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ABB ROBOTICS PRODUCT MANAGEMENT, JUNE 2017

# SafeMove2

Product Overview



# SafeMove2

## Basis

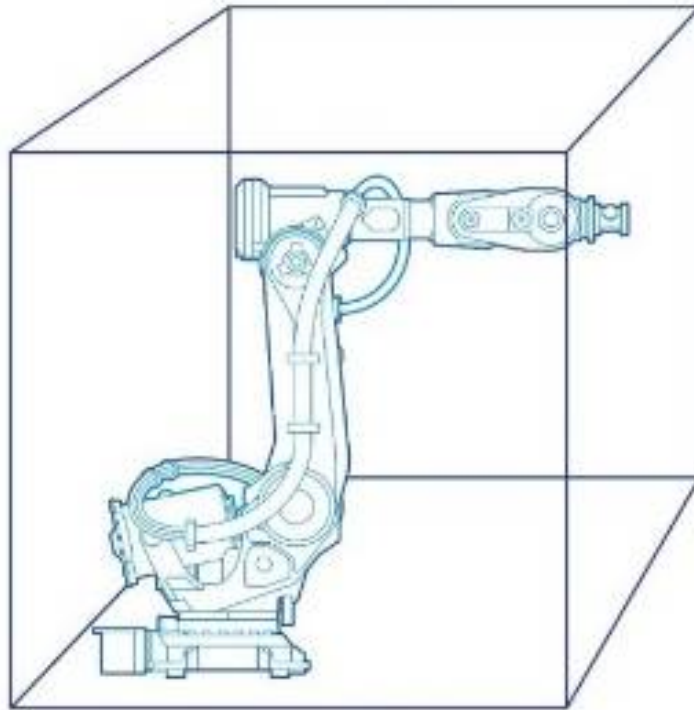


- Robots move fast, pose potential risks to people  
Safety barriers (fences cages, light curtains) intended to prevent people from walking into a robot cells
- Passing barriers cause robots to stop; interrupts production
  - Disqualifies collaboration between humans and robots.
  - Fast moving robots can break barriers if mistakenly programmed

SafeMove supply solutions to remove these bonds while maintain production

# SafeMove2

## Differentiated Value Proposition



SafeMove2, ABB's safety solution, ensures employee safety, revolutionizes safety commissioning times and reduces total investment by up to 30%.

# SafeMove2

## Product values



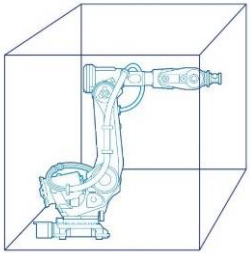
### Values

- Saves floor space
- Facilitates human/robot collaboration
- Enables hazardous applications such as X-ray inspections, laser cutting..

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# SafeMove2

## Customer benefits and key features



### Benefits

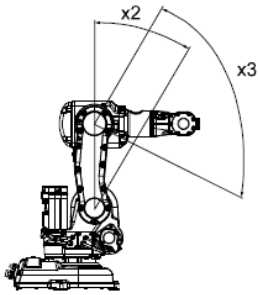
- Enables lean, flexible and more economic robot solutions
- Designed to keep humans and equipment completely safe
- Facilitates human/robot collaboration

### Features

- Fully integrated flexible software solution.
- Powerful configuration tools reducing commissioning times
- Flexible safety rated speed and position monitoring

# SafeMove2

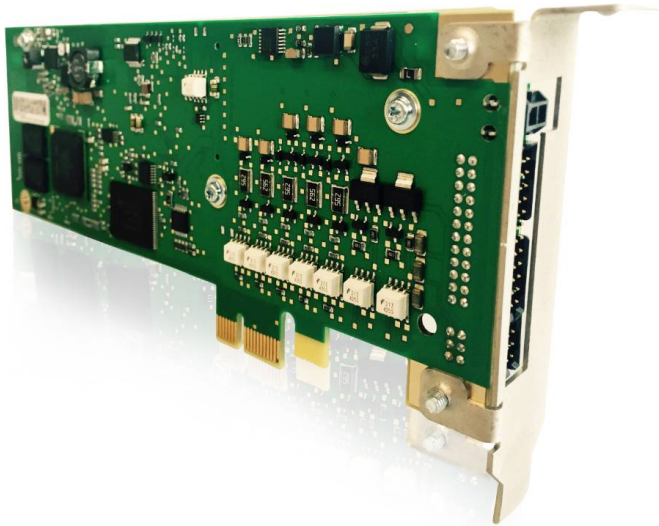
## Functions



- **Safe Zones** enables cell size optimization and simplifies the safeguarding of installations. It protects operators and enhances machine and equipment
- **Safe Axis Ranges** replaces electro-mechanical position switches, increases control and flexibility, and reduces maintenance requirements.
- **Safe Robot Speed** supervises speed at a defined level so an operator can work within the proximity of the robot.
- **Safe Standstill** supervises the stand-still of robot axes without having to switch the robot to Motors Off. It enables operators to perform tasks in the immediate vicinity of the robot.
- **Cyclic brake check** supervises that the brakes are checked periodically

# SafeMove2

Optimal balanced resources



- Space consuming SafeMove computer replaced with small PCIe extension board into main computer
- The optimal balance of hardware and software
  - Functionality based of flexible software solutions allowing future functionality expansion
  - Dedicated hardware to ensure performance of the safety system including fully reliable safety IO
  - Independency of the application running on the main computer.

# SafeMove2

## Built-in safety fieldbuses overview

- A key SafeMove2 feature is the built-in safety fieldbuses.
- Eliminating the need for dedicated hardware for communication with safety equipment such as safety PLC's & light curtains.
- No need for additional hardware, fully flexible software solution
- Wide offering of protocols
  - PROFIsafe Device (slave)
  - PROFIsafe Controller (F-host, master)
  - CIP Safety Adapter (slave)
  - CIP Safety Scanner (master) (2018)

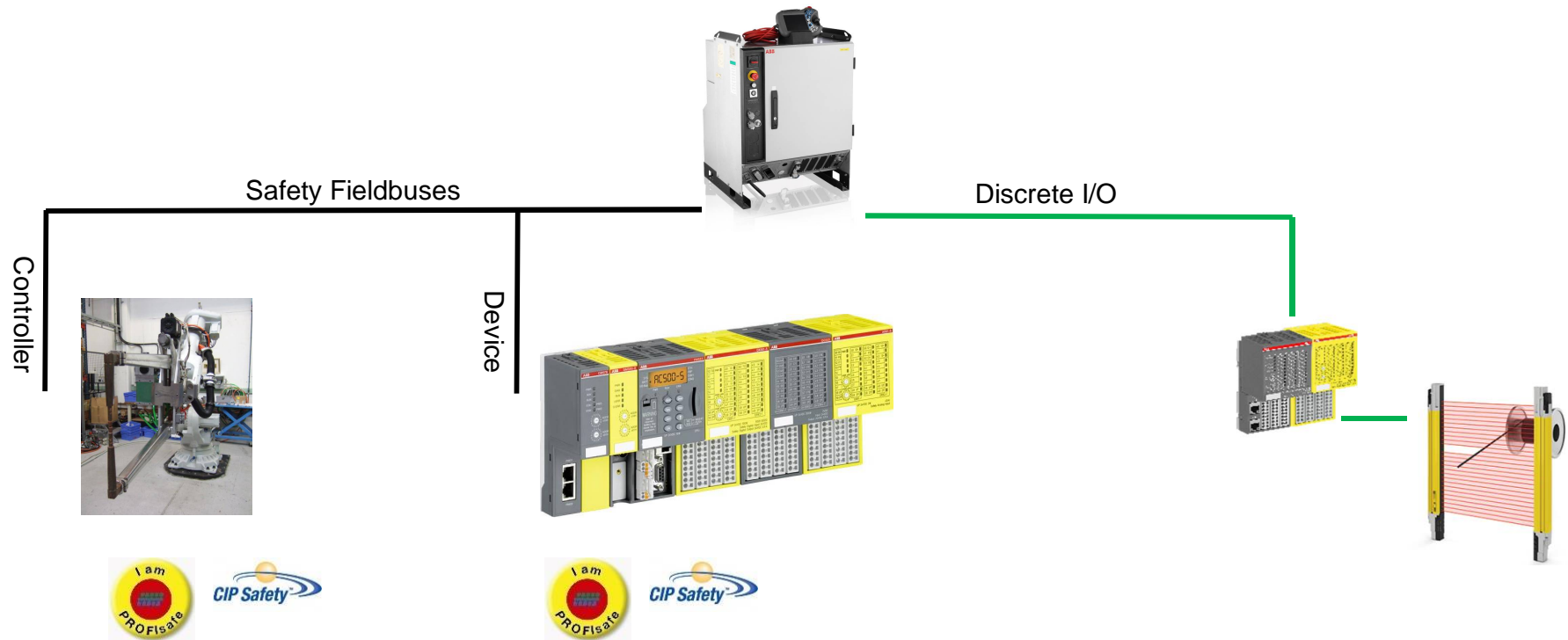


Largely reduced investments, increased flexibility & reliability



# SafeMove2

## Safe Communication Principles



# SafeMove2

## Safety fieldbus device

### Direct connection to safety networks

- Direct communication with safety PLCs
- Reduced need for cabling in line installations
- Flexible software solution, no dedicated hardware needed
- Support for either PROFIsafe or CIP Safety



# SafeMove2

## Safety fieldbus controller

### Direct control of safety equipment

- Possibility to connect safe I/O devices directly to the robot controller such as tool changers and I/O devices
- Reduced need for cabling
- Flexible software solution, no dedicated hardware needed
- Support for either PROFIsafe or CIP Safety\* protocol



# SafeMove2

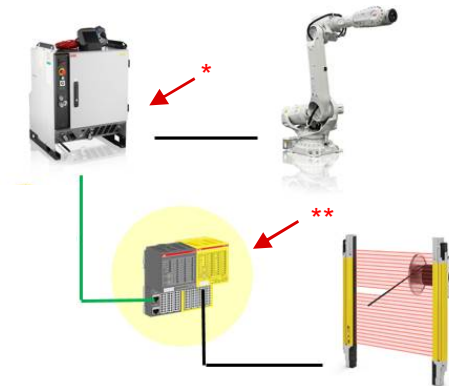
## Discrete safety IO's

### Discrete safety IOs

- Connection of safety sensors like light curtains, laser scanners, safety mats, etc.
- Directly to the SafeMove2 controller, for installations without safety fieldbus equipped PLC's
- Prepared in terms of software support (i.e. no hardware, wiring etc.)
- Intended to fill the gap of the discrete I/Os available in SafeMove1
- Exactly same functionality as F-Host, but limited to only use safe I/O devices from ABB Automation Products (Vendor Id)
- You will use the CI502 header module for Ethernet communication, but NOT the non-safe I/O:s on that unit

### Benefits

- No explicit need for safety PLC
- PROFIsafe F-host not needed.
- Higher flexibility and productivity
- Smaller safety distances due to faster safety response times



\* From ABB Robotics:  
996-1 Safety Module  
1241-1 Prepared for CI502  
888-2 Profinet m/s

\*\* From ABB Automation Products  
TU508-ETH  
CI502-PNIO  
TU582-S  
DI581 or DX581

# SafeMove2 – Discrete I/Os

## Communication module

- Communication interface module CI502-PNIO
  - PROFINET RT fieldbus connectivity for safety I/O modules
  - Decentralized/remote safety I/Os
- DIN rail or wall mounting with TU508-ETH terminal unit
- Up to 10 DI581-S and DX581-S safety I/O modules can be connected
- Extreme condition (-XC) modules are available (-40 to +70°C, high vibration and shock requirements, etc.)



**CI502-PNIO  
communication  
interface**



**TU508-ETH  
terminal unit**

# SafeMove2 – Discrete I/Os

## Safety IO modules

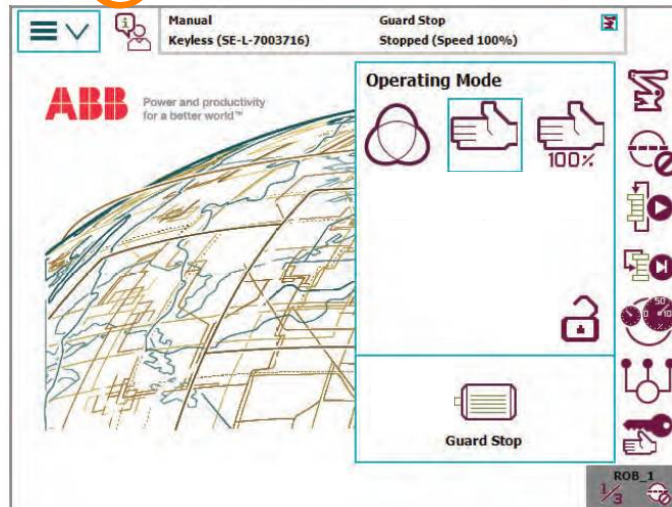
- DX581-S safety digital I/O module with
  - 8 safety output channels
  - 8 safety input channels
  - 4 test pulse outputs for 8 safety digital input channels
- DI581-S safety digital input module with
  - 16 safety input channels
  - 8 test pulse outputs for 16 safety digital input channels
- One TU582-S terminal unit suitable for both DI581-S and DX581-S modules
- SIL3 (IEC 62061, IEC 61508:2010) and PL e (ISO 13849-1) certified by TÜV Süd



**DI581-S and DX581-S  
safety digital I/O  
modules**

# SafeMove2

## Keyless mode selector

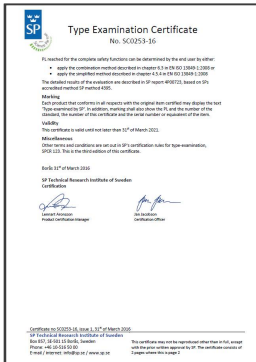


FlexPendant mode selector instead of physical key selector

- Increased ease of access
- No need for external control panels

# SafeMove2

## New and improved functions and features



- Certified PLd cat. 3 in accordance with ISO13849
- Extensive improvements in ease-of-use
- Increased number of zones, ranges, tools
- Improved precision and less sensitivity
- Zones inside zones functionality
- Support for combining safety functions
- Improved support for track based applications



# SafeMove2

Intuitive and effective commissioning

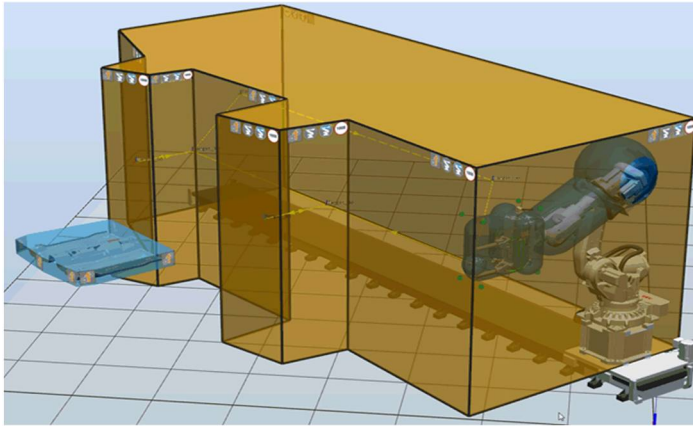


- Intuitive tools for setup and validation
  - Based on RobotStudio® 3D models and simulations
  - I/O configurator with built in signal logic
- Effective workflow for commissioning
  - Safe control of safety function in manual mode
  - Validation support tools
  - Single restart

**Significant reduced time to operation!**

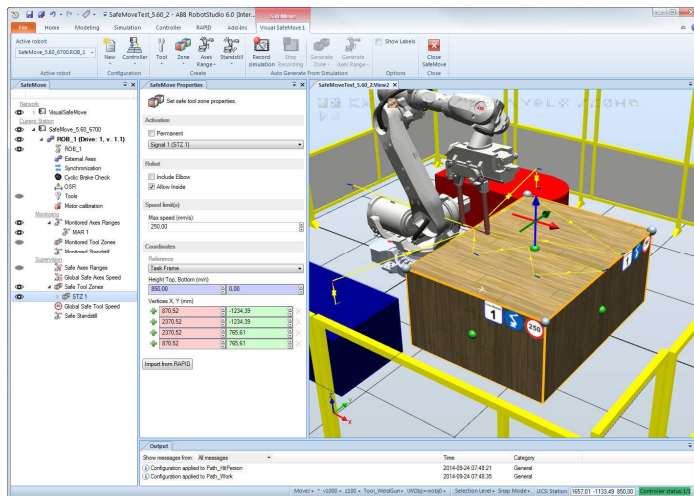
# SafeMove2

## SafeMove configuration



Intuitive tools for setup and validation based on RobotStudio

- Robot application programming
- Safety configuration
- I/O system configuration
- Simulation including safety system
- Automatic creation of safety zones based on simulation
- RobotStudio Basic - No license required



# SafeMove2

Take full advantage of RobotStudio environment

Automatic zone generation

3D editing

Proven UI concepts

Supports both Online and Offline

No RobotStudio license required!

Vertices X, Y (mm)	1	2	3	4	5	6	7	8
1:	1257.66927	519.55886						
2:	-529.42514	483.10895						
3:	-765.06682	-39.93733						
4:	-87.32959	-745.14968						
5:	418.91837	-2323.64362						
6:	1623.21041	-1760.40954						
7:	2187.57486	-410.32215						
8:	2187.57486	405.10895						

# SafeMove2

## Visual SafeMove online monitor

ABB RobotStudio 6.0 (64-bit) - SafeMove

Active robot: ...700\_AW\_RW6\_1058.ROB\_1

SafeMove Properties

Set safe tool zone properties.

Activation

- Permanent
- Signal 1 (SAR 1, STZ 1)

Robot

- Include Elbow
- Allow Inside

Speed limit(s)

Max speed (mm/s): 250 000

Coordinates

Reference: Task frame

Height Top, Bottom (mm): 2655.45643, 586.34561

Vertices X, Y (mm)

Vertex	X (mm)	Y (mm)
1	1257.66927	519.55886
2	-529.42514	483.10895
3	-755.06682	-39.93733
4	-87.32959	-745.14968

SafeMove Violations

Mechanism	Violation	Timestamp
IRB6700AW_RW6_1058 (1 Violations)	ROB_1 Safe Tool Zone (STZ) 1 is violated on Mechanical unit ROB_1. Tool 00 was active. Cause 12	2014-12-04 22:01:50

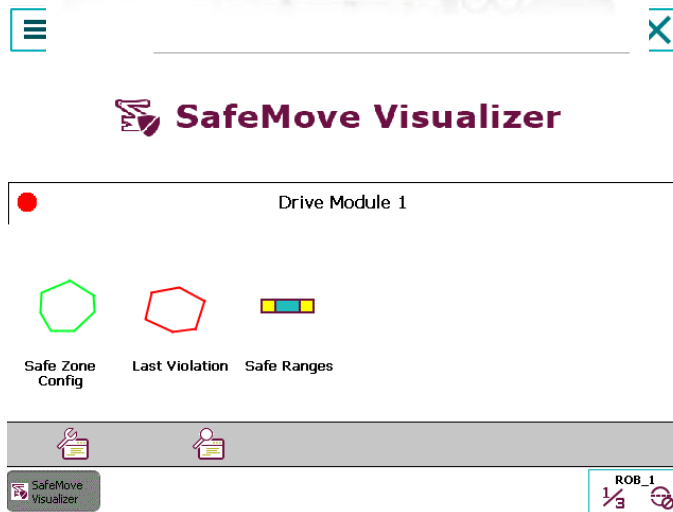
Violation!!!

# SafeMove2

## SafeMove Visualizer



- SafeMove Visualizer shows graphical representations of SafeMove configurations.
- Perfectly illustrates safety zones for fast and precise analysis of a zone or axis violation.



# SafeMove2

Feature	SafeMove Pro	SafeMove Basic	SafeMove 1 <sup>st</sup> generation
Safe Zones	16	1	8
Tool Changer Support	✓	✗	✓
Safe Axis Ranges	✓	✓	✓
Tool Orientation Supervision	✓	✗	✓
Safe Robot Speed	✓	✗	✓
Safe Stand Still	✓	✗	✓
Contact Application Support	✓	✓	✓
Safe fieldbus connectivity	✓	✓	✗
Keyless mode switch	✓	✓	✗
Discrete safety signals	0	0	8DI/8DO
Visual Safety configuration	✓	✓	✗
Commissioning modes	✓	✓	✗

# SafeMove2

## Supported robots and controllers



- SafeMove supports majority of IRC5 controllers.
  - IRC5 Single
  - IRC5 Compact
  - IRC5 Paint
- IRC5 PMC planned for later release
- SafeMove supports majority of ABB current robot range.
- IRB910SC, IRB120, IRB360 and YuMi not supported
- Support for any mounting angle, for example floor mounted, tilted and inverted.

# SafeMove2

## External axes support



- Supports all ABB track motion units.
- SafeMove supports single axis positioners
- Positioners with several axes are treated as multiple single axes.



- Non ABB track motion units, non ABB positioners, and other additional axis may be supported by SafeMove but needs to be verified case by case.



**AABB**