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# STANDARD SPECIFICATION

## DWS 2510 SUPPLY OF VALVES

### AUXILIARY DRIVES

TO BE INCLUDED IN THE SPECIFICATIONS IF AUXILIARY DRIVES ARE TO BE USED



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# 1 ACTUATORS AND MOTOR OPERATED VALVES

## 1.1 GENERAL

This section comprises the specifications for hydraulic and electric actuators to be fitted to valves of various types. Preference will be given to hydraulically operated valves unless otherwise specified in the Project Specification.

All actuators shall be complete with provision for manual operation.

## 1.2 COMPLIANCE

Actuators for the motorised operation of valves shall comply with this specification in all respects.

Should it be necessary for reasons of application to deviate from the specification, such non-compliance shall be fully described and motivated in writing at tendering stage.

The Engineer's written acceptance of such motivation shall be obtained before proceeding. All such documentation shall form part of the Contract and be retained for record purposes.

## 1.3 DESIGN LIFE

The actuators shall be designed for a minimum maintenance free life of 10 000 open/close/open cycles, assuming maximum seating torque at the end of each stroke and an average of 33% of maximum seating torque during each stroke.

## 1.4 ACTUATOR SELECTION

The available torque transmitted to a valve shaft through an electric or manual actuator shall be rated to include a 25% safety factor in addition to the maximum torque required to fully open or close the valve under the maximum working pressures and prevailing flow conditions.

The Contractor shall submit drawings and/or calculations used for specifying the valve torque at tendering stage.

## 1.5 SOUTH AFRICAN REPRESENTATION

Actuators shall have substantial South African representation with comprehensive technical "know-how", service and spares available.

## 1.6 DUTY CYCLE

The Contractor shall specify the duration of an open/close cycle at tendering stage.

## 1.7 OPERATION

Actuators shall have a function to hold the gate/disc in any fixed position for an extended period.

All valves shall be capable of being opened or closed under an unbalanced pressure equal to the nominal pressure.



## 1.8 POWER SUPPLY

The actuator shall be designed to operate from a 400V three-phase or 230V single phase, 50Hz a.c. power supply. The actuator shall be capable of operating at the rated duty with a  $\pm 15\%$  variation of the applied voltage measured at the actuator.

The actuator shall be provided complete equipped with the necessary auxiliary equipment to provide the low voltage power required by its control circuits.

The actuators shall have the correct phase rotation of the power supply after the site wiring and connections have been made.

## 1.9 ELECTRIC MOTORS

### 1.9.1 Purpose Design

The motor shall have a minimum duty rating of four consecutive complete cycles or a continuous duty of 15 minutes, whichever is the more onerous.

### 1.9.2 Gear driven actuators

The actuator shall be fitted with a low inertia high torque purpose designed electric motor.

### 1.9.3 Hydraulic pump motor

The hydraulic gear pump shall be driven by a totally enclosed fan cooled electric motor suitable for direct on-line starting. The motor and gear pump shall form one assembly.

### 1.9.4 Motor Winding and Over-Temperature Protection

Insulation Class F shall be used on the motor windings and the winding temperature rise shall be designed for Class B.

Two temperature thermostat switches shall be embedded in the starter winding for rapid, accurate over-temperature protection of the motor windings.

### 1.9.5 Motor Enclosure Anti-Condensation Heater

Where specified, an anti-condensation heater shall be provided in the motor enclosure. This heater shall be automatically switched off while the motor is in operation.

### 1.9.6 Locked Rotor Current

The locked rotor current of motors shall be specified to permit adequate sizing of the power supply cable. The voltage at the motor during starting shall not drop below 85% of the nominal supply voltage.

### 1.9.7 Single Phasing Protection

Single phasing protection shall be provided to ensure that the motor is not operated with only two of the three phases of the power supply present.

## 1.10 ACTUATOR MOUNTINGS

The actuator shall be mounted directly onto the valve body or gearbox. Should a particular application require an adaptation device, any such device shall be a specific proprietary design for a particular type of valve. A comprehensive design of any such adaptation shall be submitted to the Engineer for approval.



Provision shall be made for a weep hole to release any seepage water from the valve in order to protect the gearbox/actuator from contamination.

The attachment of the actuator to the valve body shall be such that the actuator may be detached without disturbing the valve position.

The valve manufacturer shall ensure that there is no visible movement of the actuator on the mounting adapter or valve body when the actuator is in operation.

### 1.11 INDICATORS

The actuator/gearbox shall be fitted with an engraved dial indicator in accordance with drawing BF 1816 (Refer to Annexure VS1) on stainless steel material to give an accurate reading of the travel. The engravings shall be filled with black paint.

## 2 HYDRAULIC OPERATION AND POWER PACKS

### 2.1 GENERAL

A hydraulic power pack shall consist of a control panel, hydraulic cylinders, and electro-hydraulic powerpack consisting of an electrically powered hydraulic pump, a hydraulic fluid reservoir, a manual backup operating system, control-, check- and relief valves, electrical distribution box and all hydraulic piping, fittings and anchoring.

### 2.2 CONTROL PANEL

The control panel, designed as part of the support frame, shall comprise the following:

- a) 100-mm diameter glycerine filled pressure gauge with a range of 0 to 25 MPa with the working pressure of 17,5 MPa indicated with a red line.
- b) A stainless steel epoxy powder coated electrical distribution box protected in accordance with IP 65 of SABS 1222. The box shall include,
  - an isolator lockable in its off position,
  - A set of On/Off Push buttons interlocked to prevent dual activation.
  - Three red 230V LED multi-cluster type indicating lamps marked L1, L2, L3 (one per phase and which shall burn when the supply is on) shall be fitted. These shall illuminate when on.
- c) The cable from the distribution box to the motor shall be fixed to brackets provided for this purpose.
- d) An ammeter.
- e) Lever operated directional control valves with a maximum pressure rating of 18 MPa and rated for 1,6 times the design flow rate shall include the following:
  - Spring return to neutral
  - Open centre
  - A and B working parts shall be closed in neutral position
  - Built-in adjustable pressure release valve
  - Power beyond



- f) A label (white trafalite with black lettering) showing the open and closed directions as well as the valve number shall be fixed with stainless steel screws next to each directional control valve.
- g) Directional control valves shall be positioned to allow manual operation to be executed by one person.
- h) Double pilot operated check valves to arrest the hydraulic cylinders in the required position. For tubing lengths less than ten (10) metres the check valve(s) shall be fitted to the control panel and for tubing exceeding ten (10) metres as well as tubing exposed to direct sunlight the check valve(s) shall be fitted at the cylinders.
- i) Check valves exposed to weather conditions shall be sealed in a silicone filled stainless steel box with a removable lid. The connections shall be pressure tested before sealing.

## **2.3 PUMPS**

### **2.3.1 Gear pump**

A hydraulic gear pump with an efficiency in excess of 75 percent and a maximum pressure rating of 18 MPa is required.

The system operating pressure shall not exceed 17,5 MPa.

The gear pump shall be mounted separately from the reservoir with the suction pipe lower than the reservoir level. The suction pipe, protruding 30-mm minimum inside the reservoir from the bottom, shall be fitted with a lockable stainless steel ball valve for maintenance of the filter system.

A check valve shall be fitted after the gear pump.

A suction filter system comprising a 10 µm filter, of the replaceable cartridge element type, with a minimum capacity of four (4) times the delivery rate and a vacuum gauge shall be installed upstream of the gear pump.

### **2.3.2 Hand pump**

For details on the manual operation of the hydraulic system refer to paragraph 4.

## **2.4 ELECTRIC MOTOR**

For details on the electric motor refer to Paragraph 1.9.

## **2.5 HYDRAULIC FLUID RESERVOIR**

The hydraulic fluid reservoir, with a capacity of two (2) times the maximum combined displacement volume, shall be manufactured from mild steel grade 300 WA.

A removable lid, incorporating a watertight filler cap, shall be fitted to the reservoir and sealed with a gasket.

A hydraulic fluid level indicator shall be mounted on the reservoir in such a way that it is clearly visible whilst working on the control panel. Fluctuation of the hydraulic fluid level shall



not exceed eighty (80) percent of the scale and the minimum level, with all cylinders extended, shall be indicated with a red line.

The reservoir shall be mounted on an angle iron support frame, 150-mm minimum from the wall, with stainless steel 304L legs fixed to the floor with M16 stainless steel wedge anchors.

The reservoir bottom shall slope 1% minimum with a drainpipe and transparent glass water trap at the lower end. The water trap shall be fitted with a stainless steel ball valve, 250 mm minimum from floor level for draining purposes and sealed with a taper plug.

The reservoir shall be fitted with a breather filled with silica gel.

A purpose built sump shall be supplied below the power pack and reservoir in order to catch any fluid spilled during servicing and minor breakdowns.

Corrosion protection of the reservoir and auxiliary equipment shall be in accordance with Standard Specification DWS 9900: Corrosion Protection.

## 2.6 HYDRAULIC CYLINDERS

### 2.6.1 General

The hydraulic cylinders shall be entirely fabricated from stainless steel 316L unless otherwise specified and shall be designed for a pressure of 18 MPa and sized for a maximum system operating pressure of 17,5 MPa.

The exposed parts of the hydraulic cylinders (rams) shall be covered with UV stabilised rubber/material bellows. The bellows shall be sized to show discernible retention of the bellows shape at the full operating range of the hydraulic cylinder.

The Ra (Relative amplitude) on the rod and cylinder inner surface shall not exceed 0,2  $\mu\text{m}$ .

All the stainless steel components shall be pickled and passivated in accordance with Standard Specification DWS 9900: Corrosion Protection.

### 2.6.2 Cylinders

Cylinders shall comprise the following:

- 35 mm diameter ports drilled and tapped 1/2 " BSP minimum.
- A phosphor bronze guide bearing.
- An adjustable screw ring to compensate for manufacturing tolerances of the rod sealing set and metal parts.
- Chevron type rod sealing set capable of operating in submerged conditions to 10 metre.
- A wiper seal fitted to the cylinder cover.

### 2.6.3 Piston Rod and Piston

The piston rod and piston shall comprise the following:

- A stainless steel hard chromed piston rod.
- A double acting piston manufactured from phosphor bronze or cast iron.
- Guide bearings of PTFE or phosphor bronze.
- Pistons fitted with PTFE piston sealing sets consisting of a sealing- and 'O'- ring combination.
- Piston screwed to the rod and locked with a grub screw.
- An adjustable male clevice with stainless steel swivel bearing and locked with a nut.



## 2.7 PIPES AND FITTINGS

All hydraulic tubing (seamless), fittings, double ferrel type couplings, supports and anchorage shall be of stainless steel 316L.

# 3 ELECTRIC ACTUATOR

## 3.1 ELECTRIC MOTOR

For details on the electric motor see Paragraph 1.9.

## 3.2 ACTUATOR CONTROLS

### 3.2.1 Integral Motor Starters

Integral actuator control, whereby the entire actuator, motor and stop/start control, forward/reverse control and starter are integrally mounted in the actuator enclosure, are preferred.

Where the actuator motor is of such a size that a separate mounted starter is necessary, this shall be specifically stated.

In both cases, the reversing contactor starter shall be electrically and mechanically interlocked.

### 3.2.2 Integral Pushbutton Stations

The actuator shall be provided with an integral pushbutton station with the following features:

- Local/Off/Remote selector switch. This switch shall be padlockable in each position.
- Open/Stop/Close pushbutton station. The Open and Close pushbuttons shall only operate when a local selection is made on the selector switch. The Stop pushbutton shall be of the emergency latching type and shall operate in all positions of the Local/Off/Remote selector switch.
- Digital or mechanical local indication of the valve percentage open or fully open/closed status.

## 3.3 MONITORING AND PROTECTION

The following monitoring and protection systems shall be provided:

### 3.3.1 Position Indicators

See General Technical Specification paragraph 3.15

### 3.3.2 Torque Limit Switches

Torque limit switches shall be provided to sense an overload condition in either clockwise or counter-clockwise operation to protect the valve and actuator. These torque switches shall be adjustable over the entire torque range specified for the actuator. A back-up torque limit switch shall be provided with a "faulty system" warning light.





### 3.3.3 Travel Limit Switches

Travel limit switches shall be provided to stop the actuator at the required extremes of travel and shall be set to trip the actuator operation before the actuator torque limit switches are activated.

The positions of these travel limit switches shall be adjustable, permitting adjustment to the valve shaft travel. These limit switches shall remain synchronised with the valve shaft travel for both motor and hand powered actuator operation. Provision shall be made for protection against unauthorised tampering with these limit switches.

### 3.3.4 Motor Winding Thermostats

Refer to paragraph 1.9.

### 3.3.5 Potential Free Switch Contacts

Potential free switch contacts for remote and local indication of:

- Travel limit - valve open/closed
- Torque limit exceeded

These switches shall have both normally open and normally closed contacts rated at 2 amperes, 400 volts.

Indicator lights shall be installed to indicate whether the actuator has tripped on either limited travel or excessive torque.

## 3.4 ENCLOSURES

The enclosure(s) housing the mechanical, electrical and electronic components of the actuator shall be rated to IP68 of SABS 1222. The Contractor shall provide documentary proof that this requirement is met.

A corrosion resistant plate with red lettering, reading as follows, shall be affixed to the actuator terminal cover.

**WARNING**  
THIS ACTUATOR IS TESTED FOR WEATHER PROTECTION DUTY I.P. 68  
WATERTIGHT SEALS MUST BE MAINTAINED INTACT  
REFER TO INSTRUCTION MANUAL

Cable entry into the termination compartments of the actuators and control panels shall not impair the IP rating of the enclosure.

All cable glands shall be fitted with watertight UV stabilised plastic boots and shall be supplied with the actuator.

Anti-condensation heaters shall be provided in all compartments of the enclosure housing the components of the actuator.

Lead seals shall be affixed via wire through the body and cover on all electric compartment housings after final setting and wiring of the actuators by a qualified actuator service Engineer.



## **4 MANUAL OPERATION**

### **4.1 GENERAL**

All valves shall have a manual backup operation in order to open/close the valve during emergency conditions.

The position indicator shall remain synchronised with the actual valve position during manual operation.

### **4.2 MANUAL OPERATION FOR HYDRAULICALLY OPERATED VALVES**

A manual changeover from normal/automatic operation to manual hydraulic operation to open/close the valve(s) shall be supplied. A chart, clearly indicating the changeover procedure to manual hydraulic operation shall be supplied and mounted above the handpump. All information contained on the charts shall be engraved and painted red on 2 mm thick aluminium plates (minimum size A2).

A 40-cc/stroke double action hand pump shall be mounted on the right hand side of the reservoir with the operating lever in the vertical position for horizontal stroke. The lever shall be designed that the force required on the lever at Nominal Pressure does not exceed 90 N. The manual hydraulic operation shall be capable of opening or closing the valve under an unbalanced pressure equal to the Nominal Pressure. The handle of the lever shall be 1 000 to 1200 mm from floor level.

When the hydraulic power pack is energised, the unit shall automatically return to normal operation without imparting any motion to the pump lever, thereby ensuring the safety of personnel.

A check valve shall be fitted to the hand pump outlet.

The suction pipe to the hand pump shall be tapped after the filter system.

### **4.3 MANUAL OPERATION FOR ELECTRICAL OPERATED VALVES**

Closure of valves shall be through the clock-wise rotation of hand wheels. All valves shall be capable of being opened or closed under an unbalanced pressure equal to the Nominal Pressure. The effort required on hand wheels to open or close valves under these conditions shall not exceed 90 N.

A manual de-clutch lever shall be provided which, when operated, shall disengage the electric mechanism.

When the motor is energised, the unit shall automatically return to motor operation without imparting any motion to the hand wheel, thereby ensuring the safety of personnel.

## **5 GEARBOX DRIVE UNITS**

### **5.1 GENERAL**

Gears shall be machine cut and totally enclosed in weatherproof enclosures.



Shafts, gears and other rotating components shall be supported on heavy-duty roller bearings to provide the highest possible efficiency.

The gearbox shall be coated internally to 125  $\mu\text{m}$  and externally to 250 $\mu\text{m}$  + 50 $\mu\text{m}$  recoatable polyurethane in accordance with the Corrosion Protection Specification.

A seal shall be provided on the input shaft of the gearbox to prevent water from entering the gearbox.

A weep hole (diameter 10mm minimum or machined groove 10 wide and 4 deep) shall be provided between the valve and gearbox to release any seepage water in the event of seal failure.

## 5.2 LUBRICATION

The gearbox lubricants shall be such that the gearbox can be mounted at any angle without any lubricant leaking from the gearbox enclosure.

If a gearbox is 100% filled with lubricant, the gearbox shall be provided with a maintenance free membrane breather with sufficient capacity to accommodate the expansion of the lubricant over the full temperature range.

Gears shall be fully covered with the lubricant in order to prevent corrosion.

## 5.3 SHEARPINS

Easily replaceable shear pins shall be provided on gearboxes to prevent damage to the valve if excessive force is applied on the hand wheel in the fully open or closed positions. A spare pin shall be attached to each valve. The shear pins shall be detailed and specified in the manufacturer's operating manual.