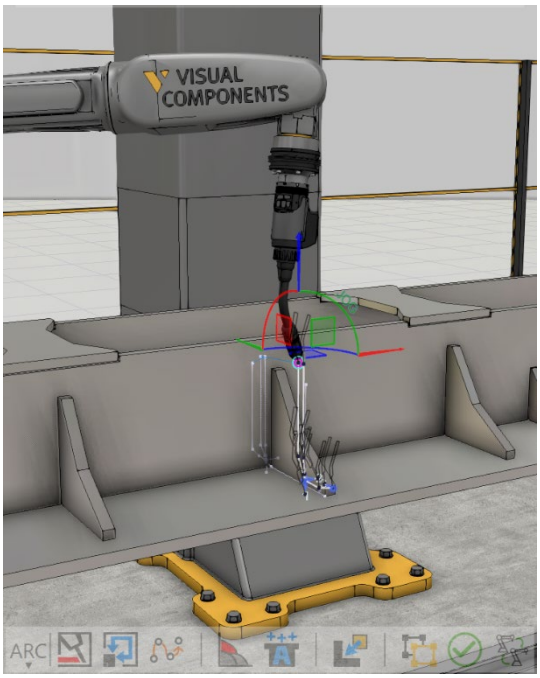
OLP – Introduction to searching

Visual Components 4.9 OLP | Version: 06/2025



NOTE: This document is only applicable to the following Robotics OLP products:

- Visual Components Premium OLP
- Visual Components Professional OLP
- Visual Components Robotics OLP

Learn how to create a search on VC OLP and how to configure/setup its different variations/possibilities.

This document includes the following topics:

- Basics about search function and its utilizations
- Different search modes
- Fronius WireSense advanced property for Fanuc and Yaskawa

Contents

Search function

Basics about the search function in automated robot welding

Using search techniques like laser, wire sensing, and gas nozzle sensing in robotic welding improves precision, efficiency, and flexibility. These functions automatically adjust welding paths, ensuring consistent, high-quality welds. Accurate detection of welding seams reduces reprogramming and manual adjustments, saving time and labor costs. This method enhances flexibility, handling variations in workpiece shapes and positions, boosting productivity and reducing defects.

Search function utilization in general

- Selecting the appropriate sensing technique for robotic welding application involves balancing precision, cost, complexity and environmental suitability. There are, for example, the following things that must be taken into consideration:
    - The specific welding application;
        - Are the searches needed or usable at all?
        - Is the welding equipment in use capable of doing a search?
    - Design of the workpiece and tools;
        - Is there enough space to do searches without collisions?
    - The type of materials being welded;
        - Rust, dirt, oil, shining, etc., might influence the search accuracy.
    - The required precision;
        - How accurate do the search results need to be, and is that needed accuracy possible to achieve as a result?
        - Jigs, fitment and/or consistency of parts – if all mentioned before are already accurate enough, searches might not be needed.
    - The production environment;
        - Is it harsh, clean, dusty, etc.?
        - Might influence the search results and must be taken into consideration when choosing the most suitable method for searching.

Different physical search touch methods for robot welding applications

There are three different main devices to choose from on the Visual Components OLP software when setting up the search path and its parameters.

Wire touch

- Wire/Wire Sweep
    - **When to Use**: All the searches that can be reached with the wire, searching lap-joints.
    - **Advantages**: Cost-effective and robust.
    - **Challenges**:
        - Wire needs to be consistent in multiple ways when doing the search.
        - Might need more frequent calibration when going for decent accuracy.
        - Contact between the searched surface and the wire needs to be good.

Nozzle touch

- Neck, Neck w/o wire, Middle, Shoulder, Front
    - **When to Use**: On sharp, easy-to-reach edges, plain search points.
    - **Advantages**: Cost-effective and robust.
    - **Challenges**:
        - Nozzle needs to remain in its original shape for accuracy.
        - Contact between the searched surface and the nozzle needs to be good.

External device

- Point laser, Point laser sweep, Camera
    - **When to Use**: High precision needed, complex geometry that might be hard/impossible to search with touching.
    - **Advantages**: High accuracy, fast searches.
    - **Challenges**:
        - Higher cost as an external device is needed
        - Sensitive to environmental conditions.
        - More complicated to set up and search accurately.

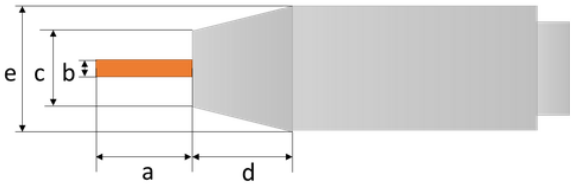
Different search modes

Note: For more detailed instructions about how to create a search on Visual Components Robotics OLP, go to the Visual Components Robotics Help, which can be found at https://help.visualcomponents.com/

Before creating a search

Tool design parameters

- Check that the tool design parameters are valid (Robot – Setup – Tool settings).



a = Wire length from gas nozzle

b = Wire diameter

c = Torch diameter

d = Shoulder distance

e = Shoulder diameter

- If the tool design parameters are faulty, it may cause a collision during search movements, or it may cause faulty search results.

Choosing the most suitable search mode

- Choose the search mode that suits your needs the best.
    - If there's already an existing robot cell with a specific search method in use, that should be chosen. Some methods require installing external devices and/or software options on the robot controller to be available for use.
- Consider what and how you want to find from the workpiece.

Using the manual search or the auto search

You can create a search using either manual or auto search.

- By using manual search, you must choose the search points by pointing to those points individually and giving the parameters according to the given instructions.

  Note: When using manual search, lock the external auxiliary axes (if needed, of course, there can be special cases), minimizing movements that could cause possible variation and unwanted errors in search results. Auto search checks the starting point of that weld and sets and locks the auxiliary axes to that orientation.

- By using auto search, you choose just the weld that the search is needed for, and it's created automatically.

  Note: You might need to adjust auto search parameters to get the search working as expected.

  (if needed, of course, there can be special cases)

Creating a search in general

Choosing search points in robotic welding requires careful consideration to ensure precision and consistency. Begin by examining the seams to be welded, identifying critical areas where accurate alignment plays a pivotal role. Special attention should be given to regions where variations in joint gaps, positions, or orientations might occur due to part tolerances, fixturing, or thermal distortion.

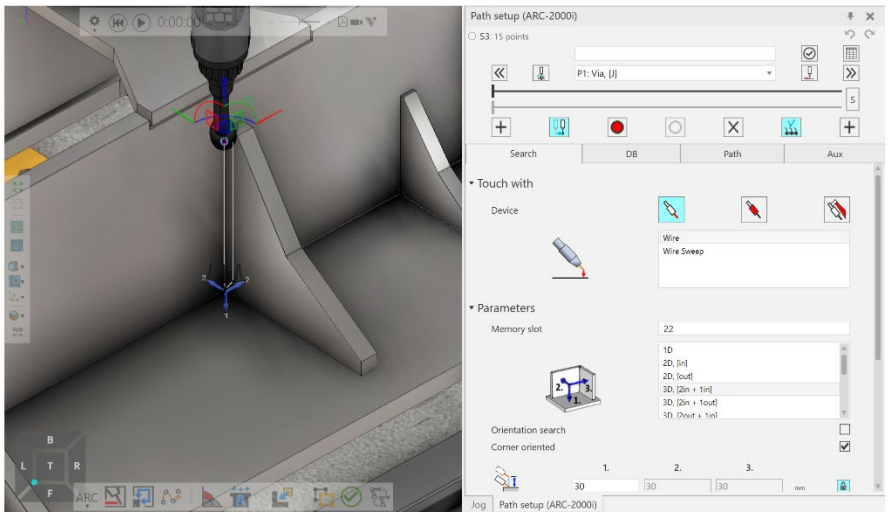
The selection of search points should focus on well-defined geometric features such as edges, corners, or holes that can be easily detected. In most cases, machined surfaces and laser-cut forms on the workpiece provide the most reliable features for detection. Depending on the complexity of the part, the number of search points needed for accurate positioning may vary: simpler weld paths may only require one or two points, while more complex paths might need three or more.

Accessibility is another important factor when choosing search points. They should be located on surfaces that provide clear and consistent feedback during detection. Regions with reflective, dirty, or inconsistent materials that could lead to detection errors should be avoided.

Trial welds on actual parts are essential to validate the chosen search points and assess the effectiveness of potential path corrections. Adjustments can then be made based on real-world results to optimize the process for accuracy and reliability.

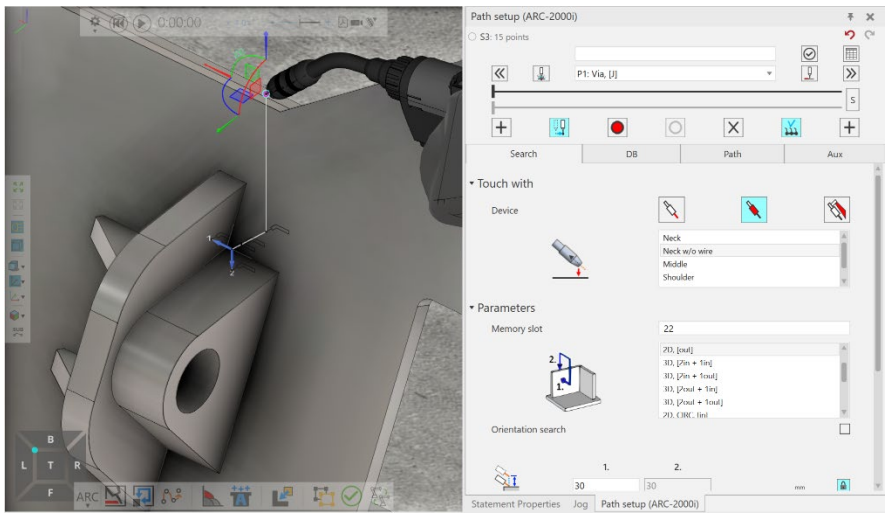
Search examples

Wire touch, 3D search mode



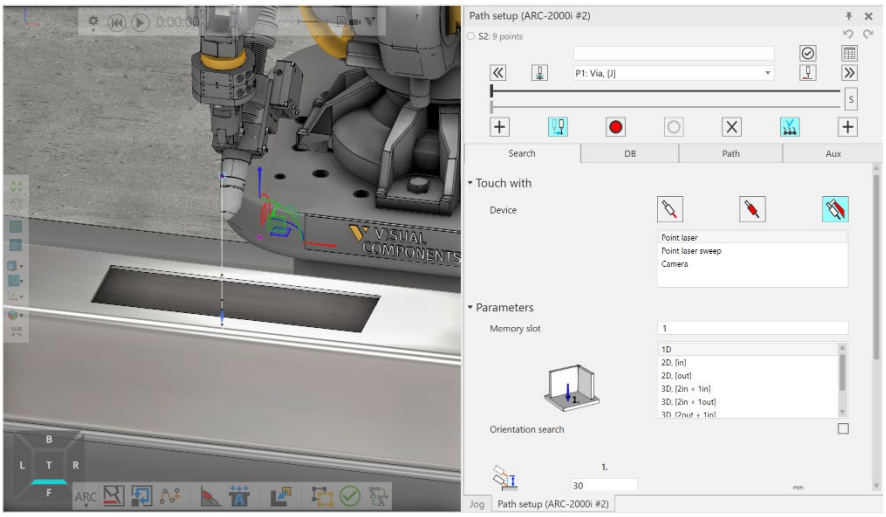
- Example on wire touch 3D search.
- A 3D search is chosen here because there are more than two surfaces to be welded together that can have variation in positioning.

Nozzle shoulder touch, 2D search mode



- Example on gas nozzle neck touch (w/o wire) 2D search.
- A 2D search is chosen here because parts to be welded are accurately positioned, have quite a simple form and are easily detected.

Laser search, 1D search mode



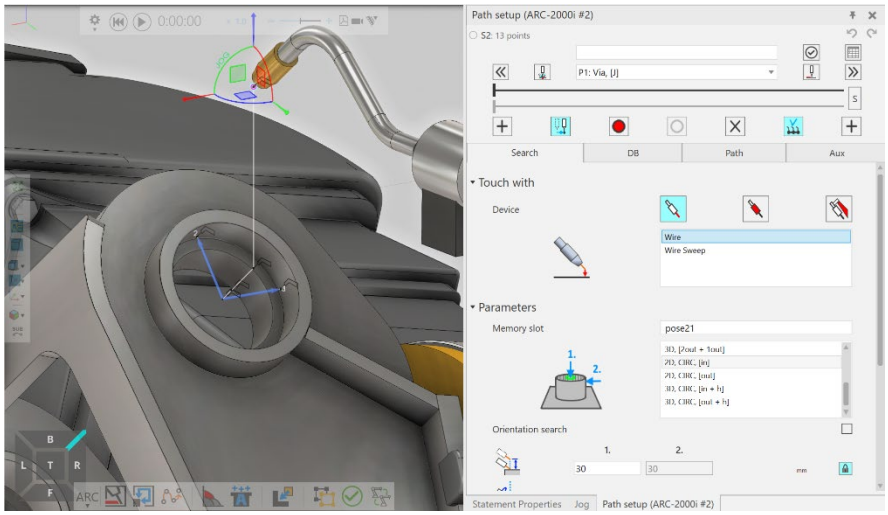
- Example on point laser 1D search.
- A 1D search is chosen here, because the workpiece is positioned as flat surface on very well fixed and centering jig, only the height of the surface must be checked.

Note: Circular search is currently supported for

- ABB: inside circle variant 1 (2 / 3 not tested)
- Fanuc: inside circle variant 2 or 3, outside circle variant 2
- OTC: inside circle variant 2 or 3, outside circle variant 2
- Panasonic: Only 2D circ searches. Inside circle variant 1, outside circle variant 1 or 2 (For Panasonic, SLS searches need to be enabled: Robot Settings | Path | Search: PanasonicSLS. Also, other advanced parameters, ask more from your local reseller.)
- Yaskawa: Inside circle variant 2 or 3, outside circle variant 2

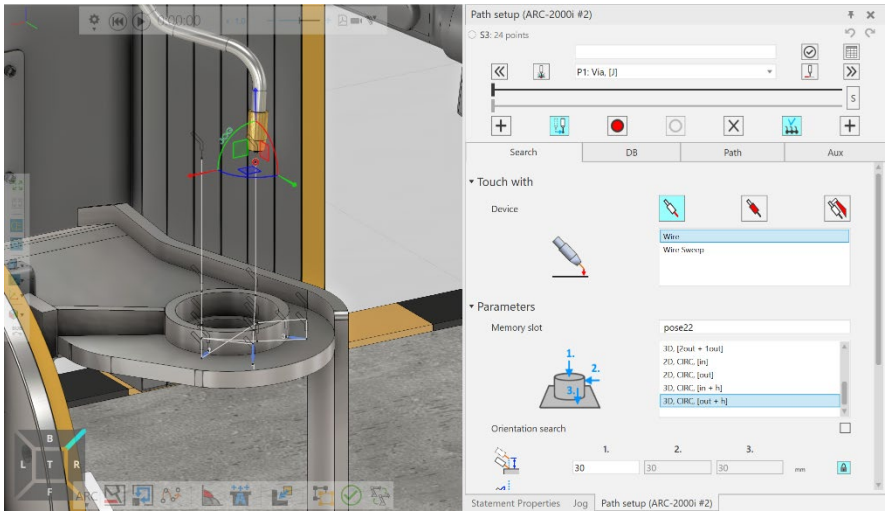
Note: For more detailed instructions about how to create a circular search on Visual Components Robotics OLP, go to Visual Components Help that can be found from https://help.visualcomponents.com/

Wire touch, 2D inside CIRC



- Example on wire touch 2D inside CIRC search.
- A 2D inside circular search is chosen here because only the positioning of the part to be welded must be checked.

Wire touch, 3D outside CIRC+H



- Example on wire touch 3D outside CIRC+H search.
- A 3D outside circular search with height is chosen here because the relative positioning of the part to be welded to the workpiece must be checked vertically and horizontally for a more accurate and consistent result.

Fronius WireSense

Fronius WireSense is currently supported for Fanuc and Yaskawa robots as an option on the robot controller software. Fronius welding equipment should be capable of doing a push-pull movement of the wire, so that you can utilize this option.

When to use the WireSense

- The most common use for WireSense is searching lap joints.
    - Even small differences in height/thickness can be found on flat surfaces that can't be detected with other search methods.

How to use the WireSense

- Add an advanced search paramerer, WireSense.

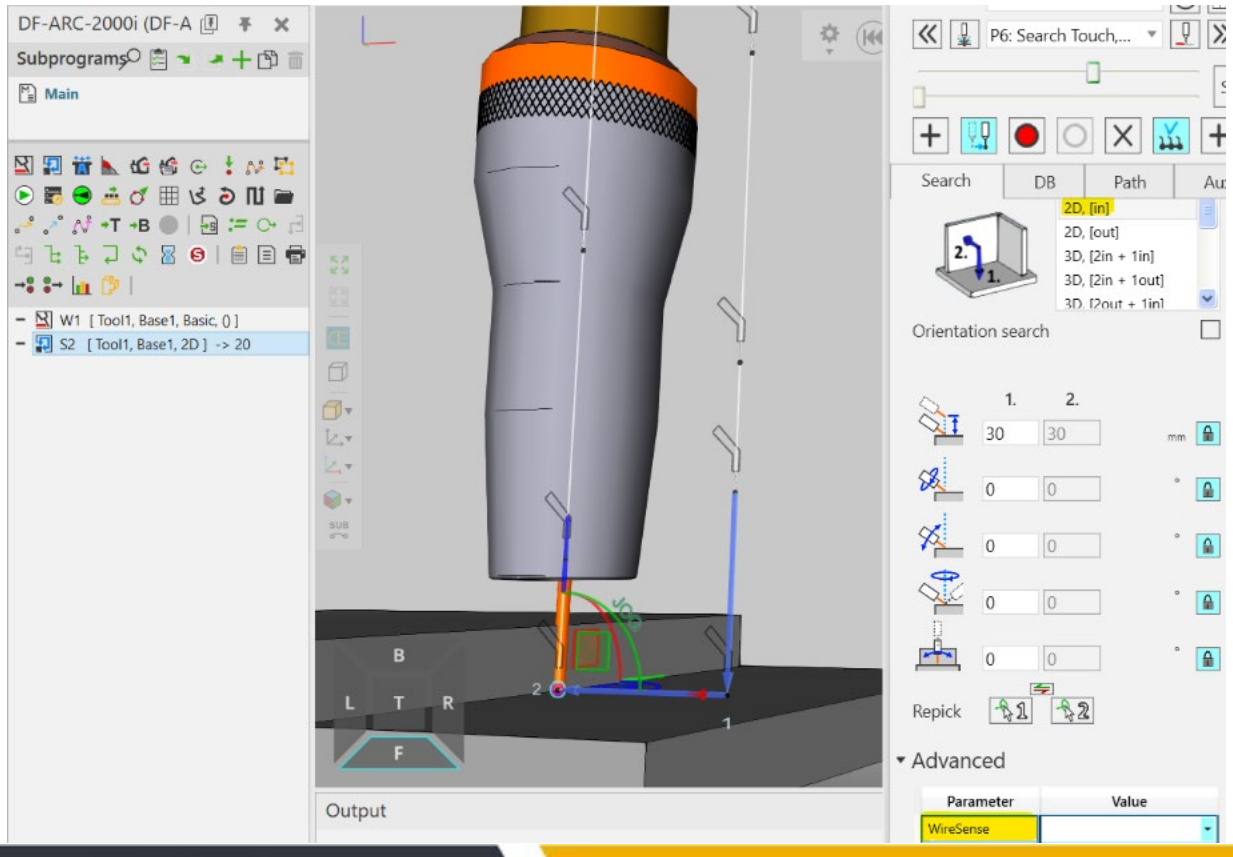
  Note: The parameter is case sensitive. Thus, remember to put it like this WireSense.

- Use the Search mode 2D, [in].

Fronius WireSense is available for Fanuc and Yaskawa robots as an option on the robot controller software. Fronius welding equipment must perform a push-pull movement of the wire to use this option.

When to use WireSense

- Most commonly used for searching lap joints.



On Fanuc

It uses the provided utility functions DF_SEARCH2, DF_SEARCH2_WS, and WS_REAL_HEIGHT. These must be loaded onto the robot controller before using WireSense search.

On Yaskawa

It uses the provided utility function, which must be loaded onto the robot controller before using WireSense search. Utility functions depend on the robot setup and can be found in the Translator/Search folder.