



FEDERATION EUROPEENNE DE LA MANUTENTION

SECTION IX

FEM
9.754

Safety rules for automatic miniload storage and retrieval machines

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Preliminary note

When deviating from the following recommendations, equivalent regulations, especially regarding the protection of persons, should be agreed upon in writing by the supplier and the customer; they are, if possible, to be laid down previously with the competent authorities.

1 Scope

The regulations laid down in the present rules, apply to miniload storage and retrieval machines which are used for the automatic service of shelves; they cover miniload storage and retrieval machines which operate in an enclosed area and which have a maximum height of 12,50 m, a maximum load of 315 kg, and which do not transport bulky loads (total dimensions length + width + height < 2,5 m). These miniload storage and retrieval machines have no installation to carry persons.

The machines which do not meet these criteria, do not fall under the present rule and must correspond to the regulations of FEM 9.753 „Safety rules for storage and retrieval machines“.

2 Definitions

The definitions of FEM 9.101 of FEM Section IX are complemented within the scope of the present rule as follows:

2.1 Miniload storage and retrieval machines

A miniload storage and retrieval machine is an automatic conveyor for unit loads.

2.2 Enclosed area

The enclosed area comprises the areas in which persons can be endangered by miniload storage and retrieval machines.

These areas are:

- the operating range of the miniload storage and retrieval machine
- the shelves
- the area in which the load units or products, which are being moved by the miniload storage and retrieval machine, can fall down.

2.3 Operating range of the machine

The area taken up by the movements of the miniload storage and retrieval machine.

2.4 Operator's position(s)

Each place from which the movement of the storage and retrieval machine can be commanded; it always lies outside of the enclosed area. Do several operator's positions exist, one operator's position (called the main operator's position) must have the priority over the others.

3 Construction and equipment – rules and regulations

With respect to the materials used, the design, the method of construction and equipment, the machines must comply with the state-of-the-art engineering and especially with the regulations put down in the documents of FEM Section IX (TSC storage and retrieval machines) and meet the relevant regulations in the country of the user.

4 General conditions of operation

4.1 Construction of the installation and operation

The conditions of the installation and operation must be subject of a performance spec which is drawn up by the supplier and the user and where is put down especially the place of erection, the kind of load, the through-put, etc.; should it be necessary to consider certain

factors in an installation with respect to safety, like fire, explosion, risks of chemical or biological nature, prejudice to the environment, noise, etc., these factors have to be laid down by the parties to the contract.

The description of the manufacturer is applied, where no special operating conditions are agreed upon.

4.2 Delimitation of the enclosed area

4.2.1 The enclosed area shall not be accessible during operation. The access can be prevented by permanently installed enclosings (wall, partition, fence, etc.) or by invisible barriers. Only qualified and authorized personnel may pass these barriers after having taken all necessary precautions. The opening of an access during operation must provoke an immediate stillstand. If the access is through a door, the door must have the following characteristics:

- it must open only outwards
- it must be possible to open it from the inside without a key
- it only shall be possible to open it from the outside with a key.

4.2.2 Warning and directional signs

Clearly visible warning signs have to be put on suitable places, especially at the access, which prohibit the access to the enclosed area or the travelling of persons on the storage and retrieval machines or which give other indications.

4.3 Load units

The load units must comply with the specifications accepted by the manufacturer. The user has to see to it that the load units are in such a condition not to fall down into the enclosed area during operation, not to jam and not to project into the area of operation of the machine.

4.4 Application

It is prohibited to use miniload storage and retrieval machines for purposes other than the one it was constructed for.

5 Safety equipment

These measures and dispositions are meant to ensure the safety of persons and goods, considering the legal regulations in the country of the user, after determination of the causes of danger (including the dangers in connection with maintenance and repair).

The means for preventing accidents must be examined in the following order:

- accident preventing by the machine itself already in the stage of construction, in order to avoid the origination of danger;
- when this is not possible, provision of protective measures.

5.1 Removable protection equipment

If the installation requires this kind of protection equipment (coverings, partitions, fences, etc.), it is to be provided with safety contacts which prevent dangerous movements of the machine when the protection equipment is removed.

5.2 Brakes

The drives for the travel and lifting unit must be equipped with brakes which actuate automatically in the event of power failure.

5.3 Limitation of the travelling and lifting movement

To delimit the movements of the travel and lifting unit, the following devices are to be provided:

- preliminary limit switch to reduce the speed
- limit switch with an automatic opener which turns off the main current on all poles, over the main relay
- appropriate buffers have to be provided to take up the energy of the travel movement.

5.4 Anti-collision protection

If a number of machines are in operation in one aisle, the aisle must be provided with a device to prevent collisions.

5.5 Anti-derailment, anti-tipping, anti-falling devices

The stability of the machines with the maximum load must be ensured in all operational positions and for all travel movements in accordance with FEM 9.311.

Devices to prevent derailment must be fitted on the machines and must still be effective in the event of the travel or guide rollers breaking.

Rail sweeps, located as low as possible, must be provided in front of the travel wheels.

5.6 Electrical safety

In the following, special measures are dealt with, which ensure the safety of the persons charged with the operation, maintenance and inspection of the miniload storage and retrieval machine.

These measures exceed the devices necessary for the regulation and control.

5.6.1 Earthing

If auxiliary circuits are used for the control of the machine, they must be earthed on the secondary side, in order to prevent unintentional movements in the event of an earth fault.

5.6.2 Devices for emergency disconnection

A device for emergency disconnection with mechanical interlock in open position must be provided on the control station outside the enclosed area; and if by reasons of the design or lay-out of the installation it is not possible to overlook the whole enclosed area, several devices for emergency disconnection must be installed in a way to cover the whole concealed area. The opening of these devices may only occur by means of a key or a device which ensures equal safety. The number, the position etc. of these devices for emergency disconnection must be agreed upon by the user and the manufacturer before the construction of the installation.

5.6.3 Putting into service

The putting into service or the re-putting into service after the acting of the emergency disconnection may only be possible from the main control station.

These devices may be placed inside the enclosed area for adjusting and maintenance purposes.

In this case they must be located outside the reach of operation of the machine and be connected to a device for emergency disconnection.

5.6.4 Manual operation

Should it become necessary during adjustment and maintenance operations to command the different movements by hand, a device must be provided which makes it possible to switch from automatic to manual control. A device for switching from automatic to manual control must be placed outside the protective device. This

switching may only be possible in connection with the key mentioned in chapter 3.1.1 of FEM 9.753, which may only be removed in the „Off“ position.

Each movement is controlled by constantly pressing the push-button (releasing the push-button interrupts the movement).

The push-buttons for the manual control of the movements are integrated in a console which may be situated in the enclosed area outside the operating range of the machine. Outside the enclosed area, this console must be covered with a mechanically lockable cover.

When the manual control is situated inside the zone of danger, it must be ensured that no harm can come to the operating personnel. This can be achieved for example by an enclosed operator's position, by reducing the speed, by protective bows, etc.

5.6.5 Power supply

The unprotected conductors of the power supply must be wired or protected resp. in a way to prevent unintentional contact by the personnel.

5.7 Lighting

a) The machine must be designed in a way to make it possible to instal the lighting system for the maintenance area.

b) The user has to see to the general lighting of the installation.

6 Maintenance, inspection, repair

6.1 Maintenance of installation shall be carried out at regular intervals.

6.2 Maintenance and repair shall be carried out by qualified personnel who are acquainted with the machines, the installation, the regulations and the safety equipment.

6.3 Maintenance work shall be carried out in accordance with the manufacturer's instructions and confirmed with the signature and date. The documentation is to be kept accessible at any time.

6.4 During maintenance work the miniload storage and retrieval machine must be switched off and secured against unauthorized starting.

6.5 If two miniload storage and retrieval machines operate on the same rail and one of them is being serviced, both machines have to be put out of operation and secured against unauthorized putting into operation.

If the available machine must be kept running, a buffer and an electric contact must be provided to protect the area of maintenance of the machine which is switched off.

6.6 General rule: When working in the danger area, the persons concerned must take precautions to protect themselves against danger.

6.7 Defects or damages which are found during inspection or maintenance work must be immediately reported for repair. In the event of obvious danger for the personnel or the machine, the equipment must be stopped immediately.

6.8 The spare parts must be in accordance with the instructions of the manufacturer.

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