*CONSTRAINED_SOLID_IN_SOLID_{OPTION1}_{OPTION2}

This keyword can take the following two forms:

*CONSTRAINED_SOLID_IN_SOLID

*CONSTRAINED_SOLID_IN_SOLID_PENALTY

To define a CBIS ID and heading the following options are available:

ID

TITLE

Purpose: Provide either constraint-based or penalty-based coupling between solids and the solids/thick shells in which the solids are embedded. It is one of the keywords in the *CONSTRAINED_BEAM/SOLID_IN_SOLID family.

To use the constraint-based coupling, this keyword takes the form of *CONSTRAINED_SOLID_IN_SOLID. It constrains solid structures to move with Lagrangian solids/thick shells, which serve as the master component. This keyword constrains both acceleration and velocity. This keyword, together with *CONSTRAINED_BEAM_IN_SOLID, intend to sidestep certain limitations of the CTYPE = 2 implementation in *CONSTRAINED_LAGRANGE_IN_SOLID. Notable features of this keyword include:

1. **Tetrahedral and pentahedral solid elements are supported.** They are treated as degenerated hexahedra in the CTYPE = 2 implementation.

2. **Velocity/Fixed boundary condition.** The CTYPE = 2 implementation failed to constrain solid nodes that were buried inside elements whose nodes had velocity/fixed boundary conditions prescribed.

3. **Optimized Sorting.** Sorting subroutine is optimized for larger problems to achieve better performance and less memory usage.

To use the penalty-based coupling, this keyword takes the form of *CONSTRAINED_SOLID_IN_SOLID_PENALTY. A penalty spring is attached between coupling points on the solid and in the solid/thick shell element. Penalty spring stiffness is calculated based on the geometric mean of slave and master's bulk modulus. The magnitude of this coupling force can be controlled using PSSF (penalty spring stiffness scale factor). This penalty coupling conserves kinetic energy much better in transient problems such as blast loading.

If a title is not defined, LS-DYNA will automatically create an internal title for this coupling definition.

Title Card. Additional card for TITLE and ID keyword options.

Card ID	1	2	3	4	5	6	7	8
Variable	COUPID	TITLE						
Type	I	A70						

Card 1	1	2	3	4	5	6	7	8
Variable	SLAVE	MASTER	SSTYP	MSTYP				
Type	I	I	I	I				
Default	none	none	0	0				

Card 2	1	2	3	4	5	6	7	8
Variable	START	END				PSSF		
Type	F	F				F		
Default	0.	10^{10}				0.1		

VARIABLE	DESCRIPTION
COUPID	Coupling (card) ID number (I10). If not defined, LS-DYNA will assign an internal coupling ID based on the order of appearance in the input deck.
TITLE	A description of this coupling definition.
SLAVE	Slave set ID defining a part or part set ID of the Lagrangian solid structure (see *PART, *SET_PART).
MASTER	Master set ID defining a part or part set ID of the Lagrangian solid elements or thick shell elements (see *PART or *SET_PART).

VARIABLE	DESCRIPTION
SSTYP	Slave set type of “SLAVE”: EQ.0: part set ID (PSID). EQ.1: part ID (PID).
MSTYP	Master set type of “MASTER”: EQ.0: part set ID (PSID). EQ.1: part ID (PID).
START	Start time for coupling.
END	End time for coupling.
PSSF	Penalty spring stiffness scale factor. Only available in penalty form.