Data types
zonedata - Zone data
RobotWare - OS

|	
Usage	zonedata is used to specify how a position is to be terminated, i.e. how close to the programmed position the axes must be before moving towards the next position.
Description	A position can be terminated either in the form of a stop point or a fly-by point.

A stop point means that the robot and additional axes must reach the specified position (stand still) before program execution continues with the next instruction. It is also possible to define stop points other than the predefined fine. The stop criteria, that tells if the robot is considered to have reached the point, can be manipulated using the stoppointdata.

A fly-by point means that the programmed position is never attained. Instead, the direction of motion is changed before the position is reached. Two different zones (ranges) can be defined for each position:

- The position zone for the TCP path.
- The reorientation and additional axis zone.
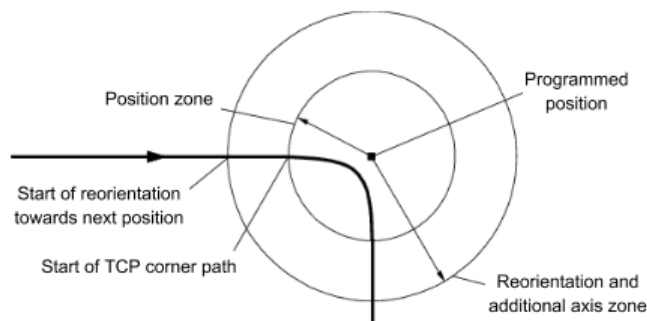
The zone for the TCP path
A corner path is generated as soon as the edge of the corner zone is reached (see figure above).
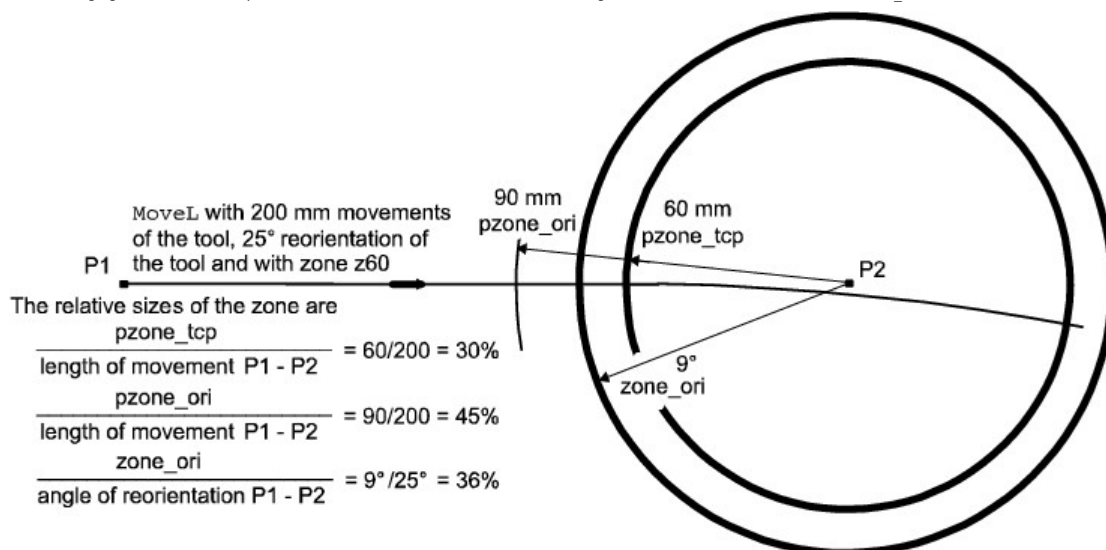
Calculation of reorientation and additional axis zone
The datatype zonedata contains one component that determines the position zone, pzone_tcp. But the reorientation and additional axis zone can be affected by all of the following zonedata components.

- pzone_ori - zone radius, in mm TCP movement, for reorientation of the tool
- pzone_eax - zone radius, in mm TCP movement, for movement of the additional axis
- zone_ori - angle zone, in degrees of tool reorientation
- zone_leax - zone size, in mm of linear additional axis movement
- zone_reax - angle zone, in degrees of rotational additional axis reorientation

The size of the reorientation and additional axis zone is generally limited by the smallest zone generated from the applicable components above. The zone will be defined as the smallest relative size of the zone based upon the zone components and the programmed motion.

If the calculations result in a reorientation and additional axis zone that is smaller than the position zone, the reorientation and additional axis zone will be set to the same size as the position zone. The exception is if there is no (or almost no) TCP position movement. If the reorientation is large and the position movement is small, the position zone can be reduced to the size of the reorientation and additional axis zone.
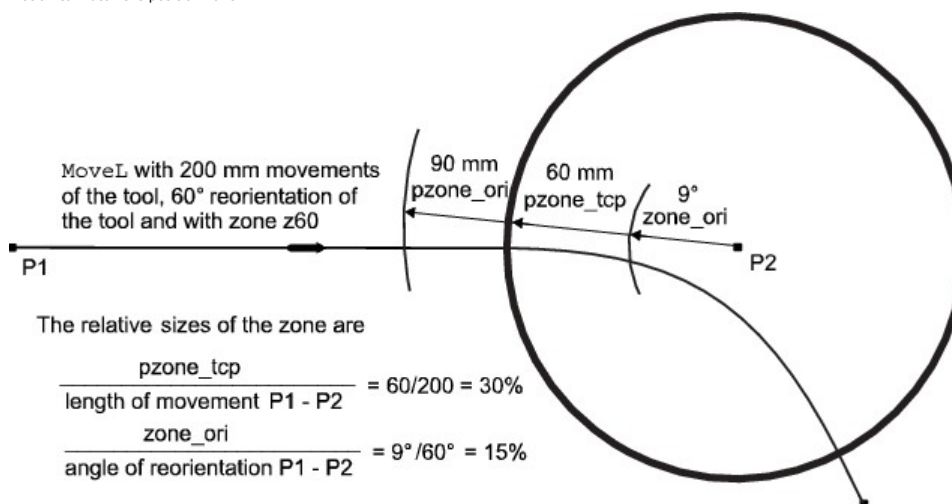
The following figure shows an example of the reorientation and additional axis zone being reduced to 36% of the motion due to zone_ori.

MoveL with 200 mm movements of the tool, 25° reorientation of the tool and with zone z60

The relative sizes of the zone are

$$\frac{pzone\_tcp}{length\ of\ movement\ P1 - P2} = 60/200 = 30\%$$

$$\frac{pzone\_ori}{length\ of\ movement\ P1 - P2} = 90/200 = 45\%$$

$$\frac{zone\_ori}{angle\ of\ reorientation\ P1 - P2} = 9°/25° = 36\%$$

The size of the reorientation and additional axis zone must never be smaller than the position zone. So if, for example, zone_ori result in a smaller size than

pzone_tcp, the reorientation and additional axis zone is increased to the size of the position zone.

The following figure shows an example where zone_ori would result in a reorientation and additional axis zone of 15% of the motion, but is increased to 30% of the motion to match the position zone.

MoveL with 200 mm movements of the tool, 60° reorientation of the tool and with zone z60

The relative sizes of the zone are

$$\frac{pzone\_tcp}{length\ of\ movement\ P1 - P2} = 60/200 = 30\%$$

$$\frac{zone\_ori}{angle\ of\ reorientation\ P1 - P2} = 9°/60° = 15\%$$

Normally not all zonedata components are applicable. For example, for a rotational additional axis reorientation without robot movement, only zone_reax is applicable.

For all zonedata components that are applicable, the smallest of the following relations determine the size of the reorientation and additional axis zone (as long as it is larger or equal to the position zone).

$$\frac{pzone\_ori}{length\ of\ movement\ P1 - P2}$$

$$\frac{zone\_ori}{angle\ of\ tool\ reorientation\ P1 - P2}$$

$$\frac{pzone\_eax}{length\ of\ movement\ P1 - P2}$$

$$\frac{pzone\_leax}{length\ of\ max\ linear\ add.\ axis\ movement\ P1 - P2}$$

$$\frac{pzone\_reax}{angle\ of\ max\ reorientation\ of\ rotating\ add.\ axis\ P1 - P2}$$

Reduced corner zones

If programmed positions are close to each other and the corner zones are big, the corner zones can be reduced from the programmed size. See section *Interpolation of corner paths* in *Technical reference manual - RAPID Overview*.

Components

finep

fine point

Data type: bool

Defines whether the movement is to terminate as a stop point (fine point) or as a fly-by point.

- TRUE: The movement terminates as a stop point, and the program execution will not continue until robot reach the stop point. The remaining components in the zone data are not used.
- FALSE: The movement terminates as a fly-by point, and the program execution continues when the prefetch conditions have been met (see system parameter *Prefetch Time*).

pzone_tcp

path zone TCP

Data type: num

The size (the radius) of the TCP zone in mm.

pzone_ori

path zone orientation

Data type: num

The zone size (the radius) for the tool reorientation. The size is defined as the distance of the TCP from the programmed point in mm.

The size must be larger than the corresponding value for pzone_tcp. If a lower value is specified, the size is automatically increased to make it the same as pzone_tcp.

pzone_eax

path zone external axes

Data type: num

The zone size (the radius) for external axes. The size is defined as the distance of the TCP from the programmed point in mm.

The size must be larger than the corresponding value for `pzone_tcp`. If a lower value is specified, the size is automatically increased to make it the same as `pzone_tcp`.

`zone_ori`
zone orientation
Data type: `num`

The zone size for the tool reorientation in degrees. If the robot is holding the work object, this means an angle of rotation for the work object.

`zone_leax`
zone linear external axes
Data type: `num`

The zone size for linear external axes in mm.

`zone_reax`
zone rotational external axes
Data type: `num`

The zone size for rotating external axes in degrees.

Basic examples	The following example illustrates the data type `zonedata`:

Example 1

```
VAR zonedata path := [ FALSE, 25, 40, 40, 10, 35, 5 ];
```

The zone data `path` is defined by means of the following characteristics:

- The zone size for the TCP path is `25` mm.
- The zone size for the tool reorientation is `40` mm (TCP movement).
- The zone size for external axes is `40` mm (TCP movement).

If the TCP is standing still, or there is a large reorientation, or there is a large external axis movement with respect to the zone, the following apply instead:

- The zone size for the tool reorientation is `10` degrees.
- The zone size for linear external axes is `35` mm.
- The zone size for rotating external axes is `5` degrees.

Predefined data

A number of zone data are already defined in the system.

Stop points
Use `zonedata` named `fine`.

Fly-by points

	Path zone			Zone		
Name	**TCP path**	**Orientation**	**Ext. axis**	**Orientation**	**Linear axis**	**Rotating axis**
z0	0.3 mm	0.3 mm	0.3 mm	0.03°	0.3 mm	0.03°
z1	1 mm	1 mm	1 mm	0.1°	1 mm	0.1°
z5	5 mm	8 mm	8 mm	0.8°	8 mm	0.8°
z10	10 mm	15 mm	15 mm	1.5°	15 mm	1.5°
z15	15 mm	23 mm	23 mm	2.3°	23 mm	2.3°
z20	20 mm	30 mm	30 mm	3.0°	30 mm	3.0°
z30	30 mm	45 mm	45 mm	4.5°	45 mm	4.5°
z40	40 mm	60 mm	60 mm	6.0°	60 mm	6.0°
z50	50 mm	75 mm	75 mm	7.5°	75 mm	7.5°
z60	60 mm	90 mm	90 mm	9.0°	90 mm	9.0°
z80	80 mm	120 mm	120 mm	12°	120 mm	12°
z100	100 mm	150 mm	150 mm	15°	150 mm	15°
z150	150 mm	225 mm	225 mm	23°	225 mm	23°
z200	200 mm	300 mm	300 mm	30°	300 mm	30°

Structure

```
<data object of zonedata>
    <finep of bool>
    <pzone_tcp of num>
    <pzone_ori of num>
    <pzone_eax of num>
    <zone_ori of num>
    <zone_leax of num>
    <zone_reax of num>
```

Related information

For information about	See
Positioning instructions	*Technical reference manual - RAPID Overview*
Movements/Paths in general	*Technical reference manual - RAPID Overview*
Configuration of external axes	*Application manual - Additional axes and stand alone controller*

Other Stop points

stoppointdata - Stop point data