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# Engineering Data Sheet

Document No:- 040M00651D799 rev 7

Installation, Operation & Maintenance Instructions for  
Swing Check Valves

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Date 31<sup>st</sup> August 2006

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## **CE MARKING AND THE PRESSURE EQUIPMENT DIRECTIVE 97/23/EC**

This has been implemented in United Kingdom law by the Pressure Equipment Regulations 1999 (SI 1999/2001).

The regulations apply to all valves with a maximum allowable pressure greater than 0.5 bar. Valves with a maximum allowable pressure not exceeding 0.5 bar are outside the scope of the Directive. Valves are categorised in accordance with the maximum working pressure, size and ascending level of hazard, which is dependent on the fluid being transported. Fluids are classified as Group 1, dangerous fluids or Group 2, all other fluids including steam. Categories are SEP (sound engineering practice) and for ascending levels of hazard, I, II, III or IV. All valves designated as SEP do not bear the CE mark nor require a Declaration of Conformity. Categories I, II, III or IV carry the CE mark and require a Declaration of Conformity (Note- all valves up to and including 25mm (1") having a maximum allowable pressure greater than 0.5 bar are designated SEP regardless of fluid group.)

## **CE MARKING AND THE ATEX Directive 94/9/EC**

### **Concerning equipment and protection systems intended for use in potentially explosive atmospheres.**

This has been implemented in United Kingdom law by the Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 1996 (SI 1996/192) and amended by The Equipment and Protective Systems (amendment) Regulations 2001 (SI 2001/3766).

The regulations apply to all valves where each valve:

- has its own potential source of ignition.
- operates in a potentially explosive atmosphere created by:
  - o the presence of air / dust mixtures external to the valve.
  - o the presence of gases, vapours, mists released from the valve through leakage.

The regulations will not apply to a valve without a potential source of ignition, which operates in a dust free environment and the fluid being transported is cold, inert gas or non-flammable liquid.

The requisite level of protection for valves not exempt from the regulations is defined as Group II category 2 and shall bear the following marking:

 **II 2 GD X**

## **PRODUCT LIFE CYCLE**

The life of the valve is dependent on its application, frequency of use and freedom from misuse. Compatibility with the system into which it is installed must be considered. The properties of the fluid being transported such as pressure, temperature and the nature of the fluid must be taken into account to minimise or avoid premature failure or non-operability. A well-designed system will take into consideration all the factors considered in the valve design, but additionally electrolytic interaction between dissimilar metals in the valve and the system must be examined. Before commissioning a system, it should be flushed to eliminate debris and chemically cleaned as appropriate to eliminate contamination, all of which will prolong the life of the valve.

## **LIMITS OF USE**

The valves to which these installation, operation and maintenance instructions apply have been:

- a) categorised in accordance with the Pressure Equipment Directive.
- b) designated with the requisite level of protection in the ATEX Directive as Group II Category 2 non-electrical equipment.

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These products are categorised for Group 1 Liquid, but are not necessarily suitable for all fluids in this group.

With the exception of Fig 650 PN25 the valves may also be used on Group 2 Gas.

Swing check valves are normally used on liquid service and are unsuitable for steam and compressed air service.

Refer to Hattersley Technical Application Engineers for advice. Codes of practice, specifications and regulations should be referred to for specific guidance for valve selection on hazardous service.

Fluid	Group 1 Liquid		
Fig No.	PN	DN	Category
M651/M653	6	40-150	SEP
		200-300	I *
	10	40-100	SEP
	16	125-300	I *
		40-50	SEP
		65-125	I *
M650	25	150-300	II *
		50-65	SEP
		80-300	II*

\* Categories I and II require CE mark

Fluid	Group 1 Liquid			
Fig No.		PN	DN	Category
651/653	D drilled	3.5	1½"-10"	SEP
		Class 50	12"	I *
	E drilled	13.8	1½"-2½"	SEP
	ANSI drilled	13.8 (class 125)	3"-5"	I *
			6"-12"	II *
			1½"-2½"	SEP
			3"-5"	I *
			6"-12"	II *

\* Categories I, II and III require CE mark

## Operating pressures and temperatures

### PN Rated Valves

PN	Non-shock pressure at temperature range	Non-shock pressure at max. temperature
6	6 bar from -10°C to 120°C #	4.4 bar at 230°C #
10	10 bar from -10°C to 120°C #	8.7 bar at 230°C #
16	16 bar from -10°C to 120°C #	11.8 bar at 230°C #
25	25 bar from -10°C to 120°C #	21.0 bar at 230°C #

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## Class Rated Valves

	Non-shock pressure at temperature range	Non-shock pressure at max. temperature
Class 50	6.9 bar from -10°C to 40°C #	3.5 bar at 155°C #
Class 100	13.8 bar from -10°C to 40°C #	6.9 bar at 170°C #
Class 125	13.8 bar from -10°C to 66°C #	9 bar at 218°C #

Not suitable for fatigue loading, creep conditions, fire testing, fire hazard environment, corrosive or erosive service, transporting fluids with abrasive solids, high velocity gases that can cause shock waves.

# The maximum surface temperature under normal use is given in the table. The auto-ignition temperature of a surrounding potentially explosive atmosphere must exceed the equipment surface temperature by at least 25% (BS EN 1127-1 clause 6.4.2).

## PRESSURE/TEMPERATURE RATING

These valves must be installed in a piping system whose normal pressure and temperature do not exceed the above ratings.

If system testing will subject the valve to pressures in excess of the working pressure rating, this should be within the test pressure for the body with the pressure applied upstream of the obturator.

The maximum allowable pressure in valves as specified in the standards is for non-shock conditions. Water hammer and impact for example, should be avoided.

If the limits of use specified in these instructions are exceeded or if the valve is used on applications for which it was not designed, a potential hazard could result.

## LAYOUT AND SITING

These Check valves may be installed in horizontal pipework and vertical pipework if the flow is in an upwards direction.

Swing check valves having 6 diameters of straight lengths of pipe upstream and 3 diameters downstream are suitable for velocities up to 3 metres/second. If the valve is situated such that turbulent flow enters the valve or is situated close to reciprocating pumps then the velocity should not exceed 2 metres/second.

### Lever and Weight (optional)

If the valve is used in a vertical pipeline with a lever and weight, this must be stated on the order so that the lever and weight assembly can be positioned accordingly.

It should be considered at the design stage where valves will be located to give access for operation (lever and weight option only), maintenance and repair.

Valves must be provided with adequate support. Adjoining pipework must be supported to avoid the imposition of pipeline strains on the valve body. Heavy valves may need independent support or anchorage.

**Note:-** Check valves must not be fitted in vertical pipework with the flow downwards.

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## **INSTALLATION**

Prior to installation, a check of the identification plate and body marking must be made to ensure that the correct valve is being installed. Any electrical component e.g. actuators, limit switches must be explosion proof and comply with the Directive and Standards as listed in BS EN 1127-1 clause 6.4.5.

Valves are precision manufactured items and as such, should not be subjected to misuse such as careless handling, allowing dirt to enter the valve through the end ports, lack of cleaning both valve and system before operation and excessive force during bolting.

All special packaging material must be removed.

**REMOVE WOODEN OR PAPER CHOCKS FROM INSIDE THE VALVE**, which are fitted before despatch to prevent disk movement.

In horizontal pipework the valve must be installed so that the bolted cover is uppermost and horizontal.

**Note:-** The valve must be installed with the direction arrow on the body coincident with the direction of flow in the pipeline. For vertical pipework the flow direction should be upwards only.

When large valves are provided with lifting lugs or eye nuts, these should be used to lift the valve.

Immediately prior to valve installation, the pipework to which the valve is to be fastened should be checked for cleanliness and freedom from debris.

Valve end protectors should only be permanently removed immediately before installation. The valve interior should be inspected through the end ports to determine whether it is clean and free from foreign matter.

The mating flange (both valve and pipework flanges) should be checked for correct gasket contact face, surface finish and condition. If a condition is found which might cause leakage, no attempt to assemble should be made until the condition has been corrected.

The gasket should be suitable for operation conditions or maximum pressure/temperature ratings.

The gaskets should be checked to ensure freedom from defects or damage.

Care should be taken to provide correct alignment of the flanges being assembled. Suitable lubricant on bolt threads should be used. In assembly, bolts are tightened sequentially to make the initial contact of flanges and gaskets flat and parallel followed by gradual and uniform tightening in an opposite bolting sequence to avoid bending one flange relative to the other, particularly on flanges with raised faces.

Parallel alignment of flanges is especially important in the case of the assembly of a valve into an existing system.

Flanged joints depend on compressive deformation of the gasket material between the flange surfaces.

The bolting must be checked for correct size, length, material and that all connection flange bolt holes are utilized.

At the conclusion of installation and before operating, all dust deposits shall be removed from the equipment.

## **OPERATING**

The Swing Check valve is self-acting.

**The lever and weight if fitted may be positioned accordingly to assist opening or closing.**

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## **MAINTENANCE**

The valve should be at zero pressure and ambient temperature prior to any maintenance.

Maintenance Engineers & Operators are reminded to use correct fitting tools and equipment, as follows:

Valves within the scope of the ATEX Directive with a protection level defined as Group II category 2 will operate in Zone 1 (gases / vapours) or Zone 21 (dusts) designated in BS EN 1127-1 Explosion prevention and protection. Tools are either 'single spark' e.g. screwdriver, spanner, impact screwdriver or 'shower of sparks' e.g. sawing or grinding. Only steel 'single spark' tools are permissible in Zones 1 and 21.

Tools causing showers of sparks are only permissible if:

- no hazardous explosive atmosphere is present.
- dust deposits have been removed and no dust cloud is present.

The use of tools on equipment in Zones 1 and 21 should be subject to a 'permit to work' system.

A full risk assessment and methodology statement must be compiled prior to any maintenance. This must include the removal of dust deposits by good housekeeping.

The risk assessment must take into account the possibility of the limits of use being exceeded whereby a potential hazard could result.

A maintenance program should therefore include checks on the development of unforeseen conditions, which could lead to failure.

In systems where corrosion could be a potential hazard, wall thickness checks on the body and bonnet should be made. This requires either the removal of the valve from the pipeline or removal of the cover with the system at zero pressure. If the wall thickness has reduced by 25%, the valve must be replaced.

Under normal working conditions the Check Valve should need little attention but when required, the following procedure is recommended.

### **Replace Cover Gasket**

It is recommended that the valve is isolated from the system and the valve is drained.

1. Loosen and remove the nuts/bolts from cover/body flange by rotating anti-clockwise.
2. Remove cover by placing a thin bladed screwdriver or wedge between cover and body and tap with mallet to release adhesion.
3. Ensure gasket and body/cover jointing faces are clean.
4. Examine internal parts to ensure correct operation.
5. Fit new gasket in place.
6. Carefully position cover ensuring gasket is not displaced.
7. Re-fit nuts/bolts and tighten diagonally and evenly.

### **Replace Hinge Pin Plug Gasket**

It is recommended that the valve is isolated from the system and the valve is drained.

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1. Remove the cover as described in 1 to 4 (Replace Cover Gasket).
2. Slacken the hinge pin plug by anti-clockwise rotation and fully withdraw.
3. Ensure the body and hinge pin plug joint faces are clean.
4. Fit a new PTFE washer to the hinge pin plug, which can be, held in place with a small amount of grease. Screw and tighten hinge pin plug into body. Assist engagement of the hinge pin plug onto the hinge pin by lifting the disk assembly in the closed position whilst screwing in the hinge pin plug fully.
5. Replace the cover as described in 4 to 7 (Replace Cover Gasket).

## **Replacing the Operating Shaft 'O' Rings (Lever and Weight option only)**

It is recommended that the valve is isolated from the system and the valve is drained.

1. Remove the lever and weight assembly.
2. Slacken the operating shaft plug by anti-clockwise rotation and fully withdraw by sliding down the shaft.
3. Remove the 'O' rings and wiper seal located at the end of the plug.
4. Remove any old grease and clean the bore through the plug. Ensure the body and hinge pin plug joint faces are clean. Remove any sharp edges around the square on the shaft which may damage the 'O' rings when re-assembling.
5. Fit new 'O' rings and wiper seal using silicone grease to ease assembly.
6. Fit a new PTFE washer to the hinge pin plug, which can be held in place with a small amount of grease.
7. Carefully slide the plug onto the operating shaft taking care not to damage the 'O' rings and wiper seal.
8. Screw and tighten the plug into body.
9. Re-fit the lever and weight assembly.
10. Refill the system and pressurise checking for leakage, tightening the plug if necessary.

For the supply of genuine Hattersley spares or technical assistance contact:

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