

FEDERATION EUROPEENNE DE LA MANUTENTION Section IX SERIES LIFTING EQUIPMENT

FEM 9.851

Performance Data of S/R Machines Cycle Times

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1 Scope

These rules apply exclusively to S/R machines operated under automatic control and designed for handling unit loads. In high-bay warehouses, S/R machines are important for handling of goods.

Furtheron the extensions in chapter 6 are valid.

This document is intended as a uniform basis for calculating S/R machine cycle times and thus their handling rates, and for optimizing high-bay warehouses. The range of applications covers planning, the working-out of offers, constructions, and the handing-over of the installation to the user.

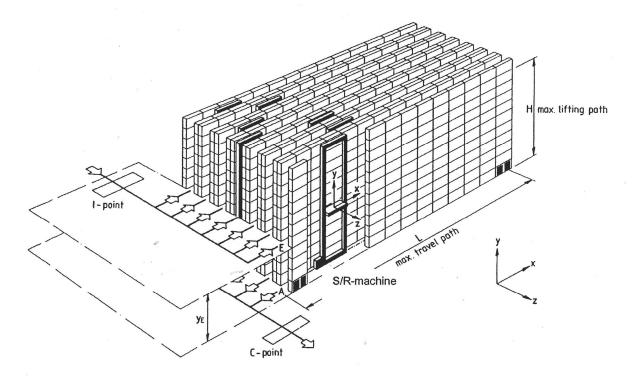


Figure 1

I-point: goods-in identification point C-point: goods-out checking point

2 Definitions

2.1 Legend to section 4

2.1 Legend to section 4		
Pick-up location for goods to be stored		
Transfer location for goods retrieved		
Coordinates of the pick-up and transfer locations		
Theoretical reference point for storage or retrieval		
Coordinates of the reference points		
Test points, corresponding to a storage location		
Maximum lifting path		
Maximum travel path		
Maximum travel speed		
Maximum lifting speed		
Ratio (H/L) x (v _x /v _y) (velocity vector)		
Time of movement between 2 points		
Total time of a single cycle		
Total time of a combined cycle		
Sum total of single cycle times		
Positioning		
Location check		
Switching and checking operations		
Fork cycle		
Sum total of combined cycle times		
Positioning		
Location check		
Switching and checking operations		
Fork cycle		
Mean single cycle time		
Mean combined cycle time		

2.2 Rate of handling

The rate of handling indicates in a high-bay warehouse the number of unit loads handled into, and/or out of, storage per unit of time. In the warehouse area, it depends on

- the number of S/R machines
- the number of cycles per S/R machine, these cycles, in turn, depending on
 - the sequence of movements
 - the arrangement of transfer points
 - machine performance.

The "cycle time" is the duration of a sequence of movements.

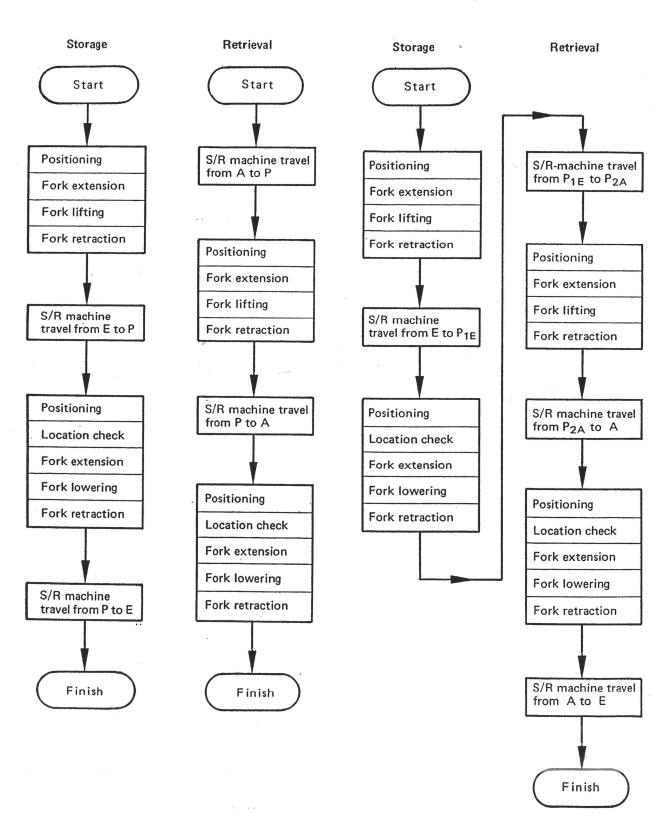
In a high-bay warehouse with transfer facility, the time required for aisle-to-aisle transfer of the S/R machine has to be considered in the calculation of cycle times.

2.3 S/R machine cycles, sequence diagrams

The following sequence diagrams are given for a better understanding of typical S/R machine cycles.

2.3.1 Single cycle

2.3.2 Combined cycle



2.3.3 Single cycle including aisle-to-aisle transfer (in z-direction)

