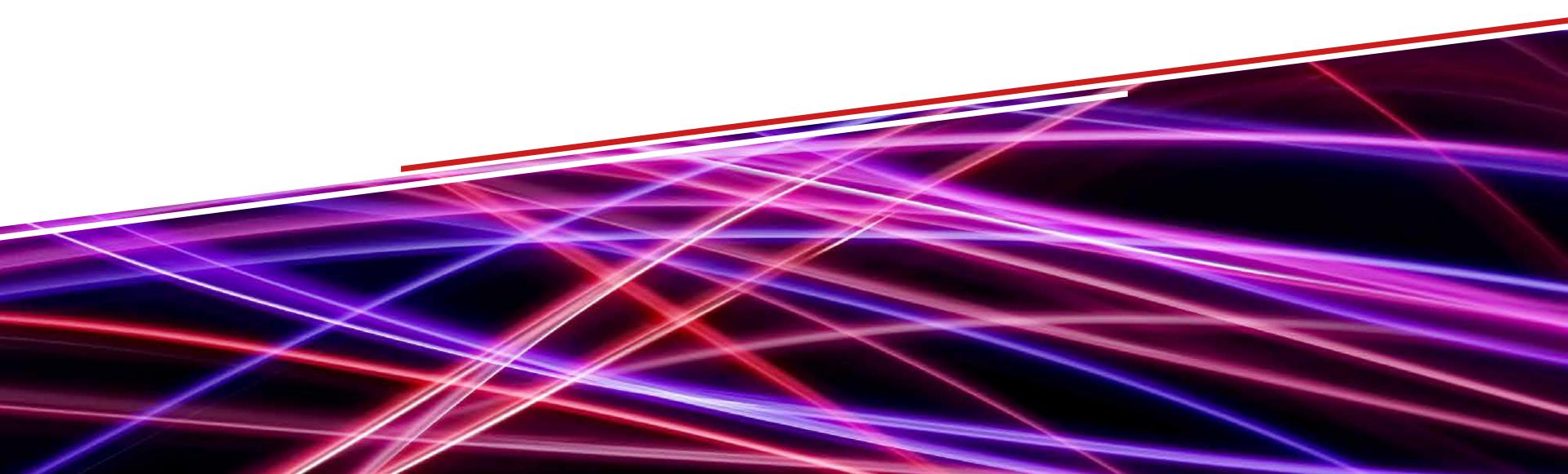
## Strategic Insights into Product Variation Management

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March 5, 2024





### **Product Variation**

Companies across the industries provide variation in their product offerings

- + Strategic tool for driving growth, enhancing customer satisfaction, and staying relevant in a rapidly changing landscape
- Presents challenges related to complexity, costs, inventory management, and brand management





## Factors Impacting Product Variation

Manufacturing Approach



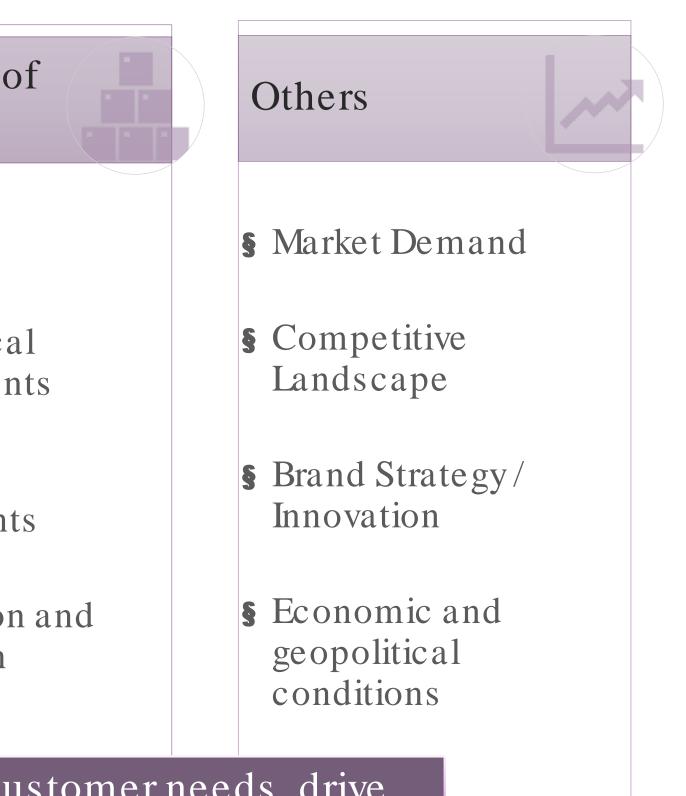
- § Make to Stock
- Seconfigure to Order
- S Engineer to Order

S Level of customization in the products Complexity of<br/>VariabilityComplexity of<br/>Product§ Amount of Choices§ Product§ Discrete vs.<br/>Continuous§ Technological<br/>Advancements§ Change Frequency§ Regulatory

- Regulatory Requirements
- Globalization and Localization

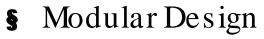
Challenge: Manage product variation to meet customer needs, drive growth, and maintain competitiveness while staying profitable





## Strategies for Handling Product Variation

PLM for seamless data connectivity across all teams and stages of the product lifecycle



- **§** Standardization
- S Collaborative Cross-Functional Teams

Design and Development Optimization Operations and Manufacturing Efficiency

Market and Customer Focus

- § Customer-Centric Approach
- S Data-Driven Analysis
- § Continuous Improvement

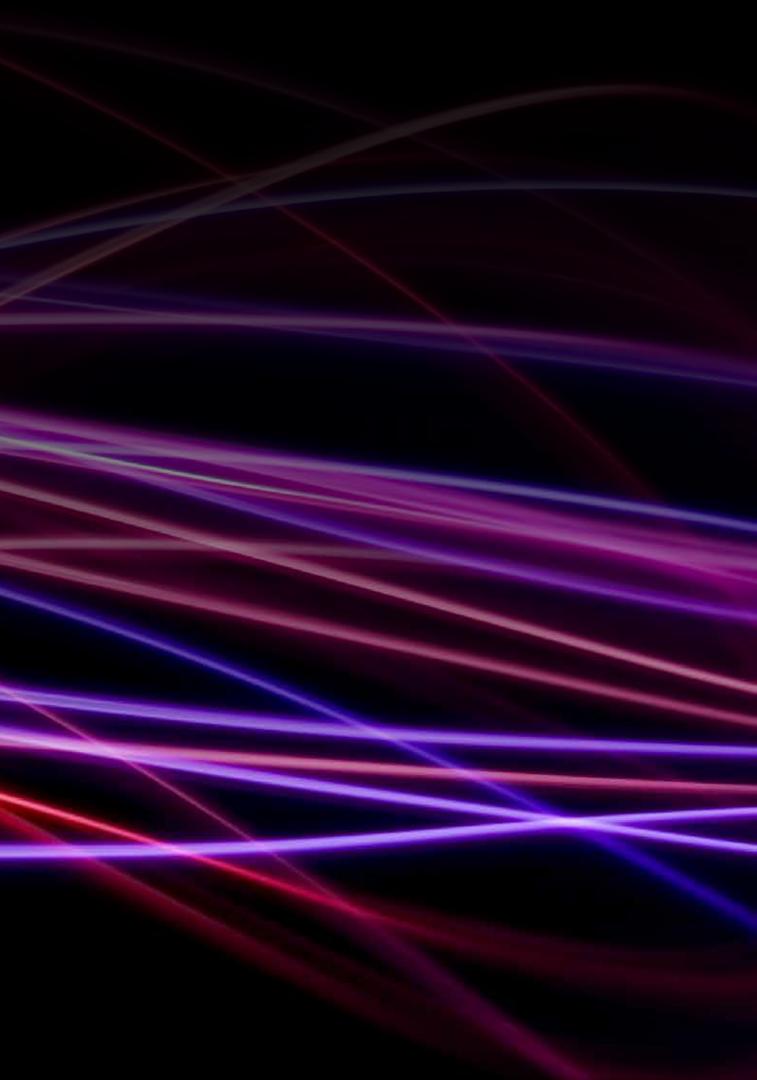




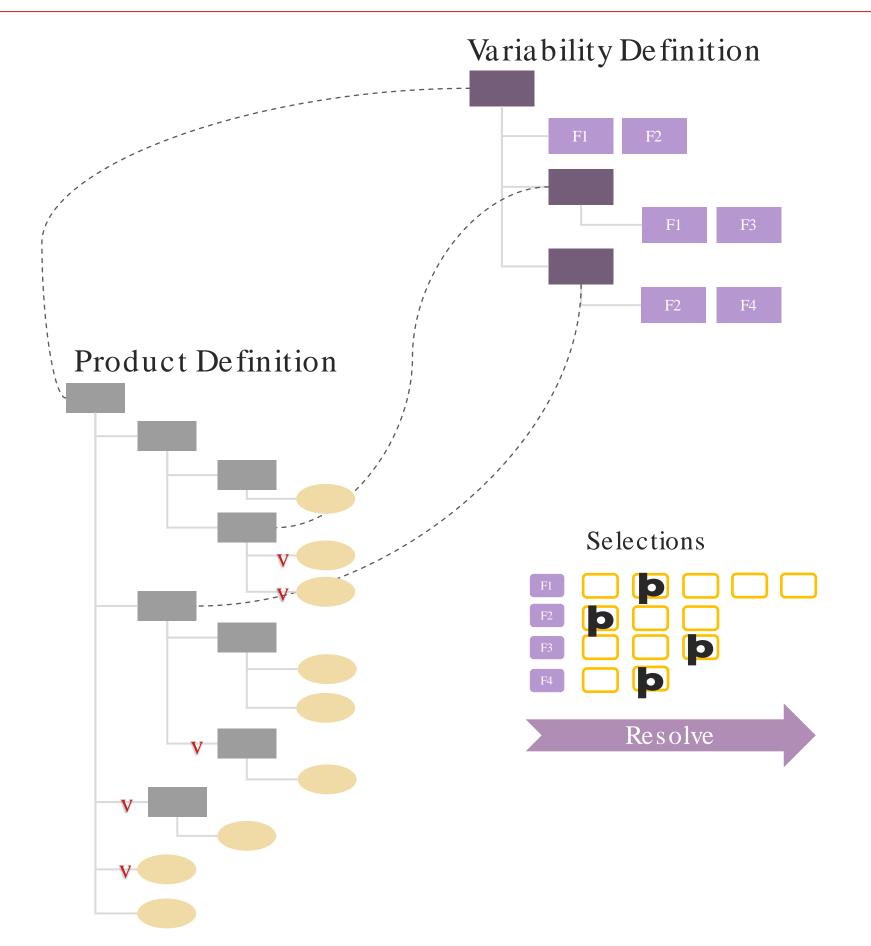
- **§** Flexible Manufacturing Processes
- S Dynamic Inventory Management
- **§** Responsive Supply Chain

# Aras Variant Management



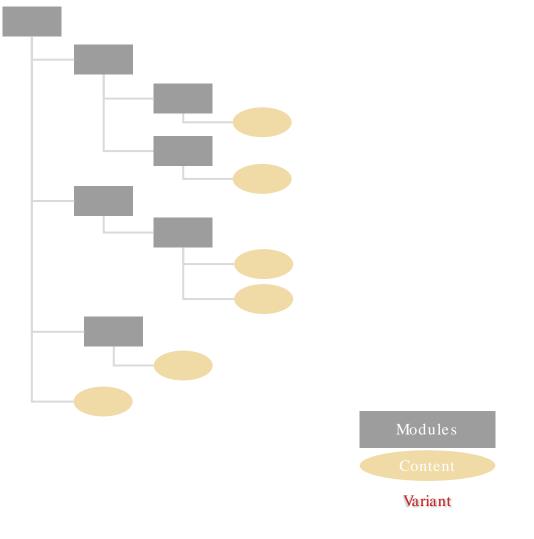


### Aras Variant Management | Overview





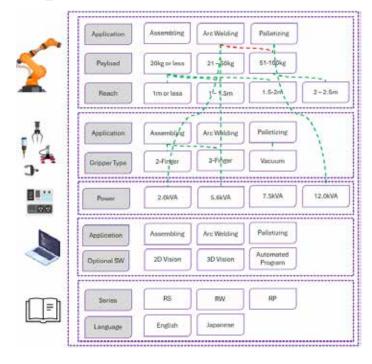
#### Product Variant



## Effective Approaches to Streamline Variability Definition

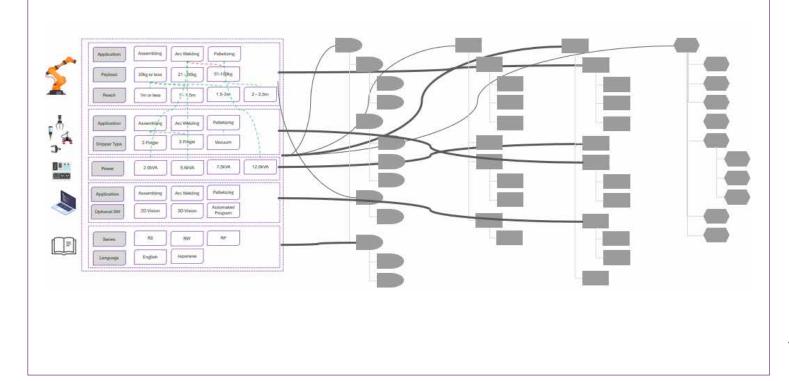
### Structured Variability

- **§** Enables the division of variability into more manageable segments, simplifying usability and handling
- Supports the application of pertinent variability scopes at different levels of product definition
- **§** Facilitates collaboration among teams in defining variability, aligning with their specific areas of expertise





- § multiple domains
- Ş





### Decoupled Variability

Allows consistent variability and rule definitions to be applied to multiple structures and across

Enables configuration experts and content engineers to work with a degree of independence while remaining linked

## Variability Definition in Aras – Key Values for Your Business

- § Manage structured, harmonized, consistent and independent definition of variability across multiple domains
- Solution Accelerate variability validation process with rapid access to pertinent rules

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×	III- 1 to III III III III III IIII IIII IIII	- Software and Programming SApplication	Maximum Paylaat -	
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□ ③ □ Q 😫 Hidden 🗸 ⑧ 🖉 💐 🔩	G-12 T1 Origine Type	A Maximum Phyload	Pow 6444	Export to Excel 16 Results
	3 D4 240pr		End Effector	
🗰 Number Name Revi Stale		20kg or legs 21-50Kg 51-100Kg <b>≢</b>		Application † 1 Maximum Payl † 2 Maximum Reach † 3 Position Repea † 4
Vi2 Controller Released	a Sectore and Pogramming A. Pleambary		Meximum Payload -	
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Vi-SW Software and Programming A Preliminary	E - St P1 Optional Sufference	1,00 mm or less 1,001-1,500mm 1,500-2,000mm 2,001-2,500mm 2	Boftwarn and Programming - : Sealing	Assembling 20kg or less 1,000 mm or less ±0.03
VIM Manuala B Preliminary	Bill_20Vis 20 voor livben     Mill_20Vis 20 voor livben	Position Repeatability (mm)	Application Assembling	Assembling 20kg or less 1 001-1 500mm +0.02
	Structure and the second		Optional Software	Assembling 20kg or less 1,500-2,000mm ±0.03
	El State Mature & Paintary	10.02 22 10.03 20.04 10.07 2	Maxwalis 📃 🙀 Arc Welding	
	() til Mit Largelge	Installation Method	Language finglish Series RS Palletizing	Assembling 20kg or less 1,500-2,000mm ±0.04
	A MLI Bapan			Assembling 21-50Kg 1 000 mm or less +0.02
		Floor Ceiling	EI- Gripper Type	
	E S 42 Addreston	13 Power	🖅 😥 Installation Method	Assembling 21-50Kg 1,000 mm or less ±0.03
			⊞— 🏠 Language	Assembling 21-50Kg 1,001-1,500mm ±0.03
		2.0kVA 5.66VA 7.5kVA 12.0kVA	E = to the state of the state	Assembling 21-50Kg 1,500-2,000mm ±0.03
			·····································	Assembling 21-50Kg 1 500-2 000mm +0.04
		Rules Restricting Selection	×	Assembling 51-100Kg 1,000 I,000 III 1002
		Changes Required X Previous Rule Set Next Fale Set >	⊞— 🎲 No of Axes	
		Selecting RW will remove	⊞– 🙀 Optional Software	Assembling 51-100Kg 1,000 mm or less ±0.03
		Application: Assembling	🕀 🖓 Position Repeatability (m	n) Assembling 51-100Kg 1,001-1,500mm ±0.03
			THEN (Maximum Payload) + (20kg or less)	Assembling 51-100Kg 1,500-2,000mm ±0.03
		Exectly One Option EXACTLY-ON	[waxuum wakided] = [57x8 dis isse]   [waxuum wakided] =	Assembling 51.100Kg 1.500-2.000mm +0.04
		Show Rules Proceed Cancel Selectes Option (Maximum P	Hoad = (21-50Kg)	Palletizing 51-100Kg 2,001-2,500mm ±0.07
		Selected Option Series + RW		
*			上 100 Get Configura	<mark>ms</mark>
				0 0 0 0 0 1 1



🔹 VI-1 Robot 🏠 🖂

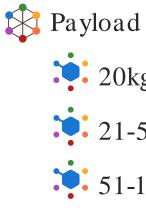
§ Improve ease of validating the list of permissible configurations in your range of product variants

### Variability Definition

### Terminology

- Feature Product characteristic with different options
- Option Choices for a Feature
- Rule Determine which Options can or cannot be combined
  - Due to technical feasibility, sales decisions, compliance, etc. §
  - Without rules, all option combinations are possible §
  - Rules reduce number of allowed option combinations §
- Variability Item Defines variability of a scope (e.g., product, system, module)
  - Using Features, Options and Rules §
  - Can be structured into multiple levels









#### Application

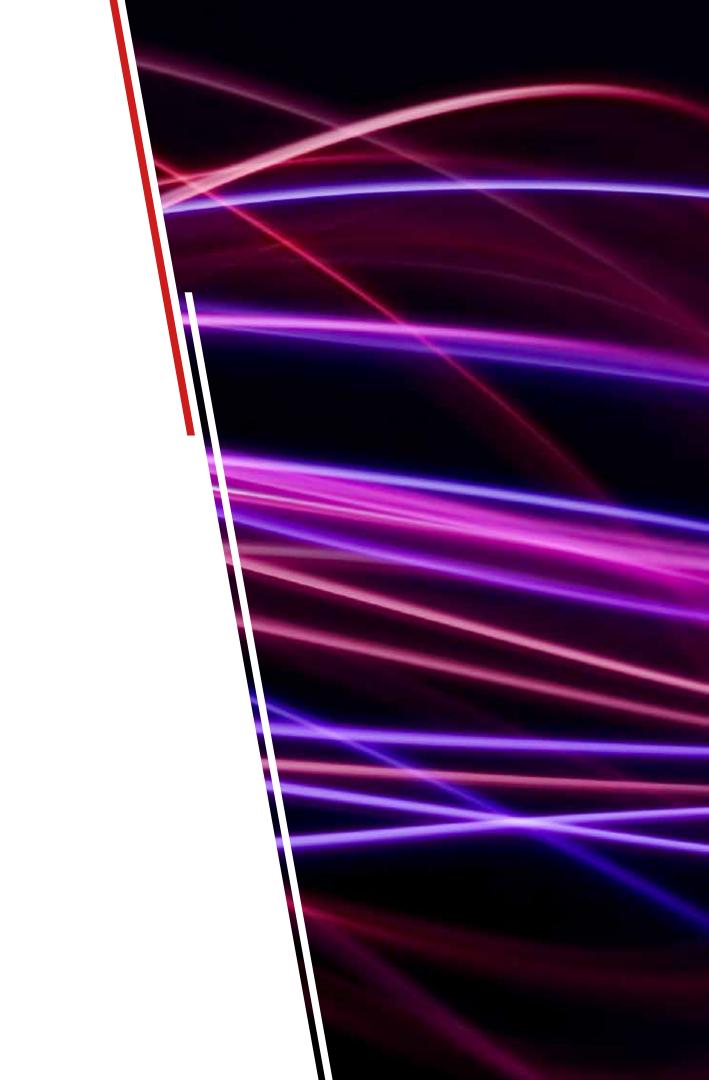
- Assembling
- Arc Welding
- Palletizing

- 20kg or less
- 21-50kg
- **51-100kg**

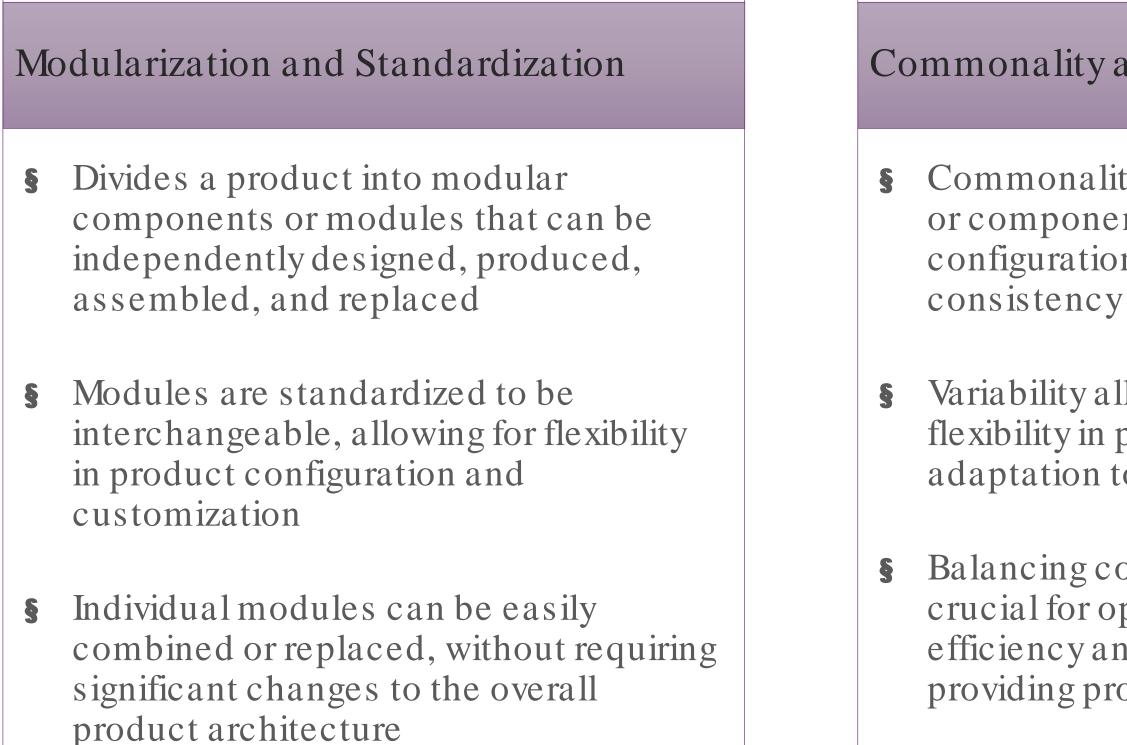
If Application=Arc Welding, then Payload=20kg or less

# Demonstration Variability Definition





## Effective Approaches to Manage Configurable Products





### Commonality and Variability

Commonality ensures shared features or components across different product configurations, promoting efficiency and

Variability allows for customization and flexibility in product design, enabling adaptation to different configurations

Balancing commonality and variability is crucial for optimizing production efficiency and minimizing costs while providing product variation

### Product Definition in Aras – Key Values for Your Business

§ Maintain configurable product definition with common and variable content, under configuration management

Breakdown Item						
Content Breakdown Stru	et ra Vaña	ehility from				
<u>∽</u> ∰ <u>⊙</u> 2	4 12	<b>S</b>				
Mariber	Resision	Name	State	Sequence	0.8.	Expression
E- 13 80-1-987	*	Robot - Riberies	Preliminary			
日-12 BD-2-ARM	A	Robot A/m	Preliminary	10.		
E- 23 80 4-1	*	Base Assembly	Preliminary	10	(C)	
E 10 60-46-11	A	Base	Preliminary	10		
🖽 - 🖨 Rokern 11a	c.	Sape 20	Preliminary	20	1	[Maximum Payload] = [22kg of leng]
🕀 🔕 R-Am-Th	8	Base 50	Releases	30	ŧ	[Maximum Payload] = [21-50Kg]
🖽 - 🛟 R-Am-11z	ć	Base 100	Releases	40	14	[Maximum Payload] = [51-100Kg]
E 10 80-4-8-12	0	Actuator - Ravolve Motion (J1)	Preliminary	20	. T.	
E SOA-ENC	8	Encoder	Released	30.	.t.,	
IB-13 80-45-14	e.	Transmission - Revolve Motion	Released	40	1	
E- 13 80-4-2	+	Am Assentily	Preliminary	20	+	
E- C BO-3-HND	A	End Effector	Preliminary	15	4	
D - 🔅 VOHWELD		End Effectore - Ark Welding	Prekninaly	10	(C)	Application + [Arc Helding]
🗘 WARC-1-20	A.	Arc Welding Attachment	Released	10.	15	[Maximum Payload] + [20kg or less]
Ø WARC-2-20	A	Arc Welding Cable	Released	20	1	[Maximum Payload] = [25kg or less]
D VOHORP	4	End Effectors - Orippers	Preliminary	20	+	Application + Assembling OR Application + Handling OR Application + Pr
0 GRP-001-3-25	8	2-Finger Gripper - 20kg or less	Releases	10.	4	[Maximum Payload] = (20kg or less) 4ND [Sripper Type] = (2-Finger)
Ø 68.P-082-0-58		2 Finger Gripper - 50kp or less	Released	20	(C)	[Maximum Payload] + [21-50Kg] AND [Gripper Type] + [3-Finger]
C 08/P-054-9-20	A.	3 Finger Gripper - 20kg or less	Released	30	10	[Maximum Payload] + [20kg or leas] AND [3ripper Type] + [3:Enger]
GRP-005-3-50	A	3-Finger Gripper - 50kg or less	Released	40	1	[Maximum Payload] = [21-50Kg] AND [Groper Type] = [3-Finger]
C GRP-001-4-1_	c	Vacuum Gripper - 100kg or less	Refeated	50	1	[Maximum Payload] = [51-100Kg] AND [Gripper Type] = Vacuum
E + VE-H-SEAL	A	End Effectors - Sealing	Preliminary	30.	4	Application - Seeing
G Sevier-101	A	Sealer Attachment (General Purpose)	Released	10		
E BO-+ CNTLR	A	Controller	Preliminary	20	1	
H - 13 80-5,5Wb	A	Software	Preliminary	30	1	
B - 13 80-000	*	Manualiz	Prehminary	40	+	
(I) เพร.ศร.ชง	A	Installation Manual - RS Geries - BN	Releases	10.	4	Series + RS AMD Language + English
INS RS-JP	*	Installation Manual - RS Series - JP	Released	20	x	Series + RS AND Language + Japanese
INSRV-EN	8	installation Manual - RM Berles - EN	Released	30	1	Series + RW AND Language × English
- Et INS-RW-JP	6	Installation Manual - RN Series - JP	Released	40	1	Senes + RW AND Language + Japanese
INSRPEN	-	Installation Manual - SP Setes - EN	Released	50	+	Series + RP AKB Language + English
I more est	A	Installation Manual - RP Series - JP	Releases	60	-	Series = RP AND Language = Japanese

aras

§ Link relevant variability scopes across product definition levels for simplified complexity presentation

:: 21-50Kg 1. 51-100Kg 🚦 BD-1-RBT 🏠 🏳 G (° | X· × a v | ···· Application No of Axes Maximum Pavlo Maximum Read Position Repeata Installation Meth Powe Controlle Power End Effector Application Maximum Payloa Gripper Type Software and Pro Application Optional Software Manuals Language

> Series Application

**§** Generate a variant from the configurable product definition with guided selection

Variability Item VI-E End Effector	I	Maximur	n Payload] =	S1-100kg] AND Gripper Ty	<u>pe]</u> = Vacu	um )				-00-dite3	GBIP-00-	CRIP-00-	Calp-00-
The second s	-								Gripper Type				
Application     Second Strategy 2-Finger		Valid Expr	ession					â	3-Finger 3-Finger Vacuum	~	>	~	>
3-Finger		8 8							Maximum Payload			-	
- : Vacuum	-	0 20	×						20kg or less	1		~	
E Maximum Payload		14	Item	Name	Revision	State	Sequ. 🕇	Quantity	21-50Kg		4		Y
20kg or less		0	GRIP-001-2-20	2-Finger Gripper - 20kg or less	8	Released	10	3	51-100Kg				
- : 21-50Kg		0	GRIP-002-2-50	2-Finger Gripper - 50kg or less	в	Released	20	3		_			
- 51-100Kg		0	GRIP-004-3-20	3-Finger Gripper - 20kg or less	A.	Released	30	1					
	-	0	GRIP-005-3-50	3-Finger Gripper - Sökg or less	A.	Released	40	1					
		0	GRIP-001-V-	Vacuum Groper - 100kg or less	0	Released	50						

	RS
	Assembling
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	1,000 mm or less
ity (mm)	±0.02
	Floo
	2.0kVA
	2.0kVA
	2.0877
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	20kg or less
amming	20kg or less
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amming	20kg or less 3-Finger Assembling
amming	20kg or less 3-Finge
amming	20kg or less 3-Finger Assembling
amming	20kg or less 3-Finge Assembling 2D Vision System

ĵ₩ 0 3 ₽	1			
Number	Name	Revision	State	Quantity
🖃 ··· 🏭 BD-1-RBT	Robot - R-Series	A	Preliminary	
🖃 🌄 BD-2-ARM	Robot Arm	A	Preliminary	1
🗄 🏭 BD-A-1	Base Assembly	A	Preliminary	1
白 🎦 BD-A-B-11	Base	А	Preliminary	1
🕀 – 🔅 R-Arm-11x	Base 20	С	Preliminary	1
🖃 🚼 BD-A-B-12	Actuator - Revolve Motion (J1)	С	Preliminary	1
R-Arm-12x	Motor 17HS15-1684D-HG-B20	A	Released	1
🖃 📲 BD-A-ENC	Encoder	В	Released	1
🔅 R-Arm-10a	Encoder AMT-Ax-02	В	Released	1
庄… 🎦 BD-A-B-14	Transmission - Revolve Motion	В	Released	1
⊕ <b>≣</b> BD-A-2	Arm Assembly	A	Preliminary	1
🖃 🏭 BD-3-HND	End Effector	A	Preliminary	1
🖻 🕂 🛟 VC-H-GRIP	End Effectors - Grippers	A	Preliminary	1
GRIP-004-3-20	3-Finger Gripper - 20kg or less	А	Released	1
🖃 🏭 BD-4-CNTLR	Controller	A	Preliminary	1
🗄 🕂 🛟 VC-CNTLR	Controllers	A	Preliminary	1
🔅 x01-ctl	X01 Controller	A	Released	1
🖃 🌓 BD-5_SWb	Software	A	Preliminary	1
🔅 SW-1	Robot Software (Standard)	A	Released	1
🔅 SW-2DV	2D Vision System Software	А	Preliminary	1
🔅 SW-4	Robot Programming Language (Standard)	С	Released	1
🖃 📳 BD-DOC	Manuals	A	Preliminary	1
INS-RS-EN	Installation Manual - RS Series - EN	A	Released	1

## Product Definition

#### Terminology

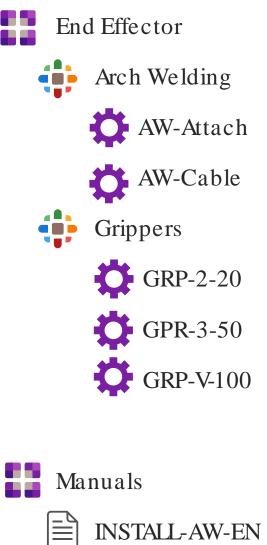
- Breakdown Item Modular blocks with structure, combined to create varied product configurations
- Variable Component – Collects assets that serve a specific function in the product, with variable feature and options

As set – Resources that contribute to the creation, functionality, or value of the product

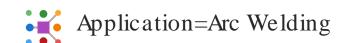
**§** Physical components, software, data, documentation, etc.

Content – Items used in constructing the breakdown items

Usage Condition – Criteria defining item utilization in product configuration





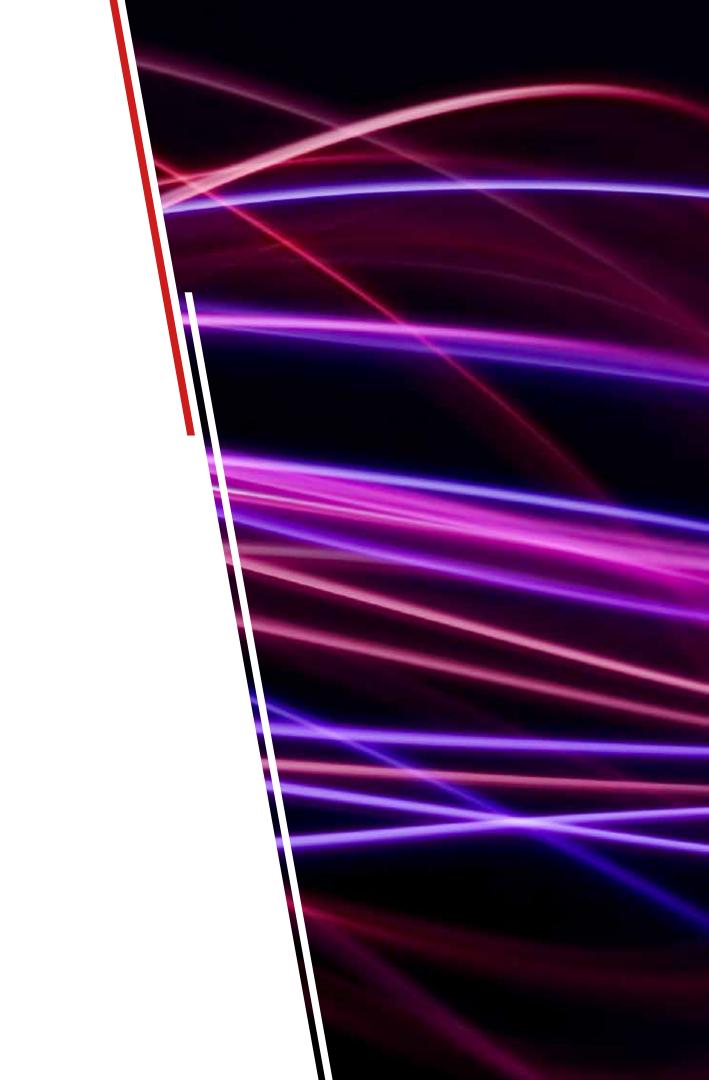


- Application=Assembling or Palletizing
- Type=2-Finger and Payload=20kg or less
- Type=3-Finger and Payload=21-50kg
- Type=Vacuum and Payload=51-100kg

- Application=Arc Welding and Language=EN
- Application=Palletizing and Language=JP INSTALL-PLT-JP

# Demonstration Configurable Product Definition





# Thank You



