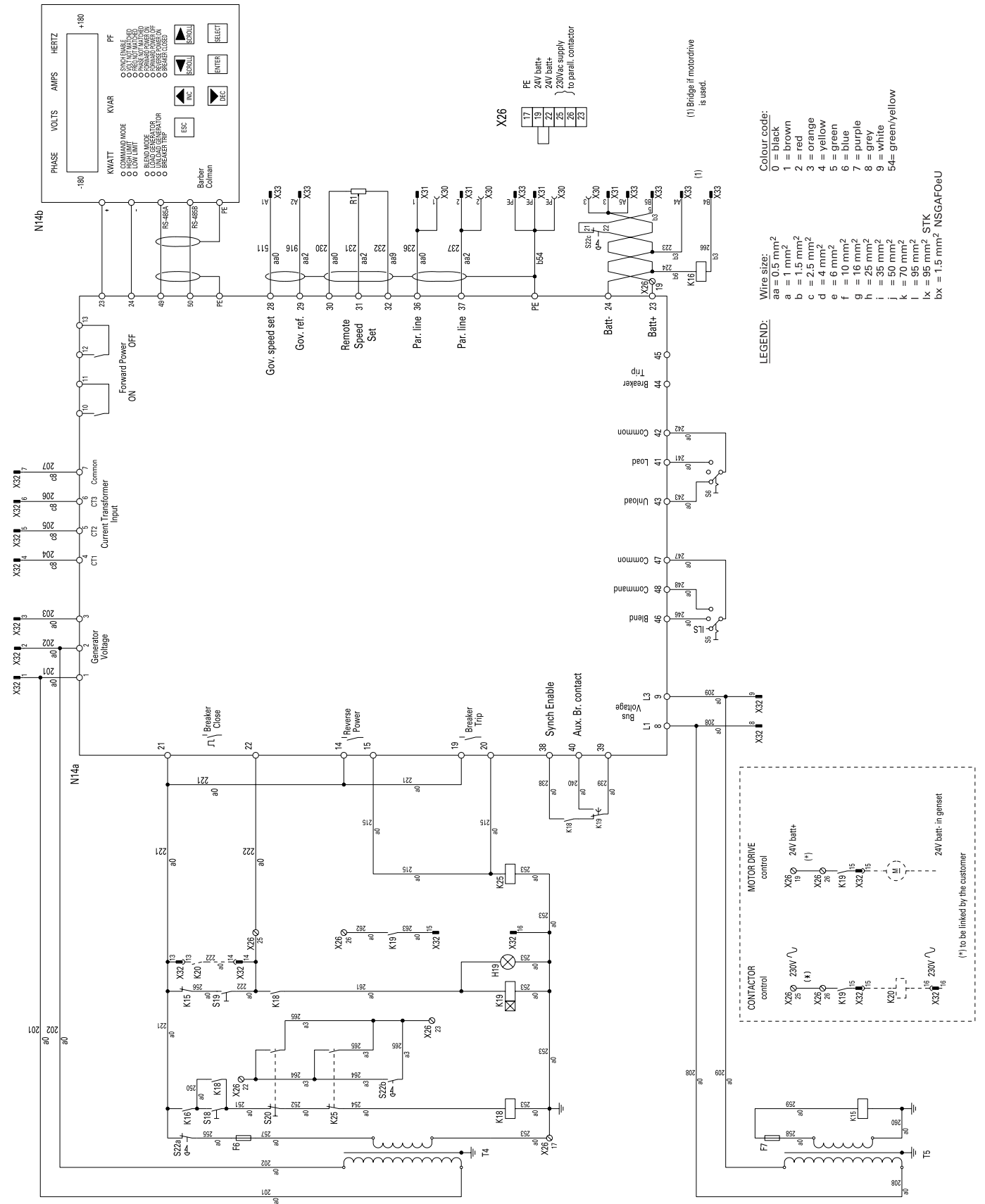
9822 0889 31

| ENGLISH | | NEDERLANDS | | FRANCAIS | | DEUTSCH | |
|---------|--|--|--|--|--|--|--|
| F6 | Fuse 4A | Zekering 4A | | Fusible 4A | | Sicherung 4A | |
| F7 | Fuse 2A | Zekering 2A | | Fusible 2A | | Sicherung 2A | |
| H19 | Lamp breaker closed | Lampje 'Stroomonderbreker gesloten' | | Lampe "breaker closed" (disjoncteur fermé) | | Lampe Ausschalter geschlossen | |
| K15 | Aux. relay bus voltage | Hulprelais busspanning | | Relais aux. tension bus | | Zusätzl. Relais Sammelschiensspannung | |
| K16 | Aux. relay genset breaker | Hulprelais stroomonderbreker generatoraggregaat | | Relais aux. disjoncteur groupe | | Zusätzl. Relais Stromaggregat-Ausschalter | |
| K18 | Aux. relay blocking line | Hulprelais blokkeerlijn | | Relais aux. ligne de blocage | | Zusätzl. Relais Sperleitung | |
| K19 | Aux. relay contactor/motor drive | Hulprelais schakelaar/motoraandrijving | | Relais aux. contacteur/entraînement moteur | | Zusätzl. Relais Schalter/Motorantrieb | |
| K20 | Contact for genset paralleling | Schakelaar voor parallelschakeling generatoraggregaat | | Contacteur pour montage en parallèle | | Schalter für Stromaggregat-Parallelschaltung | |
| K25 | Aux. relay invert breaker trip/reverse power | Hulprelais omkeerschakelaar omschakeling/terugstroomvermogen | | Relais aux. inversion déclenchement disjoncteur /puissance arrière | | Zusätzl. Relais Umkehrschaltaufsöfung/Rückleistung | |
| N14 | Paralleling module | Parallelschakelingsmodule | | Module de mise en parallèle | | Parallelschaltungsmodul | |
| R1 | Potmeter genset speed | Potentiometer generatorsnelheid | | Potentiomètre vitesse groupe | | Potentiometer Stromaggregatdrehzahl | |
| S5 | Selector switch ILS/Blend/Command | Keuzeschakelaar ILS/Blend/Command | | Sélecteur ILS/Blend/Command | | Wahlschalter ILS/Blend/Command | |
| S6 | Selector switch Unload/Load | Keuzeschakelaar Unload/Load | | Sélecteur Unload/Load | | Wahlschalter Unload/Load | |
| S16 | Breaker/contact close enable | Sluiten stroomonderbreker/schakelaar mogelijk | | Fermeture autorisée disjoncteur/contacteur | | Ausschalter/Schalter schließen aktivieren | |
| S19 | Breaker/contact close | Stroomonderbreker/schakelaar sluiten | | Fermeture disjoncteur/contacteur | | Ausschalter/Schalter schließen | |
| S20 | Breaker off/reset contactor open | Breaker onderbreker uit/resetschakelaar openen | | Disjoncteur fermé/contacteur de r  z ouvert | | Ausschalter auf aus/Resetschalter   ffnen | |
| S22 | Emergency stop | Noodstopknop | | Arr  t d'urgence | | Notabschaltung | |
| T4 | Transformer genset voltage | Transformator generatorspanning | | Transformateur tension groupe | | Transformator Stromaggregatspannung | |
| T5 | Transformer bus voltage | Transformator busspanning | | Transformateur tension bus | | Transformator Sammelschienspannung | |
| X26 | Terminal strip | Klemmenstrook | | Barrette de raccordement | | Klemmenleiste | |

| ESPA  OL | | SVENSKA | | ITALIANO | | NORSK | |
|----------|---|---|--|--|--|--|--|
| F6 | Fusible 4A | S  kring 4A | | Fusibile 4A | | S  kring 4A | |
| F7 | Fusible 2A | S  kring 2A | | Fusibile 2A | | S  kring 2A | |
| H19 | Disyuntor de l  mpara cerrado | L  mpbrytaren sl  ngd | | Spia tagliacircuito chiuso | | L  mppe for lukket bryter | |
| K15 | Voltaje del bus del rel   auxiliar | Hj  lprel   - ledningssp  nning | | Rel   ausiliario di tensione bus | | Koplings  pning hj  lperele | |
| K16 | Disyuntor del conjunto electro  geno del rel   auxiliar | Hj  lprel   - generatorgruppens brytare | | Rel   ausiliario tagliacircuito del generatore | | Bryter for hj  lperele generatorsett | |
| K18 | L  nea de bloqueo del rel   auxiliar | Hj  lprel   - sp  rtledning | | Rel   ausiliario linea di bloccaggio | | Sperrelinje hj  lperele | |
| K19 | Contacto/Accionamiento del rel   auxiliar | Hj  lprel   - motordrivningens brytare | | Rel   ausiliario contattore/azionamento motore | | Hj  lperele kontaktor/motordrev | |
| K20 | Contacto para el funcionamiento en paralelo del grupo electro  geno | Brytare - generatorgruppens parallell  drift | | Contactore per messa in parallelo del generatore | | Kontakt  r for parallellkopling av generatorsett | |
| K25 | Potencia inversa/disparo del disyuntor de inversi  n del rel   auxiliar | Hj  lprel   - riktningsomkopplare utl  sning/b  kstr  m | | Rel   ausiliario inversione scatto tagliacircuito /potenza a marcia indietro | | Hj  lperele vendebryter utl  sning/retur str  m | |
| N14 | M  dulo para el funcionamiento en paralelo | Parallell  styringsmodul | | Modulo di messa in parallelo | | Modul for parallellkopling | |
| R1 | Velocidad del grupo electro  geno por potenc  m  tro | Potentiometer f  r generatorgruppens varvtal | | Potenzionmetro per regime generatore | | Spenningsm  ler for generatorsethastighet | |
| S5 | Commutador selector ILS/Blend/Command | V  ljare ILS/Blend/Command | | Interruttore di selezione ILS/Blend/Command | | Velgerbryteren ILS/Blend/Command | |
| S6 | Commutador selector Unload/Load | V  ljare Unload/Load | | Interruttore di selezione Unload/Load | | Velgerbryteren Unload/Load | |
| S18 | Activaci  n de cierre del disyuntor/contactador | Aktivera brytarens st  ngningsfunksjon | | Breaker/contactator close enable | | Aktiver bryter/kontakt  r for lukket krets | |
| S19 | Cierre del disyuntor/contactador | St  ng brytaren | | Breaker/contactator close | | Bryter/kontakt  r lukket | |
| S20 | Disyuntor desactivado/apertura del contactor de reinicio | Brytare av/nollst  ll brytare   ppen | | Breaker off/reset contactor open | | Bryter av /tilbakestill kontakt  r   pen | |
| S22 | Parada de emergencia | N  dstopp | | Arresto di emergenza | | N  dstopp | |
| T4 | Voltaje del grupo electro  geno por transformador | Sp  nningstransformator - generatorgrupp | | Tensione generatore del trasformatore | | Transformator generatorsetts  pning | |
| T5 | Voltaje del bus en el transformador | Sp  nningstransformator - ledning | | Tensione bus del trasformatore | | Transformator koplings  pning | |
| X26 | Bloque de terminales | Anslutningslist | | Morsettiera | | Koplings  plint | |

9822 0889 31

Applicable for SAPE 315A, 500A, 1000A



9822 0889 31

| DANSK | | ΕΛΛΗΝΙΚΑ | PORTUGUÊS | SUOMI |
|-------|--|--|---|--|
| F6 | Sikring 4A | Ασφάλεια 4Α | Fusível 4A | Varoke 4A |
| F7 | Sikring 2A | Ασφάλεια 2Α | Fusível 2A | Varoke 2A |
| H19 | Lampeafbryder lukket | Λαμπτήρας κλειστού ασφαλειοδιακόπτη | Luz circuito fechado | Lampun katkaisin kiinni |
| K15 | Hjælperelæ busspænding | Βοηθητικό ρελέ τάσης διαύλου | Voltageg Bus do relé aux. | Väyläajämitten vararele |
| K16 | Hjælperelæ generatorens afbryder | Βοηθητικό ρελέ ασφαλειοδιακόπτη γεννητριών | Circuito genset do relé aux. | Aggregaatin katkaisijan vararele |
| K18 | Hjælperelæ spærrelinie | Βοηθητικό ρελέ γραμμής αναστολής | Linha bloqueadora do relé aux. | Lukitusjohdon vararele |
| K19 | Hjælperelæ kontaktor/motordrev | Βοηθητικό ρελέ επαφών/κίνησης | Contacteur/conducteur du moteur du relé aux. | Kontakttorin/moottorikäytön vararele |
| K20 | Kontaktør for generatorparallelisering | Επαφές παράλληλης σύνδεσης γεννητριών | Contacteur para sincronização genset | Aggregaatin rinnankytkentäkontaktori |
| K25 | Hjælperelæ invertering afbryderudløsning/retursstrøm | Βοηθητικό ρελέ πτώσης ασφαλειοδιακόπτη εξ αναστροφής/αναστροφής ισχύος | Circuito disparo/reverter corrente do relé aux. | Käämön katkaisimen laukaisun/vastatehon vararele |
| N14 | Paralleliseringsmodul | Μονάδα παράλληλης σύνδεσης | Módulo Paralelo | Rinnankytkentämoduuli |
| R1 | Potentiometer generatorens hastighed | Ποτενσιόμετρο ρύθμισης στροφών γεννητριών | Velocidade genset Potmeter | Aggregaatin nopeuspotentioimetri |
| S5 | Onskifterkontakt ILS/Blend/Command | Διακόπτης επιλογας ILS/Blend/Command | Comutador-selector IL S/Blend/Command | Välintäkytkin ILS/Blend/Command |
| S6 | Onskifterkontakt Unload/Load | Διακόπτης επιλογας Unload/Load | Comutador-selector Unload/Load | Välintäkytkin Unload/Load |
| S18 | Aktivering af lukning af afbryder/kontaktør | Δυνατότητα κλεισίματος ασφαλειοδιακόπτη/επαφών | Circuito/contactor possível de ser fechado | Katkaisin/kontaktorin sulkemisen valtuutus |
| S19 | Lukning af afbryder/kontaktør | Κλείσιμο ασφαλειοδιακόπτη/επαφών | Fechar circuito/contactar | Katkaisin/kontaktori kiinni |
| S20 | Afbryder fra/nulstilling kontaktør åben | Ασφαλειοδιακόπτης διακοπής/αποκατάστασης επαφών | Abzir circuito desligar/reiniciar contactor | Katkaisin pois/uudelleenvirtityskontaktori auki |
| S22 | Nødstop | Στοπ έκτακτης ανάγκης | Paragem de emergência | Hätäpysäytys |
| T4 | Transformer generatorens spending | Μετασχηματιστής τάσης γεννητριών | Voltageg genset do transformador | Muuntaja-aggregaattijännite |
| T5 | Transformer busspænding | Μετασχηματιστής τάσης διαύλου | Voltageg bus do Transformador | Muuntajan väyläjännite |
| X26 | Klemliste | Λωρίδα ακροδέκτη | Cablagem de terminais | Lititänärina |
