*CONTROL_REMESHING_{OPTION}

Available options include:

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EFG

Purpose: Provide control over the remeshing of solids which are meshed with the solid tetrahedron element type 13 and mesh-free solid types 41, 42. The element size for three-dimensional adaptivity can be set on the surface mesh of the solid part, and adaptivity can be activated based on the criterions of volume loss, mass increase, or minimum time step size. In addition, so-called interactive adaptivity triggers can be invoked using the EFG option.

There are two types of 3-D solid adaptivity affected by *CONTROL_REMESHING:

1. General tetrahedral adaptivity for which the EFG option of *CONTROL_REMESHING may be invoked. See ADPOPT = 2 in *PART.

2. Axisymmetric adaptivity, sometimes called orbital adaptivity, in which remeshing is done with hexahedral and pentahedral elements. See ADPOPT = 3 in *PART. The EFG option of *CONTROL_REMESHING does not apply for this type of adaptivity.

Card 1	1	2	3	4	5	6	7	8
Variable	RMIN	RMAX	VF_LOSS	MFRAC	DT_MIN	ICURV	CID	SEGANG
Type	F	F	F	F	F	I	I	F
Default	none	none	1.0	0.0	0.	4	0	0.0

Additional card for EFG option.

Card 2	1	2	3	4	5	6	7	8
Variable	IVT	IAT	IAAT	IER	MM			
Type	I	I	I	I	I			
Default	1	0	0	0	0			

Second additional card for EFG option. This card is optional.

Card 3	1	2	3	4	5	6	7	8
Variable	IAT1	IAT2	IAT3					
Type	F	F	F					
Default	10^{20}	10^{20}	10^{20}					

VARIABLE	DESCRIPTION
RMIN	Minimum edge length for the surface mesh surrounding the parts which should be remeshed.
RMAX	Maximum edge length for the surface mesh surrounding the parts which should be remeshed.
VF_LOSS	Volume fraction loss required in a type 13 tetrahedral elements to trigger a remesh. In the type 13 solid elements, the pressures are computed at the nodal points; therefore, it is possible for volume to be conserved but for individual tetrahedrons to experience a significant volume loss or gain. The volume loss can lead to numerical problems. Recommended values for VF_LOSS in the range of 0.10 to 0.30 may be reasonable.
MFRAC	Mass ratio gain during mass scaling required for triggering a remesh. For a one percent increase in mass, set MFAC = 0.010. This variable applies to both to general three dimensional tetrahedral remeshing and to three dimensional axisymmetric remeshing.
DT_MIN	Time step size required for triggering a remesh. This option applies only to general three dimensional tetrahedral remeshing and is checked before mass scaling is applied and the time step size reset.
ICURV	Define number of element along the radius in the adaptivity. See remark 3.

VARIABLE	DESCRIPTION
CID	Coordinate system ID for three dimensional axisymmetric remeshing. The z-axis in the defined coordinate system is the orbital axis, and has to be parallel to the global z-axis in the current axisymmetric remesher. EQ.0: use global coordinate, and the global *z*-axis is the orbital axis (default)
SEGANG	For Axisymmetric 3-D remeshing: Angular element size (degrees). For General (tet) 3-D remeshing: Critical angle specified in radians to preserve feature lines.
IVT	Internal variable transfer in adaptive EFG. EQ.1: Moving Least square approximation with Kronecker-delta property (recommended in general case). EQ.-1: Moving Least square approximation without Kronecker-delta property. EQ.2: Partition of unity approximation with Kronecker-delta property. EQ.-2: Partition of unity approximation without Kronecker-delta property. EQ.-3: Finite element approximation.
IAT	Flag for interactive adaptivity. EQ.0: No interactive adaptivity. EQ.1: Interactive adaptivity combined with predefined adaptivity. EQ.2: Purely interactive adaptivity. The time interval between two successive adaptive steps is bounded by ADPFREQ. EQ.3: Purely interactive adaptivity.
IAAT	Interactive adaptivity adjustable tolerance. EQ.0: The tolerance to trigger interactive adaptivity is not adjusted. EQ.1: The tolerance is adjusted in run-time to avoid over-activation.

VARIABLE	DESCRIPTION
IER	Interactive adaptive remeshing with element erosion for metal cutting. EQ.1: The failed elements are eroded and the cutting surface is reconstructed before adaptive remeshing. The current implementation only supports SMP and IAT = 1, 2, 3.
MM	Interactive adaptive remeshing with monotonic resizing. EQ.1: The adaptive remeshing can not coarsen a mesh. The current implementation only supports IAT = 1, 2, 3 and IER = 0.
IAT1	Shear strain tolerance for interactive adaptivity. If the shear strain in any formulation 42 EFG tetrahedral element exceeds IAT1, remeshing is triggered. (0.1 ~ 0.5 is recommended).
IAT2	$L_{\max}/L_{\min}$ tolerance where $L_{\max}$ and $L_{\min}$ are the maximum and minimum edge lengths of any given formulation 42 EFG tetrahedral element. If this ratio in any element exceeds IAT2, remeshing is triggered. (RMAX/RMIN is recommended.)
IAT3	Volume change tolerance. If the normalized change in volume of any formulation 42 tetrahedral element, defined as $\|v_1 - v_0\|/\|v_0\|$ where v_1 is the current element volume and v_0 is the element volume immediately after the most recent remeshing, exceeds IAT3, remeshing is triggered. (0.5 is recommended.)

Remarks:

1. The value of RMIN and RMAX should be of the same order. The value of RMAX can be set to 2-5 times greater than RMIN.

2. When interactive adaptivity is invoked (IAT > 0), even if none of the tolerances IAT1, IAT2, and IAT3 for the three respective indicators (shear strain, edge length ratio, normalized volume change) are exceeded, remeshing will still be triggered if any of the three indicators over a single explicit time step changes by more than 50%, that is, if

$$\frac{|[\text{value}]_n - [\text{value}]_{n-1}|}{|[\text{value}]_{n-1}|} > 0.5$$

where $[\text{value}]_n$ denotes value of indicator in n^{th} (current) time step and $[\text{value}]_{n-1}$ denotes value of indicator in previous time step . This condition is checked only if $[\text{value}]_{n-1}$ is nonzero.

3. ICURV represents a number of elements and applies only when ADPENE > 0 in *CONTROL_ADAPTIVE. The "desired element size" at each point on slave contact surface is computed based on the tooling radius of curvature (see the description of ADPENE in *CONTROL_ADAPTIVE), so that ICURV elements would be used to resolve a hypothetical 90 degree arc at the tooling radius of curvature. The value of ICURV is (internally) limited to be >=2 and <=12. The final adapted element size is adjusted as necessary to fall within the size range set forth by RMIN and RMAX.