

DOCK LEVELLERS



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**Hidden risks of dock levellers
Transgression to principal security requirements
Regulation 98/37/CE**

armo

Dear Sirs,

You may have already become acquainted with the news, but we think it important to inform you that every year, due to the use of incorrect hydraulic circuit, thousand of dock levellers with the CE mark are introduced into the European market that, according to their destination, risk to prejudice people's protection, in transgression to principal safety requirements – Regulation 98/37/CE.

The risks, warned by us in this special edition of Armo Informa, relates to the lack of design in the hydraulic circuit. We start by saying that there are 3 kinds of hydraulic circuits that exist in the market place:

- A. Hydraulic circuits that do not provide suction of oil from the tank to the cylinders and without duplication and automatic survey of critical components. The dangers are shown in chapters 2-3-4.
- B. Hydraulic circuits that do not provide suction of the oil from the tank to the cylinders. The dangers are shown in chapter 2.
- C. Hydraulic circuits that will provide suction of oil from the tank to the cylinders and with duplication and automatic survey of critical components. We confirm, in this case, a correct design does not create others dangers.

The failure is due to a design defect of the hydraulic circuit used and not by the structure. In fact it is possible to install to the same dock leveller power packs type A, B or C and obtain clear-cut results: the dock levellers with power packs A or B fitted are dangerous, the same dock leveller with power pack C fitted is safe.

To know which type of hydraulic circuit you have on your dock levellers, it is sufficient to examine the hydraulic drawing or to make the tests we explain in this booklet.

We remind that the dock leveller, being a machine, must follow all specific regulations independently from used component.

Due to 'economic' reasons, the A or B type hydraulic circuits are still being installed, missing the basic of the safety rules.

The tests explained in chapters 2.3 and 3.3 were done in the presence of an expert of the Turin Courthouse on dock levellers, with a power pack type A; the result of this first test is easily shown on internet at the address www.armoweb.com/videoonline.asf

These tests can be carried out on every single dock leveller, with the proper cautions.

In our opinion, regulations are clear and complete in there entirety. In any case the art. 7 of Regulation 98/37/CE indicates that machines, which could compromise safety, due to non conformity, must be taken away from market place.

For hopefully simple reading, this Armo Informa has been divided in to chapters.

Remaining at your disposal for everything you deem necessary, best regards

Managing Director
Gianpalo Ardissone

1.1 Regulation 98/37/CE of June 22nd 1988

The principal safety requirements are mentioned in the Regulation 98/37/CE of June 22nd 1988. The mentioned regulation has repealed and been replaced by the 89/392/CE, known as a Machine Regulation

1.2 European Regulation UNI EN 292 Part 1 and Part 2 of November 1992

The machinery safety obligations, general and principal design requirements, are mentioned in UNI EN 292 Part 1 and Part 2 of November 1992 which is a regulation of type “A”, including main concepts, design principles applied to all machines.

1.3 European Regulation UNI EN 1398

The mentioned requirements to dock leveller are listed in UNI EN 1398, regulation of type “C” which is the one including detailed safety requirements for a machine or for a particular machines group.

In the preface chapter 0, the Regulation states that “...machines must satisfy EN292, for dangers not covered by the present regulation...”

1.4 Hazard value

To estimate the hazard value, refer to EN 292/2, art. 6.1 e 6.2 that we sum up:

“... When a danger is present on a machine, and no safety precautions are adopted, this will cause, at the end, wounds or wealth damages...”

...a machine must be safe... but as it is impossible to reach absolute safety, it is necessary to obtain the biggest safety level, considering the technology status time by time.

... To judge the safety level required to a machine, a statistical datum, showing the low number of accidents is not sufficient. Particularly, the lack of accident data can not be considered an automatic presumption of low risk level and it can not authorise to assume less important safety precautions ...

...when a danger level is estimated, consider the highest wound or wealth damage resulting from an identified risk, also with a low possibility that this wound or wealth damage will arrive...”

1.5 Safety Principles

A danger is eliminated by applying the prescription of Part I of the Regulation 98/37/CE Art. 1.1.2:

“Safety principles - ... For the choice of correct solutions, the manufacturer must follow the next principles:

- To remove or reduce all risks in the best way (addenda of safety in the machine design and production) ...”

This concept is also indicated in EN292/1 Art.5.3 “Removal of risks by means design”.

Schematic information of the strategy for the choice of safety requirements is indicated in the table 2 page 15 of EN292/1, where it is underlined that, if the reduction of the risk by means of design does not cause other dangers, the goal is reached.

2.1 Floating position

The dock leveller lip lies on the truck body, free to float and follow fluctuations of the vehicle bed height during loading.

When the dock leveller platform goes down, the oil is “pushed” by the weight of the frame, the oil is forced through the cylinder and back into the hydraulic tank, when the dock leveller rises back up the oil **must** then travel back from the hydraulic tank and back to the cylinder, by means of a vacuum effect. If this does not happen, oil is then missing from the cylinder with an automatic shut down of all security devices.

2.1 Hazard extent

Let’s consider a full truck approaching to the loading bay to unload goods. The forklift enters the truck for unloading goods; the truck body will go down by circa -200 mm due to the extra weight. At the end of these unloading operations, the completely empty truck body will be at a position of circa +200 mm higher than its initial position before the forklift entered to start unloading.

So, the overall potential vertical travel of the leveller platform and truck body will be about 400 mm. This measurement has been used by us to carry these practical tests out.

Of course, respecting En 292/2 6.1 and 6.2, “hazard value” is considered in its worst conditions.

2.3 Practical tests

With a fork lift truck, it is possible to simulate the oscillation of the truck body during loading and the trucks sudden removal from the loading bay which will test if the platform will ‘lock out’. With the lip completely open and laying on the ‘forks’ of the lift truck, operate the fork lift truck, so that the frame travels through the 400 mm of vertical movement as mentioned above and in this scenario the following tests have been carried out:

- a) **Down stroke speed check test** – With fast lowering of the lift truck forks, the dock leveller goes down to an unguarded speed. After the first 400 mm (when the cylinder takes oil) the dock leveller goes down to a controlled speed confirming the correct operation of the limiting device
- b) **Emergency push button test** - By pressing the emergency button and with a quick lowering of the lift truck forks, the dock leveller goes down to an unguarded speed. After the first 400 mm (when cylinder takes oil), the dock leveller stops confirming the correct operation of the emergency push button.
- c) **Safety device with empty dock leveller test** – Lift truck moves away, the dock leveller falls down for the first 400 mm because of oil missing from the Cylinder, and it continues for about 100 mm by inertial force.
- d) **Safety device with a load of 1000 kg on the dock leveller test** – Removal of the lift truck, the dock leveller falls down for the first 400 mm because of oil missing from the Cylinder, it continues for about 200 mm by inertial force.
- e) The test of the safety device with a load more than 1000 kg has not been carried out because dangerous.

All tests have shown that due to their being no suction of oil from the hydraulic tank back to the lift cylinder there is a sudden automatic shut down of all safety devices.

2.4 Reference regulation

En 292 – Part II – Par. 3.8 The hydraulic circuits of the machine must be designed in order to avoid danger caused by a missing or lack of pressure.

En 1398 – Par. 6.3.4.3 The draining of oil from the cylinder doesn't arrive if the down stroke of dock leveller is stopped.

2.5 Transgression of Regulations

EN292 – Part I – 5	Strategy of safety measures choice
EN292 – Part I – 5.3	Removal of danger by means of design
EN292 – Part I – 6	Hazard value
EN292 – Part II – 3.7	Uncontrolled modification of speed – Impossibility to stop mobile parts – Shut down of safety devices
EN292 – Part II – 3.8	Pressure loss
EN1398 - 6.3.1	Automatic safety device (stop in 0.20m)
EN1398 - 6.3.2.3	Controllers (empty down stroke speed <0.15m/s)
EN1398 - 6.3.2.8	Stop of dock levellers (in case of emergency)
EN1398 - 6.3.2.9	Prevention of automatic start (uncontrolled movements)
EN1398 - 6.3.4.3	Cylinders (uncontrolled draining)

2.6 Remarks

The danger seems to be undervalued or unknown: in any case never stated, in opposition to the Law Decree 242/96 Art. 3, par. 1,2a,2b,11 "... the employer must self-certify, by written letter, the complete list of risks and the fulfilment of pertinent obligations ..."

The justifications usually given can be summed up as follows:

- Truck bed height fluctuation during loading is very little – however, it is enough to see the internet video to understand that already with the entry of a fork lift, the truck body goes down of about 250 mm.
- The truck must not go away until the load/unload is finished – who states this, normally declares that his dock leveller is equipped with automatic safety device that starts up when the truck goes away.

In any case, nobody else is better positioned than the final end user to judge if the danger is present.

Chapter 3 – Electric circuit failure

3.1 Floating position

The dock leveller lies on the truck body, free to swing and follow the height fluctuations during loading, in order to follow vertical oscillations of the truck without ever leaving it.

If duplication of critical components and automatic survey, as foreseen by EN 292/II art. 3.7.5. e art. 3.7.6, is not applied into the hydraulic circuit, every electrical problem could cause a dangerous failure, because it stops the dock leveller from the vertical oscillation, or 'free floating'

3.2 Hazard extent

The electrical failure causes a danger which the extent is proportional to the used load:

- Up to 2000 kg a trip hazard between platform lip and vehicle bed
- More than 2000 kg a trip hazard, hydraulic components explosion (Chap.4) and permanent deformation of dock leveller structure.

3.3 Practical tests

By using a truck and a lift truck the following tests have been carried out:

- a) **Travel of the lift truck from truck body to warehouse** – The test is to simulate the unloading using a lift truck with a total weight of 5500 kg placed on the truck. The operator is on the forklift truck at the far end of the trailer near the cab with the leveller platform and lip in the normal operating position. At this point the emergency stop button or switch is activated to simulate a failure of the electric circuit. When the fork lift truck drives out of the vehicle back towards the warehouse, the vehicle body, due to its suspension, is lowered by some 75mm, the platform has remained stable to simulate an electric plant failure so a gap is created. There is a trip hazard, and the operator can not see the control panel.
- b) **Passage of lift truck from warehouse to truck body (NO real test was done)** – As you can see on internet address www.armoweb.com/videoonline.asf, the passage of the lift truck caused a vertical oscillation of the truck body of about 250 mm. This difference could cause a serious danger for operator safety and a permanent deformation of the structure.

3.4 Reference Regulation

En 292 – Part I – Par.3.16 – Dangerous breakage...It is a defect on the machine or in its power feeding, causing a dangerous situation.

En 1398 – Par.3.10 – Floating position is the property which allows dock leveller, laid on the vehicle, to automatically follow all vertical movements of vehicle during loading operations.

En 1398 – Par.6.1.5 – The dock levellers must be designed in order to avoid stumble risks in the loading area.

3.5 Transgression of Regulations

EN292 – Part I – 3.5 Removal of danger by means design

EN292 – Part I – 3.12 foreseen use of the machine

EN292 – Part I – 3.16 Dangerous failure

EN292 – Part II – 3.7.5 Duplication of “critical” components

EN292 – Part II – 3.7.6 Automatic survey

EN292 – Part II – 5.1.2 the user instructions must not compensate the design lack

EN1398 – 3.10 Floating position

EN1398 – 6.1.5 Stumble risks

3.6 Remarks

This danger is known by dock leveller manufacturers; usually it is indicated in the user and instruction manual and it is notified by a pilot lamp installed on the control panel. The operator, in case of lamp off, must not use the dock leveller.

We think it is possible, during the load/unload operations, for the operator not to be able to see the pilot lamp switched off and he continues to work normally.

We remark that in any case the Law foresees dangers must be solved by the design and the user and instructions booklet must not compensate for the lack of design.

4.1 Over load pressure

Usually the pressure in the hydraulic circuit with a load on the dock leveller in the operating position but without lying on the bed of the vehicle, can reach an over load equal to 800-1000 atm. This over load pressure depends on the dock leveller dimensions and cylinder position.

4.2 Hydraulic drawing check

In case of electric power missing, the detail indicated in Fig.1, is formed by the valve group, flex pipes and connection is not protected by a max pressure valve. The pressure in this part of the hydraulic circuit can reach the max above mentioned value (800-1000 atm).

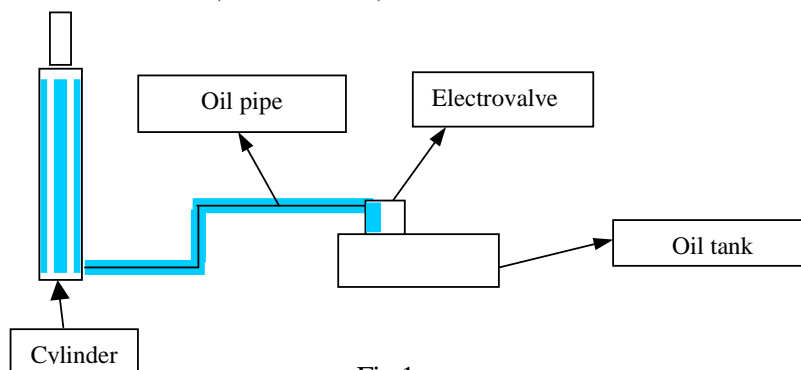


Fig.1

4.3 Practical test (carried out in Armo factory)

With the emergency push button switched on, we loaded a dock leveller, equipped with a power pack A, with a weight of 2500 kg; the over load pressure in the mentioned circuit reached 350 atm and it caused a valve group explosion, realised in aluminium die-casting.

4.4 Reference Regulations

En 292 – Part I – Par.3.8 The hydraulic circuits of the machine must be designed in such a way to not exceed, in these circuits, the max possible pressure.

En 1398 – Par.6.3.4.2 A limiting pressure valve must be installed in all hydraulic circuit. It must be placed and adjusted to prevent the operation with a pressure more than 115% of the normal operation pressure.

4.5 Transgression of Regulations

EN292 – Parte I – 3.8	Protection from dangers due to hydraulic circuits
EN292 – Parte II – 3.7.5	Duplication of “critical” components
EN292 – Parte II – 3.7.6	Automatic survey
EN1398 – 6.3.4.1	Requirements for hydraulic equipments - Characteristics
EN1398 – 6.3.4.2	Pressure limiting valve

4.6 Remarks

It results that this problem has never been taken into consideration and we can not offer any remarks about this issue.

Chapter 5 – What is foreseen in the case of failing of the safety requirements

5.1 Regulation 98/37/CE – Enclosure 5 – Conformity declarations

“Before drawing the CE conformity declaration up, the manufacturer... must make all necessary researches and tests on components, accessories or on the complete machine to establish if it could be installed and set up in safety conditions, due to its design and manufacturing...”

5.2 Regulation 98/37/CE – Enclosure 7 – CE mark

“The CE conformity declaration signature authorises the manufacturer to mark his machines with the CE brand.”

If the above indication at point 5.1 is not respected, the CE brand cannot be applied.

5.3 Regulation 98/37/CE - Art. 5

“The member States consider the machines marked CE and with the proper CE conformity declaration according to the obligation of safety regulations.”

5.4 Regulation 98/37/CE - Art.7

“... If a member State find out that some machines marked with “CE”.....used according to their destination, risk to prejudice the safety of people, animals or goods, it assumes all necessary measures to take machines or safety components away from market, to forbid the introduction on the market, the set up or to limit the free distribution ...”

5.5 Regulation 98/37/CE - Art.8

“In case the manufacturer did not follow the obligation about safety requirements, these obligations are incumbent on whoever imported the machine on the market”.

The responsibility is always of the manufacturer: but, when he does not follow the safety requirements, according to Art 8, the responsibility rests on everybody: supplier, designers, installers and employers.

5.6 Regulation 98/37/CE - Art.10

“... Any notification by a member State of an illegal application of the CE brand obliges every manufacturer to adapt the product according to CE mark obligations and to stop the breach of the law...”

“.. In case conformity failure continues to exist, the Member State adopts all necessary measure to limit or forbid the import of the machine on the market or guarantees the withdrawal of it from trade...”

Chapter 6 – What Law requires

Law Ordinance 626/94 and 242/96

In Italy the fulfilment of Safety Regulation is according to Decrees Nr. 626 of September 19th 1994 and following modifications D.L. 242 of March 19th 1996. Please, inform yourself for your country regulations.

OBLIGATIONS OF MANUFACTURERS AND SUPPLIERS.

“It is forbidden the manufacturing, the sale, the rental and the licence of machines, equipments and installations not following the present law regulations about safety ...”

(from D.L. 242/96, Art. 4, par 2)

OBLIGATIONS OF DESIGNERS

“The designers of working area, place and plants must respect the general principles for safety and wealth prevention about technical and project choices for machines and protection devices according to the main safety requirements foreseen by the present regulation”

(from D.L. 626/94, Art. 6, par 1)

OBLIGATIONS OF INSTALLERS

“Installers and assemblers of plants, machines and other technical equipment must follow all safety and working hygiene requirements, and all the instructions supplied by manufacturers of machineries and technical equipments of their competence.”

(from D.L. 626/94, Art. 6, par 3)

OBLIGATIONS OF EMPLOYER

Choosing the working equipments, the employer, according to the company activity, that is the production unit, must estimate ... the risks for safety and wealth of his workers...After this, the employer will draw the following document up:

Report about the safety and wealth risks during working, where he lists the used principle for this evaluation.

The identification of protection and prevention systems...

This document will be kept in the company

... The employer must self-certify, by written letter, the complete list of risks and the fulfilment of pertinent obligations

(from D.L. 242/96, Art. 3, par 1,2a,2b,11)

The non-observance of the principal security requirements is prosecutable offence according to mentioned Regulations

