Make2Pack och ISA88-part5
- introduction-

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Charlotta Johnsson
Inst. för Reglerteknik, LTH
Lunds Universitet, Sverige

Charlotta Johnsson
Name: Charlotta Johnsson
Resident: Lund, Sweden
Employments:
  Dept. of Automatic Control, LTH. 2004 –
  Associate Professor (education and research)
  Independent consultant, 2004 -
  Siemens, Genova Italy, 2000-2004
  System Architect, Product Manager
  PhD studies, Dept. of Automatic Control LTH, 1993-1999
  “A Graphical Language for Batch Control”

Voting member in ISA SP88 & SP95 committees.
Chairman European Operations of WBF
WBF – the Forum for Manufacturing and Automation Professionals
Member of, and Swedish national expert in, IEC/ISO JWG 15.
My assigned tasks today

- Relationen til ISA-88.05
- Hvad er fokusområdet for de enkelte dele i Make2Pack standarderne.
- Hvorledes anvendes de enkelte standarder.

What I will present

- What is OMAC? ISA? And Make2Pack?
- Short introduction to the documents PackAL, PackML and PackTags.
- Present the ISA-88.05 Standard and Technical Report
- Where is this work being used to day?
OMAC

The OMAC Users Group was formed in 1994.

OMAC = Organization for Machine Automation and Control
(Open, Modular Architecture Control)

“OMAC is the global organization for automation and manufacturing professionals that is dedicated to supporting the machine automation and operational needs of manufacturing.”

OMAC has about 500 members from end-user companies, OEM's, and technology providers and integrator companies.

There are three Working Groups:
• Packaging Machinery,
• Manufacturing Infrastructure,
• Machine Tool.

OMAC – Packaging Machinery

There are five Packaging machinery sub-groups:
PackSoft - developing guidelines for machinery programming languages to ease learning, support transportability of software across platforms, and allow continuing innovation
PackConnect - defining the control architecture platforms and connectivity requirements for packaging automation systems
PackAdvantage - Identify and communicate to the packaging industry the Benefits/Results of using “connect & pack” guidelines for packaging automation systems
PackML – naming convention guidelines for communications between production machinery within the packaging industry.
PackLearn - promotes awareness of Group initiatives by defining, and developing programs to meet, the educational and training needs of the industry
OMAC – Packaging Machinery - PackSoft

The PackSoft sub-group has developed the document:

• PackAL v1.0 - Packaging Application Function Block Library, Guidelines for programming common functional elements in Packaging.

  • Functional Blocks
    • Structured text
    • Ladder Logic
    • Sequential Function Charts
    • Etc

OMAC – Packaging Machinery - PackML

The PackML sub-group has the objectives to collect, from users and suppliers:

• Line types definitions in common use,
• Machine state names and definitions,
• Tag names and definitions/data sets.

The work has resulted in the following documents:

• PackML v3.0 – Defines State Models
• PackTags v3.0 – Defines Tags
ISA = International Society of Automation

ISA is an international society that
- develops and publishes standards,
- provides training,
- publishes books,
- organized conferences and fairs etc

ISA publishes standards for ANSI
ANSI = American National Standards Institute

ISA has appr. 30 000 members worldwide

ISA & ISA88

ANSI/ISA 88: Batch Control

ISA 88 is a standard that focuses on control of batch processes.
- ISA88, part 1: Models and Terminology
- ISA88, part 2: Data Structure and Guidelines for Languages
- ISA88, part3: General and Site Recipes
- ISA88, part 4; Batch Production Records
- Draft-ISA 88, part 5: Implementation Models & Terminology for Modular Equipment Control
- ISA TR88.00.02: Machine and Unit States: An implementation Example of ISA88

People from WBF (World Batch Forum) and people from OMAC-Packaging Machines met and saw potentials in comparing, synchronizing and develop common models for discrete and batch control.
Functional Hierarchy

Level 4
Business Planning & Logistics
Plant Production Scheduling, Operational Management, etc.

Level 3
Manufacturing Operations Management
Dispatching Production, Detailed Production Scheduling, Reliability Assurance,

Level 2
Batch Control
Continuous Control
Discrete Control

Level 1

Level 0
The actual production process

Time Frame
- Days, shifts, hours, minutes, seconds

ISA 88’s position in the Functional Hierarchy

Level 4
Business Planning & Logistics
Plant Production Scheduling, Operational Management, etc.

Level 3
Manufacturing Operations Management
Dispatching Production, Detailed Production Scheduling, Reliability Assurance,

Level 2
ISA 88 Control
Continuous Control
Discrete Control

Level 1

Level 0
The actual production process

Time Frame
- Days, shifts, hours, minutes, seconds

Time Frame
- Months, weeks, days

1 - Sensing the production process, manipulating the production process
2 - Monitoring, supervisory control and automated control of the production process
3 - Work flow / recipe control to produce the desired end products. Maintaining records and optimizing the production process.
4 - Establishing the basic plant schedule - production, material use, delivery, and shipping. Determining inventory levels.
OMAC’s position in the Functional Hierarchy

Level 4
Business Planning & Logistics
Plant Production Scheduling, Operational Management, etc.

Level 3
Manufacturing Operations Management
Dispatching Production, Detailed Production Scheduling, Reliability Assurance

Level 2
ISA 88 Control
Continuous Control

Level 1
OMAC Control

Level 0
- The actual production process

ISA95’s position in the Functional Hierarchy

Level 4
Business Planning & Logistics
Plant Production Scheduling, Operational Management, etc.

Level 3
ISA95 Manufacturing Operations Management
Production, Detailed Production Scheduling, Reliability Assurance

Level 2
ISA 88 Control
Continuous Control

Level 1
OMAC Control

Level 0
- The actual production process

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Level 4
Business Planning & Logistics
- Plant Production Scheduling, Operational Management, etc.

Level 3
Manufacturing Operations Management
- Dispatching Production, Detailed Production Scheduling, Reliability Assurance, ...

Batch Control
- Discrete & Packaging Control
- Continuous & Converting Control

Level 2
 ISA 88
- Control
- Part 5
- OMAC

Level 1
 ISA 95
- Factory Floor Automation
- Actuators and Instruments

Level 0
 ISA 88
- The actual production process

Equipment Hierarchy

Enterprise

Site

Area

Production Line

Production Unit

Process Cell

Storage Zone

Storage Unit

Work Cell

Unit

Equipment Module

Control Module

Lower level equipment used in repetitive or discrete operations

Lower level equipment used in continuous operations

Lower level equipment used in inventory operations
1. Defines structures and models for organizing control systems for flexibility and modularity
2. Defines a recipe/equipment model for batch functions
What Information is Central to Batch Control?

Recipe-Equipment Control Separation

- Recipes reference basic equipment capabilities, independent of how the capabilities are actually implemented
### ISA88 Modes

Equipment entities and procedural elements may have modes:
- Automatic
- Semi-automatic
- Manual

### ISA88 State Model

Equipment entities and procedural elements may have states. An example of procedural states:
ISA88 Part 5

**ISA88 Part 5 Scope**

**Part 5: Implementation Models & Terminology for Modular Equipment Control**

ISA88 Part 5 provides detailed guidance on how to create the actual automation that delivers the Equipment Control concept as defined in Part 1.
Where is the effort?

- Working Draft 6 out (July 2010)
- During the last years the work has been lessened with all the changes in the ISA88-Part 1 update
- WEB Ex and Face-To-Face meetings scheduled regularly.
- The work is led by Dave Chappell (chappell.da@gmail.com)
The ISA88 committee has defined a set of standards that provides terminology and a consistent set of concepts and models for batch manufacturing plants and batch control. These standards, however, were not defined in the context of packaging machines or machines that perform discrete operations.

This technical report is an example of the application of the ISA 88 standards for packaging machines and other types of discrete operation machines that perform a single dedicated operational function.
• The purpose of the technical report is to
  a) Explain functional state programming for automated machines;
  b) Identify definitions for common terminology;
  c) Explain to practitioners how to use state programming for automated machines;
  d) Provide actual implementation examples and templates from automation control vendors;
  e) Identify a common tag structure for automated machines in order to:
      • Provide for Connect & Pack functionality;
      • Provide functional interoperability and a consistent look and feel across the plant floor;
      • Provide consistent tag structure for connection to plant MES and enterprise systems.

• The TR defines a common model for communication between machines (represented as Units in the ISA 88 model) and a recipe execution system using OPC tags.

• The terms and definitions are harmonized, as much as possible, with ISA88.01.
The models used in this document are extensions to the procedural and equipment state and mode models presented in ISA88.01 and describe how they could be applied to the similar, yet somewhat differing machine functionality.

ISA88-part5 Base State Model
The TR identifies a common communication tag structure for automated machines in order to:
- Provide consistent tag structure for connection to plant supervisory, MES and enterprise systems.
- Provide functional interoperability and a consistent look and feel across the plant floor.
- Provide for “Connect & Pack” functionality defined by OMAC.

PackTags are broken out into three groups:
- Command Tags
- Status Tags
- Administration Tags
Conclusions

Tack för er uppmärksamhet!

Charlotta Johnsson
Email: charlotta.johnsson@control.lth.se

Voting member ISA SP88
Voting member ISA SP95
National Expert IEC/ISO JWG 15