# ECONOBOOST EB A
# COLD WATER
# BOOSTER SET

OPERATION & MAINTENANCE
MANUAL

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# OPERATING AND MAINTENANCE INSTRUCTIONS

## ‘A’ Range Booster Sets

The STOKVIS ‘A’ range of booster sets are designed and manufactured to automatically control the pressure in a water distribution system, using pressure switches or variable speed drive invertors.

These operating instructions and safety information must be read carefully, and understood, by the operatives before running the plant.

The operator is responsible for following the instructions and complying with the safety requirements given in this operation manual.

No liability can be accepted for damage or operation disorders that are the result of non-compliance with the operating instructions.

The booster set is permanently connected to the system, delivering water at a pressure range within a pre-determined window, on a ‘Duty’ / ‘Assist’ or a ‘Duty’ / ‘Assist’ / ‘Assist’ (or Standby) basis, depending on the number of pumps fitted, and the control logic required.

An accumulator pressure vessel, or number of vessels, sized on the area and specific requirements of the system, is attached or included on the set, and will act as a hydraulic buffer between the booster set and the system.

## HANDLING

Delivery vehicles should be guided on site by a competent banks man, and should not reverse unless under the supervision of a competent banks man.

If unloading is to carried out in a public area the appropriate Personal Protective Equipment must be worn, and local safety rules must be observed and obeyed.

All large or heavy objects must be off loaded, and transported by mechanical means and operatives should observe the recommended 25 kg manual handling limit.

Any packing material removed from the set, after delivery, should be disposed of in accordance with local regulations.

## DESIGNATION CODES

The numbers in the designation code of the Booster Set determine the number and size of vessels and pumps, together with any other relevant information required.
i.e ***AEV-2-24 / 2PV 804 BTA*** is an ***'A'*** range ***E***co version ***Variable*** speed drive set with ***2*** off ***24*** litre accumulator vessels, ***2*** off ***Pumps***, (***Vertical*** mounted SV ***804*** pumps), a ***Break Tank*** located ***Above*** the set

***AEV-2-24 / 2PV 804 BTA***

| | |
|---|---|
| ***A*** | Booster set range |
| ***E*** | Eco version |
| ***V*** | Variable Speed Drive |
| ***2*** | Number of vessels |
| ***24*** | Size of vessels |
| ***2P*** | Number of pumps |
| ***V*** | Orientation of pumps (V = Vertical – H = Horizontal) |
| ***804*** | Pump Size (Lowara 804) |
| ***BT*** | Other information (SL = Suction Lift – BT = Break Tank) |
| ***A*** | Break tank orientation (A = Above – C = On common base with pumps S = On stand adjacent to pump set) |

## LOCATION

The STOKVIS Booster Set should be sited in a dry, well-ventilated position but not subject to extremes of temperature.

If the set is to be stored for any length of time, and there is a possibility of frosts, any liquids within the pumps should be drained and the vent and bleed plugs removed and stored in a safe place.

Ensure that the pumps and motors are clear of obstructions and that an adequate air supply reaches the motor cooling fans.

The unit should be mounted on a level surface and can be fixed down using the holes provided in the base (if required).

## INSTALLATION.

To install the equipment, all that is required is to connect up the suction and discharge manifolds (or legs) to the suction supply tank and discharge pipe work, to the system, respectively, and to make electrical connections from the incoming main supply to the panel and the low voltage connections to the low water cut-off device, and any 'volt free' signals to the building management system (where applicable).

All pipe work should be flushed out before connecting the unit and should be must be suitably supported so as not to put any strain on the manifolds of the unit.

We recommend that once the unit has been installed, it should be commissioned by STOKVIS prior to being put to work. This will ensure that any problems which may affect the warranty of the unit can be reported and rectified.

## ELECTRICAL SUPPLY.

The operating voltage and other electrical data is marked on the motor rating label, ensure that the motor is suitable for the electrical supply on which it will be used.

The electrical supply and final connections to the set should be sized and installed by a qualified electrician in accordance with the requirements of BS 7671(formally I.E.E. 16th Edition rules & regulations.) and any local current regulations.

The installer must ensure that the local supply is compatible with the voltage and frequency stamped onto the motor plates, and the maximum load requirements of the set.

It is also the responsibility of the installer to ensure that the cable and fuse/MCB protection is suitably rated to accommodate the pump set.

The integrity of the main incoming supply must be tested and certified prior to applying power to the set.

All STOKVIS booster sets are tested and fully earthed, in accordance with the requirements of BS 7671, however additional equipotential bonding may be required on site, and will be the responsibility of the installer.

## PRIMING AND VENTILATION.

The pump(s) must be fully primed and vented before starting, since the mechanical seal faces are lubricated / cooled by the pumped liquid.

i) An adequate supply of water should be available, in the system, or the supply tank should be filled with water, and the isolating valve opened.

ii) Close the Discharge isolation valve on the pump to be primed.

iii) Remove the fill / bleed plug completely, fill the suction leg and pump via the bleed point or priming point on suction lift sets, or open the suction valve slowly, allowing water to fill the pump on flooded suction sets.

iv) When water flows out of the fill / bleed point close the prime pot isolation valve, or the suction isolator and re-fit the fill / bleed plug.

v) The above procedure will need to be repeated for each pump in turn.

## ACCUMULATOR PRESSURE VESSEL.

The accumulator expansion pressure vessel, or vessels, are designed to act as a hydraulic buffer between the pumps and the system, and help reduce the number of starts per hour of the pumps.

All STOKVIS Booster and Pressurisation sets are Designed, Manufactured, Tested and Installed in compliance with the requirements set down in the Pressure Equipment Regulations 1999 (SI 1999 / 2000) for a 'Group 2' liquid (water).

During commissioning, the pressure vessel(s) will be given a pre-charge (using clean dry air or nitrogen gas), this must be checked, and adjusted, if necessary, on a regular basis to maintain the correct operation of the system (see maintenance for frequency).

When there is a small drop in pressure detected within the system, the product stored within the internal butyl rubber bladder of the vessel will be discharged, using the air pressure in the void around the bladder as a propellant, in an attempt to accommodate the requirements of the system.

To check the charge in the vessel the following operational sequence should be carried out.

i) Close the isolation valve feeding the expansion vessel.
ii) Attach a hose to the drain point and drain all water from the vessel.
iii) Check the pre-charge in the vessel and fill to required pressure, using clean, dry compressed air or compressed nitrogen gas at the Schrader valve.
iv) Close drain valve, remove hose and slowly open isolating valve to the system.

It is the users' responsibility to ensure that the pre-charge in the vessel is checked on a regular basis, following these directions.

The maximum pressure rating of the vessel is indicated on the label attached to the outside of the vessel, and must never be exceeded.

The use of clean, dry, compressed air for recharging of vessels must only be carried out by experienced personnel in a responsible manner.

The use of compressed nitrogen gas for recharging of vessels must only be carried out by experienced personnel who have studied, and understood, the relevant COSHH safety information data sheet.

Contact with refrigerated compressed gases may cause cold burns and/or frostbite.

Please note that under the HSE`s Transportable Gas Containers regulations, it is the end users responsibility to ensure that the pressure vessel is checked and its condition logged by a `competent person`. STOKVIS can offer this service, along with all other service and spare parts requirements for this equipment.

## PUMPS

Before any electrical works are carried out, or the terminal box cover is removed, on the pump, the electrical supply must be isolated and made safe.

Any electrical works should be carried out by a competent and qualified electrical engineer, in accordance with the requirements of BS 7671 and any relevant local and national regulations.

Ensure that the pump has been filled with liquid, primed and bled before operation, and is running in the correct direction as indicated on the pump body.

If any, or all, of the pumps are rotating the wrong way, isolate and make safe the power supply and swap any two phases to the motor to correct this

It is the responsibility of the engineer / operator to ensure that the pumps and motors are clear of obstructions and that an adequate air supply reaches the motor cooling fans.

Do not remove any covers designed to prevent access to rotating parts unless the electrical supply has been isolated and made safe before hand.

Do not operate the pump with covers or guards removed, missing or damaged.

Operating the pump with the discharge valve closed for more that a few minutes will cause the transfer of the power, taken by the pump, to be transmitted to the liquid being handled in the form of heat.

This can cause the temperature of the liquid to rise rapidly in a relatively short time, and can destroy or cause damage to occur to the internal components of the pump.

The pump must not be allowed to run dry under any circumstances since overheating will rapidly damage the internal components of the pump.

Pipe work attached to the pump set must be suitably supported such that there are no forces acting upon the suction and discharge manifolds of the set.

## COSHH

The responsibility of the Control of Substances Hazardous to Health lies with the user, who must at all times refer to the relevant COSHH data sheets and adhere to the information and instructions detailed within, assess the risks to health related to the product and what controls are needed, use those controls and ensure that workers use them, make sure that the controls are properly working, inform workers about risks to their health and carry out any training necessary.

## PRINCIPLE OF OPERATION.

**Pressure switch Controlled Units**

The unit is a pressure switch controlled multi - pump booster set, with the potential to operate all pumps simultaneously, giving duty/assist (/assist-standby) operation.

On a falling pressure, at a preset point, the duty pump pressure switch will make, causing the duty pump to start and at the same time initiating a minimum run timer, which will help prevent too frequent operation of the pump and control gear.

If for any reason the duty pump fails to meet the demand of the system the assist pressure switch will make, causing the second pump to run, again initiating a minimum run timer to protect the pump and control gear.

This procedure will be repeated to activate the assist / standby pump (if available) if the duty and assist pump fails to meet the demand of the system.

The pump(s) will run on under the control of the timer for a preset period, normally 3 minutes. If the pressure drops to the cut in point during the time out period, the system will be reset and the timer will run for a further 3 minute period.

Due to the timer control, the cut out pressure is not critical, but is normally set to a differential of around 1 bar above the cut in pressure. This figure may vary dependant upon site conditions and pump selection.

All units have one or more pressure vessels built in to provide a positive pressure to the system to aid control of the pumps.

Each pump starter is fitted with a thermal overload to prevent damage due to single phasing. If a pump trips, a lamp will illuminate and the overload relay will prevent the operation of the pump until such time as the overload is manually reset.

All standard units are fitted with a low water cut-off circuit, using a low voltage relay. Where applicable, this should be wired to a float switch or electrodes in the suction break tank. For fire fighting applications, the low water cut-off device will be linked internally within the panel, preventing its operation.

Dependant upon specification, volt free contacts for the remote indication of pumps running, pumps tripped and low water cut-off may be fitted for connection to clients BMS system.

## MULTI-PUMP UNITS.

On multi-pump sets the ‘Duty’ pump is normally determined via the internal control logic of the control panel rotating the pump sequence per operation, in an attempt to achieve even wear of the pumps.

# PRINCIPLE OF OPERATION.

### Variable Speed Controlled Units

The unit is a pressure transducer controlled multi - pump booster set, with the potential to operate all pumps simultaneously, giving duty/assist (/assist-standby) operation.

As the pressure, in the system, changes the internal software programming of the variable speed drive will adjust the speed of the pump to match the required duty of the system.

If the demand on the system exceeds the capacity of the 'Duty' pump the 'Assist' will automatically become enabled via the RS 485 data link or the control logic within the panel.

This procedure will be repeated to activate the assist / standby pump (if available) if the duty and assist pump fails to meet the demand of the system.

The pump(s) will run on under the control of the transducers which will continue to send a signal to the inverters to increase speed, decrease speed or to stop at zero demand. Due to the inverter control, the cut out pressure is not critical, but is normally set to a differential of around 1 bar above the cut in pressure. This figure may vary dependant upon site conditions and pump selection.

Overload, over current, under current over voltage and under voltage protection of the set is accommodated within the variable speed drive.

The operational time rotation of the 'Duty' pump can be pre-programmed within the drive (if required).

All units have one or more pressure vessels built in to provide a positive pressure to the system to aid control of the pumps.

All standard units are fitted with a low water cut-off circuit, using a low voltage relay. Where applicable, this should be wired to a float switch or electrodes in the suction break tank. For fire fighting applications, the low water cut-off device will be linked internally within the panel, preventing its operation.

Dependant upon specification, volt free contacts for the remote indication of pumps running, pumps tripped and low water cut-off may be fitted for connection to clients BMS system.

# NOISE

Exposure to loud noise can cause permanent hearing damage.

Damage can involve loss of hearing ability and people may also suffer a permanent sensation of noises or ringing in the ears.

Factors that contribute to hearing damage are noise levels and how long people are exposed to the noise on a daily basis.

Suitable protective equipment must be supplied if employees are to be exposed to excessive levels of noise for prolonged periods.

## MAINTENANCE

The unit is constructed using low maintenance components throughout and should not require any day to day maintenance. The following is the recommended frequency for various maintenance tasks.

Other items, such as security of fixings, terminations, etc. are not specified, but should be carried out as a matter of course, as on any other piece of equipment.

**Monthly.**

1. Check each pump for leakage and quiet running.
2. Check operation of set and test auto duty rotation.
3. Check pipe work and installation for condition and leakage.

**Six Monthly.**

In addition to the Monthly schedule:

1. Isolate and drain water from pressure vessels and check pre-charge pressure, topping up to specified pressure if necessary.
2. Using the valves provided, check the operating points of the pressure switches and adjust if necessary.
3. Exercise valves to prevent seizure.
4. Check control panel – test trips, check contactors, etc. for burning, check lamps.

Please note that under the HSE`s Transportable Gas Containers regulations, it is the end users responsibility to ensure that the pressure vessel is checked and its condition logged by a `competent person`. STOKVIS can offer this service, along with all other service and spare parts requirements for this equipment.

## ENVIRONMENT

STOKVIS recognizes the need for sustainable development and continually aims to improve the environmental effect of its activities.

The end user of the equipment supplied by Stokvis also has the responsibility of meeting or improving upon relevant legislative, regulatory and environmental codes of practice.

This will involve consideration of environmental issues, educating staff so that they carry out their activities in an environmentally responsible manner, promoting waste minimisation by recycling or finding other uses of by-products whenever economically viable and promoting the efficient use of resources, energy and fuel throughout the company’s operations.

# ELECTRICAL & MECHANICAL TEST CERTIFICATE

## 'A' Range Booster Sets.

| MECHANICAL TEST | | | |
|---|---|---|---|
| VISUAL INSPECTION | PASS | AT CLOSED VALVE | PASS |
| HYDRAULIC TEST | PASS | FUNCTIONALITY TEST | PASS |

| ELECTRICAL TEST | | | |
|---|---|---|---|
| VISUAL INSPECTION | PASS | EARTH CONTINUITY | PASS |
| EARTH BONDING | PASS | EARTH LOOP IMPEDANCE | PASS |
| INSULATION TEST | PASS | FUNCTIONALITY TEST | PASS |

The issue of this electrical and mechanical test certificate confirms that the product listed above has been fully tested to the manufacturer's standard inspection and test procedures. This also asseverates their compliance with the legislation and directives as listed on the declaration of conformity. (FORM No. 020 (08/03))

**QUALITY ASSURANCE:**  **Date: 4th January 2005**

Project Manager or nominee

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# DECLARATION OF CONFORMITY

**We hereby certify that the product, serial number as below, complies with the provisions laid down by the modified 'MACHINES' directive (EEC directive 89/392) and the appropriate national legislation.**

**Other directives which apply are:**
**98/37/EC – BSEN292 PT1/PT2 BSEN809 – EN60335 PT1 – EN29001 – 89/336/EEC BSEN55014/1 - BSEN50081/1 – BSEN50082/1 – BSEN50082/2 – 73/23/EEC EN60335/2/41 – BS4999 – BS5000/11 – IEC34/1**

**It also complies with the provisions of the draft Harmonised European Standard PR EN 809.**

**QUALITY ASSURANCE:** _____ **Date: 4th January 2005**
Project Manager or nominee

Form No. 020 (08/05)

BoosterA/revise2006

# WRITTEN SCHEME OF EXAMINATION

## In Accordance with The Pressure Systems Safety Regulations 2000

This document has been issued in compliance with the Pressure Systems Safety Regulations 2000. All Stokvis supplied booster and pressurisation sets are designed, manufactured, and tested in accordance with the regulations. All are issued with a written scheme of examination, to be read in conjunction with the set operation and maintenance manual.
This written scheme of examination is written and certified as suitable for the equipment listed only, and does not in any way certify the system as a whole. The responsibility for ensuring that the examination is carried out at the due times rests with the owner / user of equipment.

## EQUIPMENT DETAILS

The standard written scheme of examination is for new installations and is recommended to be carried out every six months. A thorough examination is recommended to be carried out every twenty four months.

The following pressure equipment is inspected and tested, as part of the assembly (where applicable):-

**Vessels (System vessels and pump set control vessels)**
**Piping (Pump set manifolds, and on site to isolation valves)**
**Safety accessories (Pressure regulating valves, pressure relief valves)**
**Pressure accessories (Pressure control switches, Transducers**)

**VESSELS**
A housing designed and built to contain fluids under pressure.
**PIPING**
All piping components intended for the transportation of fluids under pressure including pipes, tubing, fittings, joints, hoses etc,
**SAFETY ACCESSORIES**
Devices designed to protect pressure equipment against the allowable limits being exceeded.
**PRESSURE ACCESSORIES**
Devices with an operational function and having pressure bearing housings.

Manufacturer's Approval:  Date: May 2005 _

## STANDARD TESTING PROCEDURE (New Sets)

i) Visual inspection of the system and vessel for damage.
ii) Ensure pumps are disabled, isolate vessel(s) and drain any water from vessel
iii) Bleed any air from vessel
iv) Check that there is no pressure on either the water or the air side of the vessel.
v) Remove the flange or inspection hatch retaining bolts.
vi) Push diaphragm bag up into vessel and refit the flange
vii) Attach 'Bucket Pump' and pressurize the vessel to $1^1/_2$ times the Maximum Working pressure.
viii) Allow to soak for a minimum of 15 minutes
ix) Check for leaks
x) Exhaust pressure, remove 'Bucket Pump', remove flange and refit bladder and reassemble.
xi) Isolate vessel and any pressure sensitive equipment from the system.
xii) Attach 'Bucket Pump' and pressurize the system to $1^1/_2$ times closed valve pressure.
xiii) Allow to soak for a minimum of 15 minutes
xiv) Check for leaks
xv) Exhaust pressure from the system and re-establish vessel and sensitive equipment
xvi) Charge the air pressure in the vessel to the required value
xvii) Using 'Bucket Pump' set pressure switches to the required values
xviii) Remove 'Bucket Pump', connect to main water supply and fill the system
xix) Bleed each pump, individually, ensuring all air is exhausted
xx) Spin pumps to check for direction
xxi) Under take full running test of the system to closed valve pressure, checking the operation of the pumps and controls.
xxii) Inspect for any leaks
xxiii) Record all tests and observations onto the test sheet together with any settings
xxiv) Fill in label details and attach

## TESTING of an EXISTING SYSTEM

i) Visual inspection for damage or deterioration.
ii) Ensure pumps are disabled, isolate vessel(s) and drain any water from vessel
iii) Bleed any air from vessel
iv) Check that there is no pressure on either the water or the air side of the vessel.
v) Remove the flange or inspection hatch retaining bolts.
vi) Remove the flange or inspection hatch and inspect the diaphragm bag and hatch gasket for any damage. (If a significant volume of water is found in the vessel, but outside the bag, it could indicate a ruptured bladder.)
vii) Visually inspect the interior of the vessel for corrosion (if corrosion is present it must be assessed by a Competent Person regarding the measures required to repair or treat the area or to replace the vessel)

**If hydraulic testing required the following procedures would also be carried out**

a) Ensure pumps are disabled, isolate vessel(s) and drain any water from vessel
b) Bleed any air from vessel
c) Check that there is no pressure on either the water or the air side of the vessel.
d) Remove the flange or inspection hatch retaining bolts.
e) Push diaphragm bag up into vessel and refit the flange
f) Attach 'Bucket Pump' and pressurize the vessel to $1^1/_2$ times the Maximum Working pressure.
g) Allow to soak for a minimum of 15 minutes
h) Check for leaks
i) Exhaust pressure, remove 'Bucket Pump', remove flange and refit bladder and reassemble.
j) Isolate vessel and any pressure sensitive equipment from the system.
k) Attach 'Bucket Pump' and pressurize the system to $1^1/_2$ times closed valve pressure.
l) Allow to soak for a minimum of 15 minutes
m) Check for leaks

viii) Replace the hatch, ensuring that the bolts are tightened in the correct sequence, as recommended by the manufacturer
ix) Recharge the air pressure in the vessel to the required value and leave to stand for 15 minutes.
x) Check the air pressure in the vessel, and check for leaks
xi) Close the Drain valve and slowly open the isolating valve to allow water to return to the vessel and leave to stand for 15 minutes
xii) Check for any leaks
xiii) Re-enable the pumps to put the system back on line, still checking for leaks
xiv) Record all tests and observations onto the test sheet together with any settings

## RECORD OF EXAMINATION

| UNIT TYPE | | UNIT No. | |
|---|---|---|---|

| PUMP DETAILS | | | | | | | |
|---|---|---|---|---|---|---|---|
| PUMP MAKE | | | | PUMP TYPE | | | |
| No. PUMPS | | VOLTS | | RPM | | KW / HP | |
| **PUMP DETAILS** | | | | | | | |
| PUMP MAKE | | | | PUMP TYPE | | | |
| No. PUMPS | | VOLTS | | RPM | | KW / HP | |
| **VESSEL DETAILS** | | | | | | | |
| SIZE | | SERIAL No. | | YEAR | | RATING | BAR |
| SIZE | | SERIAL No. | | YEAR | | RATING | BAR |
| SIZE | | SERIAL No. | | YEAR | | RATING | BAR |
| SIZE | | SERIAL No. | | YEAR | | RATING | BAR |
| **MANIFOLD DETAILS** | | | | | | | |
| SUCTION | | NR VALVES | | DRAIN VALVES | | | |
| DISCHARGE | | GATE VALVES | | PR VALVE | | | |
| PRESSURE SWITCH TRANSDUCER | | PRESSURE GAUGE | | CONTROL LINE | | | |
| PRESSURE SWITCH TRANSDUCER | | PRESSURE GAUGE | | OTHER | | | |
| PRESSURE SWITCH TRANSDUCER | | OTHER | | | | | |
| PRESSURE SWITCH TRANSDUCER | | OTHER | | | | | |
| NOTES | | | | | | | |

## MAINTENANCE DETAILS

| DATE | ENGINEER | WORK CARRIED OUT |
|---|---|---|
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