Engineering Standards Implementation Guide

RDS-PP, RDS-PS, KKS, ISO 14224, and SFI for CMMS

Why Engineering Standards Matter

Without standards, every site invents its own:

- Naming conventions
- Equipment classifications
- Failure codes
- Hierarchy structures

The result: incompatible data across sites, useless for benchmarking, impossible to standardize maintenance.

Engineering standards solve this by providing:

- **Consistent taxonomy** - Same equipment = same classification everywhere
- **Comparable data** - MTBF means the same thing across all sites
- **Industry benchmarking** - Compare your performance to peers
- **Vendor communication** - Universal language with suppliers

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Choosing the Right Standard

Decision Matrix

Standard	Primary Industry	Hierarchy Focus	Failure Data	Best For
ISO 14224	Oil & Gas, Process	Equipment taxonomy	Yes (comprehensive)	Reliability analysis, failure tracking
RDS-PP	Power Plants	Functional + Physical	Limited	Power generation facilities
RDS-PS	Power Systems	Functional + Physical	Limited	Electrical systems, renewables
KKS	Power Plants (German)	Functional + Physical	Limited	German/European power plants
SFI	Maritime/Shipping	Functional	Limited	Vessels, offshore
ISO 55000	All industries	Asset management	No	Governance framework

Decision Tree

```
What industry are you in?
│
├─► Oil & Gas (Upstream, Downstream, Midstream)
│   └─► Use ISO 14224 for equipment taxonomy and failure codes
│       Consider RDS-PP/KKS if strong power generation component
│
├─► Power Generation (Thermal, Nuclear)
│   └─► Use KKS (German-speaking) or RDS-PP (international)
│       Add ISO 14224 failure codes for reliability analysis
│
├─► Power Generation (Renewables - Wind, Solar)
│   └─► Use RDS-PS (enhanced IEC 81346)
│       Add ISO 14224 failure codes for reliability analysis
│
├─► Maritime/Shipping
│   └─► Use SFI for vessel hierarchy
│       Add ISO 14224 failure codes for reliability analysis
│
├─► Manufacturing/Process Industries
│   └─► Use ISO 14224 (adapted) for equipment taxonomy
│       Create custom hierarchy based on your process
│
└─► Utilities (Water, Gas Distribution)
    └─► Use ISO 14224 for equipment
        Consider GIS-based linear asset management
```

Part 1: ISO 14224

Overview

ISO 14224:2016 "Petroleum, petrochemical and natural gas industries — Collection and exchange of reliability and maintenance data for equipment"

What it provides:

- 9-level equipment taxonomy
- Standard equipment classes with boundaries
- Failure mode, mechanism, cause codes
- Data collection requirements
- Example data sheets

See our dedicated ISO 14224 Cheat Sheet for complete code tables.

ISO 14224 Hierarchy (Quick Reference)

Level	Name	Example
1	Industry	Petroleum
2	Business Category	Upstream - Offshore
3	Installation	Platform Alpha
4	Plant/Unit	Water Injection
5	Section/System	Seawater Lift
6	Equipment Unit	Pump P-4501A
7	Subunit	Pump Assembly
8	Maintainable Item	Mechanical Seal
9	Part	O-Ring

Key Equipment Classes

Class	Equipment	Typical Boundary
1.1	Centrifugal Pump	From suction flange to discharge flange, excluding motor
1.2	Reciprocating Pump	From suction to discharge, excluding driver
2.1	Centrifugal Compressor	From suction to discharge, including internal seals
3.3	Electric Motor	From terminal box to coupling
5.1	Shell & Tube HX	From inlet to outlet flanges
8.6	Control Valve	Body, actuator, positioner as one unit

Implementation Steps

1. **Map your equipment to ISO 14224 classes**
    - Export your asset register
    - Assign ISO 14224 class code to each asset type
    - Document boundary definitions
2. **Load failure code tables**
    - Failure modes (ELP, LOO, VIB, etc.)
    - Failure mechanisms (wear, corrosion, fatigue, etc.)
    - Failure causes (design, operations, maintenance, etc.)
3. **Configure CMMS**
    - Add classification field
    - Add failure code fields to work orders
    - Make codes mandatory for failure records
4. **Train users**
    - What codes mean
    - How to select appropriate codes
    - Why it matters for analysis

Part 2: RDS-PP (Reference Designation System for Power Plants)

Overview

RDS-PP is based on IEC 81346 and provides designation systems for power generation facilities.

Key features:

- Three-aspect designation (Function, Location, Product)
- Covers entire power plant lifecycle
- International standard (VGB PowerTech)

RDS-PP Structure

Aspect Prefixes:

- = Function aspect (what it does)
- + Location aspect (where it is)
- - Product aspect (what it is)

Example designation:

```
=G1 +KAA -AA001
|    |     |
|    |     └── Product: Turbine 001
|    └──────── Location: Unit 1, Turbine Building
└─────────────── Function: Generator system 1
```

RDS-PP Function Codes (Main Groups)

Code	System	Description
A	Electrical Power Supply	Grid connection, transformers
B	Instrumentation & Control	DCS, PLCs, instruments
C	Communication	Telecom, networks
E	Water Supply	Raw water, cooling water
G	Steam/Water Cycle	Boiler, turbine, condenser
H	Heat Supply	District heating
K	I&C for Machine	Turbine controls
L	Fuel Storage & Handling	Coal, oil, gas handling
M	Combustion Air/Flue Gas	Air systems, FGD, SCR
N	Auxiliary Systems	Compressed air, HVAC
P	Process (non-power)	Chemical dosing
Q	Auxiliary Steam	Auxiliary boilers
R	Waste Disposal	Ash handling
U	Structural Facilities	Buildings, civil
X	Heavy Machinery	Cranes, conveyors

RDS-PP Examples

Designation	Description
=G1 +KAA -MK001	Unit 1 HP Turbine
=G1 +KBA -AN001	Unit 1 Generator
=G1 +MAA -PU001	Unit 1 FD Fan
=G2 +HAA -WE001	Unit 2 Steam Drum
=A0 +UCA -TN001	Common Station Transformer
=N0 +BAA -PU001	Instrument Air Compressor

Implementation Steps

1. **Define plant structure**
    - Identify all units
    - Define location hierarchy (buildings, floors, areas)
    - Define function groups
2. **Assign designations**
    - Start with major equipment
    - Work down to components
    - Document designation rules

3. **Configure CMMS**
    - Add function, location, product fields
    - Or combine into single designation field
    - Build hierarchy structure

Part 3: RDS-PS (Reference Designation System for Power Supply)

Overview

RDS-PS extends IEC 81346 specifically for electrical power systems, including:

- Transmission & Distribution
- Substations
- Renewable energy (wind, solar)
- Energy storage
- Smart grid infrastructure

RDS-PS vs RDS-PP

Aspect	RDS-PP	RDS-PS
Focus	Power generation	Power systems (gen + T&D)
Renewables	Limited	Full support
Grid integration	Limited	Comprehensive
Energy storage	Limited	Full support
Standard base	VGB R 116	IEC 81346 series

RDS-PS Structure

Same three-aspect system as RDS-PP:

- = Function
- + Location
- - Product

RDS-PS for Renewables

Wind Farm Example:

```
=WF01           Wind Farm 01 (function)
+A01            Array 01 (location)
-WTG001         Wind Turbine Generator 001 (product)

Complete: =WF01+A01-WTG001

Subcomponents:
=WF01+A01-WTG001.ROT    Rotor assembly
=WF01+A01-WTG001.GBX    Gearbox
=WF01+A01-WTG001.GEN    Generator
=WF01+A01-WTG001.NAC    Nacelle
=WF01+A01-WTG001.TWR    Tower
```

Solar Plant Example:

```
=PV01           PV Plant 01 (function)
+F01            Field 01 (location)
-INV001         Inverter 001 (product)

Related equipment:
=PV01+F01-STR001        String 001
=PV01+F01-CB001         Combiner Box 001
=PV01+SUB-TR001         Main Transformer
```

Battery Energy Storage Example:

```
=BES1           Battery Energy Storage System 1
+R01            Rack 01
-BAT001         Battery Module 001

Related:
=BES1+PWR-PCS001        Power Conversion System
=BES1+CTL-BMS001        Battery Management System
=BES1+THM-HVAC001       Thermal Management
```

RDS-PS Implementation

1. **Define system boundaries**
    - Generation assets
    - Transmission/interconnection
    - Distribution (if applicable)
    - Customer interface
2. **Establish designation rules**
    - Function codes by system type
    - Location codes by geographic/physical
    - Product codes by equipment type
3. **Document crosswalks**
    - If migrating from other standards
    - Map old designations to RDS-PS

Part 4: KKS (Kraftwerk-Kennzeichensystem)

Overview

KKS is the German power plant identification system, widely used in Europe and globally where German engineering influence is strong.

KKS structure:

```
Plant Unit + Function + Equipment + Component
   1            2           3           4
```

KKS Code Structure

Level 0: Plant identification (optional)

- AA = Plant A
- AB = Plant B

Level 1: Unit/system area (1-2 characters)

Code	System
0	Plant general
1	Main machine set
2	High pressure systems
3	Intermediate pressure systems
4	Low pressure systems
5	Feedwater systems
6	Condensate systems
7	Cooling water systems
8	Auxiliary systems
9	Gas turbine

Level 2: System (2-3 characters)

Code	System
LAB	Boiler
LBA	Superheater
MAA	Turbine HP

MAB Turbine IP
MAG Turbine LP
MKA Generator

Level 3: Equipment (2-3 characters)

Code	Equipment
AA	General
AP	Pump
AT	Tank
AV	Valve
AN	Motor
CF	Filter

Level 4: Component/signal (optional)

Code	Meaning
001	Sequence number
M01	Motor
P01	Instrument

KKS Examples

KKS Code	Description
1MAA AA001	Unit 1 HP Turbine
1MKA AN001	Unit 1 Generator
1LAA AP001	Unit 1 Boiler Feed Pump 1
1LAA AP002	Unit 1 Boiler Feed Pump 2
1LAB AV001	Unit 1 Main Steam Valve
0LCB AP001	Common Condensate Pump 1

KKS to RDS-PP Mapping

KKS	RDS-PP	Description
1MAA AA001	=G1+KAA-MK001	HP Turbine
1MKA AN001	=G1+KBA-AN001	Generator
1LAA AP001	=G1+LAA-AP001	Boiler Feed Pump

Part 5: SFI Group System (Maritime)

Overview

SFI is the international standard for ship classification. (See Maritime CMMS Guide for full details.)

SFI Structure

```
Main Group (1 digit)   → Major ship function
Group (2 digits)       → System
Subgroup (3 digits)    → Component type
Detail (6 digits)      → Specific item
```

SFI Main Groups

Group	Name
0	Ship General
1	Hull
2	Cargo Equipment
3	Ship Equipment
4	Accommodation
5	Crew Equipment
6	Machinery Main
7	Machinery Systems
8	Common Systems

SFI Examples

Code	Description
601	Main Diesel Engine
611	Auxiliary Engine
631	Propeller
721	Sea Water Cooling System
731	Air Compressor
851	Main Switchboard

Part 6: Combining Standards

ISO 14224 + RDS-PP/KKS

Use RDS-PP or KKS for:

- Equipment naming/designation
- Hierarchy structure
- Location identification

Use ISO 14224 for:

- Equipment classification (for reliability analysis)
- Failure modes
- Failure mechanisms
- Failure causes
- Data collection requirements

Example combined approach:

Field	Standard	Example
Asset ID	RDS-PP	=G1+LAA-AP001
Description	Company	Boiler Feed Pump A
Equipment Class	ISO 14224	1.1 - Centrifugal Pump
Failure Mode	ISO 14224	ELP - External Leak
Failure Mechanism	ISO 14224	1.1 - Wear

SFI + ISO 14224

Use SFI for:

- Vessel hierarchy
- Equipment identification
- Spare parts cataloging

Use ISO 14224 for:

- Failure coding
- Reliability analysis
- Industry benchmarking

Part 7: Implementation Roadmap

Phase 1: Assessment (Weeks 1-2)

- [ ] Audit current equipment naming
- [ ] Count naming variations
- [ ] Identify applicable standard(s)
- [ ] Define implementation scope

Phase 2: Design (Weeks 3-4)

- [ ] Define hierarchy structure
- [ ] Create designation rules
- [ ] Build equipment class crosswalk
- [ ] Design failure code structure
- [ ] Document standards guide

Phase 3: Configuration (Weeks 5-6)

- [ ] Configure CMMS fields
- [ ] Load code tables
- [ ] Build hierarchy
- [ ] Set up validation rules
- [ ] Create templates

Phase 4: Data Migration (Weeks 7-10)

- [ ] Export current data
- [ ] Apply designations
- [ ] Classify equipment
- [ ] Validate relationships
- [ ] Load to CMMS

Phase 5: Rollout (Weeks 11-12)

- [ ] Train administrators
- [ ] Train end users
- [ ] Monitor compliance
- [ ] Refine as needed

Quick Reference: Standard Selection

If your industry is...	Use this for hierarchy	Use this for failure codes
Oil & Gas - Offshore	ISO 14224 (9-level)	ISO 14224
Oil & Gas - Refining	ISO 14224 or custom	ISO 14224
Power - Coal/Gas/Nuclear	RDS-PP or KKS	ISO 14224
Power - Wind/Solar	RDS-PS	ISO 14224
Maritime - Vessels	SFI	ISO 14224
Maritime - Offshore platforms	SFI or ISO 14224	ISO 14224
Manufacturing	Custom (based on ISO 14224)	ISO 14224 (adapted)
Utilities - Water	Custom	ISO 14224 (adapted)
Facilities	Custom (location-based)	Simplified ISO 14224

Need help implementing engineering standards? AssetStage provides consulting, training, and data migration services for ISO 14224, RDS-PP, RDS-PS, KKS, and SFI implementations. Contact us at sales@assetstage.io

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