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| EE495/CME495 |
| EE495/CME495 System Requirement Matrix |
| Revision 1 |
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# Purpose

This document identifies the complete set of system requirements for the Doepker Industries Robot Rotator. It contains a matrix which identifies where the formal requirement is located, allocates each requirement to hardware or software or both, identifies one or more methods that will be used to verify each requirement, and identifies at which level of testing each requirement is verified.

As requirements are verified through analysis, inspection, demonstration or testing the documents containing the verification are identified in the matrix.

## Document Identifier

This document is identified as:

**CD3 – EE495/CME495 System Requirements Matrix**

## Applicable Documents

Applicable documents include:

**CD1 – EE495/CME495 Problem Defintion**

## Revision History

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| --- | --- |
| **Revision** | **Changes** |
| 1 | Initial Revision |
| 2 |  |

## Abbreviations and Acronyms

The following is a list of abbreviations and acronyms used in this document:

FAT Factory Acceptance Test

HW Hardware

SRM System Requirement Matrix

SW Software

# Requirements Matrix

The matrix in this section identifies every system requirement. Its columns are described below:

1. **Requirement ID.** A unique identifier that can be used for purposes of traceability.
2. **Source.** An unambiguous reference to the origin of the requirement.
3. **Description.** The requirement text.
4. **Allocation.** The system object or objects to which the requirement is allocated.
5. **Verification Method.** This column indicates how the requirement will be verified:

* **Analysis.** Requirements are verified by applying indirect methods such as mathematical analysis, modeling, simulation, similarity assessments, review of design, and validation of records.
* **Inspection.** Requirements are verified by direct visual observation of passive characteristics, without the use of specialized equipment or services.
* **Test.** Requirements are verified by measurement of quantitative characteristics during or after the controlled application of stimuli under appropriately controlled conditions, or by direct visual observation of active qualitative characteristics.
* **Noted.** Noted, but no verification required, such as for an information only requirement containing a "will" statement.

1. **Test Level.** The level of testing at which the requirement will be verified. The column is subdivided into the three levels of testing at which the verification of the requirement will be shown.

* **Sub.** At the subsystem test level. Subsystem tests are generally performed to verify functionality on a unit level before the unit is integrated into the system. The tests are not witnessed by Doepker Industries, but the results of the test are available for review upon request.
* **FAT.** At the Factory Acceptance Test level. The factory acceptance is performed at Doepker Industries according to test procedures. The test procedures are submitted to Doepker Industries for approval before the start of testing. Doepker Industries is requested to witness FAT.

1. **Comments.** Used to clarify the group’s interpretation of a requirement, supplement any columnar information or to denote those rows in the table that are “Title Only”.
2. **Where Verified.** Identifies one or more documents that verify the requirement. Reference to a test procedure means the completed test procedure. This column is filled in before FAT.

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| **Table 2-1 System Requirements Matrix** |
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| **Requirement ID** | **Source** | **Description** | **Allocation** | | **Verification Method** | **Test Level** | | **Comments** | **Where Verified** |
| **SW** | **HW** | **Sub** | **FAT** |
| **RD: Rotator Design Requirements** | | | | | | | | | |
| RD-1 | Client | The system shall rotate a load 360° around a horizontal axis. |  | X | Test |  | X |  |  |
| RD-2 | Client | The system shall be able to recall and rotate to 4 different angle positions. | X | X | Test |  | X |  |  |
| RD-3 | Derived | The system shall support at minimum 1177 Nm of dynamic torque. |  | X | Test |  | X |  |  |
| RD-4 | Derived | The system shall support at minimum 941 Nm of static torque. |  | X | Test |  | X |  |  |
| RD-5 | Derived | The system shall support a load of maximum 500 kg in weight. |  | X | Test |  | X |  |  |
| RD-6 | Derived | The system shall support a load offset of maximum 0.15 meters. |  | X | Test |  | X | The offset distance is calculated from the center of the rotator to the center of gravity of the load. |  |
| RD-7 | Derived | The system shall rotate at a minimum speed of 5.0 rpm and a maximum of 9.0 rpm. | X | X | Test |  | X |  |  |
| RD-8 | Derived | The load shall remain fixed along the rotational axis when the system is not rotating. |  | X | Test |  | X |  |  |
| RD-9 | Derived | The system shall rotate to angle positions with a resolution of maximum 1°. | X | X | Test |  | X |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **HD: Hardware Design Requirements** | | | | | | | | | |
| HD-1 | Derived | The system shall be built on two “A” frame supports. |  | X | Inspection | X |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **ED: Electrical Design Requirements** | | | | | | | | | |
| ED-1 | Derived | The system shall operate on the following three-phase electrical power voltages:   * 120V, single-phase * 575V, 3-phase |  | X | Analysis | X |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **SRR: Standards and Regulations Requirements** | | | | | | | | | |
| SRR-1 | Derived | The system shall use only RoHS compliant components. |  | X | Analysis | X |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
| **SR: Safety Requirements** | | | | | | | | | |
| SR-1 | Client | The system shall have a clearly visible and intuitive emergency stop button, which stops all system operations when pressed. | X | X | Test |  | X |  |  |
| SR-2 |  |  |  |  |  |  |  |  |  |
| **UIR: User Interface Requirements** | | | | | | | | | |
| UIR-1 | Derived | System operation shall only be performed using physical electrical buttons. | X | X | Test | X |  |  |  |
| UIR-2 | Derived | The system shall have a control panel with buttons to rotate and recall positions. | X | X | Inspection |  | X |  |  |
| UIR-3 | Derived | The control panel shall be at minimum 0.5 meters apart from the rotating portion of the system. |  | X | Inspection |  | X |  |  |
|  |  |  |  |  |  |  |  |  |  |
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