FEM

European Materials Handling Federation

www.fem-eur.com

Product Group /

Intralogistic Systems

08.2016

FEM 9.101

Guideline /

Terminology – Storage and Retrieval Machines - Definitions

For references see end of document

Index

For references see end of document

1 Scope

This document has been produced as a guide, which gives a general overview of the storage and retrieval machine (SRM) and related topics. Construction-specific criteria as well as operation-specific criteria will be discussed. It contains a functional description of the assemblies for the construction of an SRM and furthermore of all components related to the technical implementations at the state of the art. The practical use and operation procedures of an SRM will also be discussed.

The aim of these guidelines is to provide a definition and the appropriate terminology of the SRM. Subjects such as calculations, selection criteria of individual components, the realisable throughput or appropriate cycle times, must be delimited and are not part of this guideline. All standards dealing with SRM are listed in clause 2. This enables the reader to take a closer look at the topics that are relevant for him.

2 Reference documents

The following reference documents are indispensable for the application of this document. For dated References, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 528	*Rail dependent storage and retrieval equipment – Safety requirements*
ISO 10823	*Guidelines for the selection of roller chain drives*
DIN 15020-1	*Lifting Appliances – Principles to Rope Drives – Calculation and Construction*
DIN 15349	*Regalbediengeräte – Auslegungskriterien und Berechnungsgrundlagen für Triebwerke*
DIN 15350	*Regalbediengeräte – Grundsätze für Stahltragwerke – Berechnungen (Storage and retrieval machines; rules for calculations of steel structures)*
EN 15620	*Steel static storage systems – Adjustable pallet racking – Tolerances, deformations and clearances*
FEM 9.221	*Performance data of storage and retrieval machines – reliability - availability*
FEM 9.222	*Rules for the acceptance and availability of installations with storage and retrieval machines and other equipment*
FEM 9.311	*Rules for the design of storage and retrieval machines - Structures*
FEM 9.512	*Rules for the design of storage and retrieval machines - Mechanisms*
FEM 9.754	*Safety rules for automatic miniload storage and retrieval machines*
FEM 9.831-1	*Basis of calculations for storage and retrieval machines – Tolerances, deformations and clearances in the storage systems Part 1: General, single deep and Double deep Beam Pallet racking*

FEM 9.832	*Basis of calculations for storage and retrieval machines, tolerances, deformations and clearances in automatic small parts warehouses (not silo design)*
FEM 9.841	*Storage systems with rail-dependent storage and retrieval equipment - Interfaces*
FEM 9.842-1	*Rail dependent storage and retrieval systems – Consideration of accidental kinetic energy action in compliance with EN 528 – Part 1, Pallet racking*
FEM 9.851	*Performance data of storage and retrieval machines – Cycle times*
FEM 9.871	*Logbook for storage and retrieval machines and transfer devices*
FEM 9.881	*Project planning data for selection of drives for storage and retrieval machines*
VDI 2681	*Übersichtsblätter Lagereinrichtungen – Steuerungen für Regalbediengeräte (Review charts stores equipment; control equipment for aisle stackers)*
VDI 3561-1	*Testspiele zum Leistungsvergleich und zur Abnahme von Regalförderzeugen (Operating test cyles for performance comparison and for the commissioning of stacker-cranes)*
VDI 3561-2	*Spielzeitermittlung von regalunabhängigen Regalbediengeräten (Determination of cycles time of rack-aisle independent storage und retrieval units for high-bay warehouses)*
VDI 3561-4	*Spielzeitermittlung von automatischen Kanallager-Systemen (Determination of cycle times for automated channel-type storage systems)*
VDI 3580	*Grundlagen zur Erfassung von Störungen an Hochregalanlagen (High bay warehouses - Basic data to record failures)*
VDI 3581	*Availability of transport and storage systems including subsystems and elements*
VDI 3590-1	*Kommissioniersysteme – Grundlagen (Order-picking systems)*
VDI 3590-2	*Order picking systems – System design*
VDI 3590-3	*Order picking systems- Practical Examples*
VDI 3630	*Automatic miniload warehouses*
VDI 4068-8	*Competent Persons – Storage equipment and rack serving units*
VDI 4421	*Driving systems for piece goods conveying – Survey and selection*
VDI 4480-1	*Throughput of automatic warehouses with lane-bound shelf operating systems*
VDI 4480-2	*Throughput of automatic warehouses with non-lane-bound shelf operating systems*

VDI 4480-3	*Throughput of automatic circulation storage*
VDI 4480-4	*Throughput of automatic warehouses with multi-depth storage*

3 Definitions

3.1 Storage and retrieval machine

A storage and retrieval machine (SRM) is a handling and lifting device restricted to the rails on which they travel within and out of the aisles for the storage and retrieval of unit loads and/or long goods such as bar materials and/or for order picking or similar duties. This machine shall either include lifting means and/or lateral handling facilities. It also includes the transfer equipment for changing between aisles. Control of machines may range from manual to fully automatic.

3.2 Load handling device

Load handling devices (LHD) are used for the storage and retrieval of unit loads in or out of the location and for the transfer at the input and output point. The technical realisation of LHDs and even the applied warehouse configuration may deviate.

4 Operational scenarios

The SRM can be used for the storage and retrieval of unit loads in a high-bay warehouse or in a channel storage system. Additionally the SRM can also be applied in automatic miniload warehouses.

In addition to the storage and retrieval of complete unit loads, an SRM may be used for order picking. In this case an operator is riding on the SRM to the respective location and manually removes the required goods (“person-to-goods”).

Alternatively the retrieval of a complete unit load followed by the removal of the required goods and the re-storage of the residual goods is possible (“goods-to-person”). Another application of an SRM is the transfer of satellites within a satellite storage system (see Fig. 1). In a satellite storage system unit loads are successively stored in a location. Here the SRM serves the transport of the satellites to the location ™ respectively the input/output point. The satellite by itself drives into the target channel until the needed unit load is reached. Subsequently the satellite picks it up, moves out of the channel and back on the SRM which transfers the satellite to the input/output point again. [1]

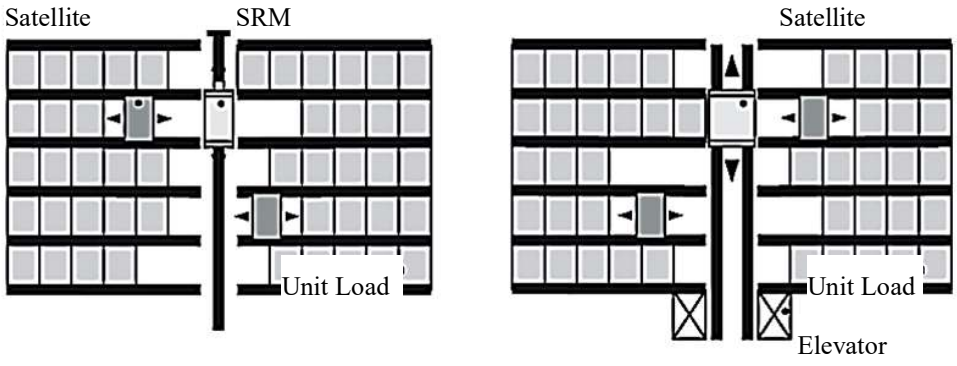

Fig. 1: satellite storage system [2]