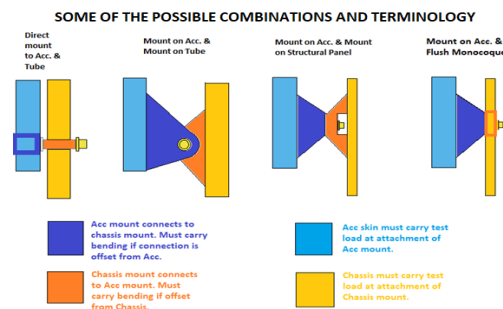


2024 SES Accumulator Container Attach/Mount Calculation



Requirements

Load Based: 15 kN or more per attachment point in any direction (F.10.5.7b)

Corner Mount : Load equal to or more than 1/4 of total mass of the container accelerating at 40 g(F.10.5.6c)

SES is calculated in the following parts:

① Accumulator Container Wall

② Accumulator Mount

③ Chassis Mount

④ Chassis (Tube or Monocoque Skin)

Acc. Mount 1-5

Chassis Mount 1-5

Additional images may be placed below each section.

F.10.5.6-7	Mounting Method: Mass Based	EQ
	Test Load: 15000 N	EQ
	Accumulator mount symmetry: Left/Right	EQ
	Chassis mount symmetry: Left/Right	EQ

This will change the names of sections.

① Mounting Method

BLANK Accumulator Mount 1		
ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount		
BLANK		
Intersection of fastener axis and fastener shear plane:		
the front/rear planes of the accumulator segments:	mm	BLANK
the top/bottom planes of the accumulator segments:	mm	BLANK
the left/right planes of the accumulator segments:	mm	BLANK
Total Surface Offset, zero for an internal hardpoint:	0 mm	EQ
Mount material (Accumulator skin if directly mounted):		EQ
Young's Modulus (E):	#N/A Pa	EQ
Ultimate Tensile and Bending Strength (S):	#N/A Pa	EQ
Shear:	#N/A Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:	mm
	--Tearout--Minimum - Fastener spacing, edge, or corner distance:	mm
	Number of fasteners used (2x if in double shear):	0
	Fastener shear diameter:	mm
	Threads in shear:	0
	Fastener UTS:	Pa
	--Pullout--Min total perimeter of washers or inserts on one surface:	mm
F.10.5.8.a	--Shear-- $0.577 \times \text{fasteners} \times \text{UTS} \times \pi \times r^2 \geq \text{Test Load}$:	0.00E+00
	--Pullout--Mount shear*thickness*perimeter $\geq \text{Test Load}$:	#N/A #N/A
	--Tearout--Mount shear*thickness*edge distance $\geq \text{Test Load}$:	#N/A #N/A
	Thread pullout $\min(\text{UTS}) \times \text{face_thickness} \times \pi \times r^2 \geq \text{Test Load}$:	#N/A #N/A

① ACCUMULATOR MOUNT

MOUNT GEOMETRY - ACCUMULATOR SIDE		
EQ		
Mount cross section on accumulator skin:		N/A
Mount thickness (B):	mm	N/A
Mount length (L):	mm	N/A
Minimum gusset thickness (T):	mm	N/A
Minimum gusset height normal to mount face (H):	mm	N/A
F.3.5	0.0 15000N Bending in shear $M^*y / I < S_u$:	N/A
#N/A	0.0 15000N Bending normal $M^*y / I < S_u$:	N/A
#N/A	Parabolic shear $3 \times \text{Test Load} / 2 \times \text{area} \leq \text{Shear}$:	N/A

② MOUNT GEOMETRY -ACCUMULATOR SIDE

ACCUMULATOR MOUNT :: Accumulator Skin interface		
EQ		
Accumulator skin at accumulator mount:	Exterior Wall	6061-T6 Welded
	Young's Modulus (E):	6.90E+10 Pa
	Ultimate Tensile and Bending Strength (S):	1.75E+08 Pa
	Shear:	1.01E+08 Pa
		3.2 mm
F.10.5.8.b	Continuous	N/A
	mm	N/A
	mm	N/A
	Pa	N/A
	mm	N/A
	0.00E+00	N/A
	0.00E+00	N/A
	0.00E+00	N/A
	54.0 mm	N/A
	3.2 mm	N/A
	1.74E+04 116.3%	N/A
F.10.1.5	N/mm ²	N/A
F.10.1.5	N/mm ²	N/A
F.5.5.3	mm ²	N/A
	mm	N/A
	mm	N/A

③ ACCUMULATOR MOUNT -Accumulator Skin interface

BLANK Chassis Mount 1

CHASSIS MOUNT: Where fastener passes through to Accumulator Mount		
BLANK		
Intersection of fastener axis and fastener shear plane:		
Review sections below: mounts per tube, bending if fastener shear is offset:		BLANK
Offset from composite panel or radially from tube surface:	mm	BLANK
Mount material (Composite skin for internal hardpoint):		N/A
Young's Modulus (E):	#N/A Pa	N/A
Ultimate Tensile and Bending Strength (S):	#N/A Pa	N/A
Shear:	#N/A Pa	N/A
F.10.5.8.b	--Pullout--Face thickness, do not include core:	mm
	--Tearout--Minimum - Fastener spacing, edge, or corner distance:	mm
From	Number of fasteners used (2x if in double shear):	0
Accumulator Mount 1	Fastener shear diameter:	0 mm
	Threads in shear:	0
	Fastener UTS:	0.00E+00 Pa
	--Pullout--Min total perimeter of washers or inserts on one surface:	mm
F.10.5.8.a	--Shear-- $0.577 \times \text{fasteners} \times \text{UTS} \times \pi \times r^2 \geq \text{Test Load}$:	0.00E+00
	--Pullout--Mount shear*thickness*perimeter $\geq \text{Test Load}$:	#N/A #N/A
	--Tearout--Mount shear*thickness*edge distance $\geq \text{Test Load}$:	#N/A #N/A

④ CHASSIS MOUNT

TUBE CHECK: < 95% not a cause for rejection in 2024. See cell AC12.		
BLANK		
Chassis type at mount:		BLANK
F.3.2.1	Square side:	mm
	Chassis tube wall:	mm
F.10.5.2.a	Number of chassis mounts on this tube:	BLANK
F.3.4.2	Ultimate Strength (Su):	#N/A Pa
	Acc Mount Tube second moment of inertia (I):	0.00E+00 mm ⁴
	Tube Length (L):	mm
	Chassis mount distance to closest triangulated node (a):	mm
F.10.1.1.a	Tube Max Bending Force (Su*I)/(a*(1-a/L)*OD/2):	BLANK
https://engineeringlibrary.org/reference/beam-forces-moments-all-force-stress-manual		

⑤ TUBE CHECK

MOUNT GEOMETRY - CHASSIS SIDE		
EQ		
Mount cross section on chassis surface:		N/A
Mount thickness (B):	mm	N/A
Mount length (L):	mm	N/A
Minimum gusset thickness (T):	mm	N/A
Minimum gusset height normal to mount face (H):	mm	N/A
#N/A	0.0 15000N Bending in shear $M^*y / I < S_u$:	N/A
#N/A	0.0 15000N Bending normal $M^*y / I < S_u$:	N/A
#N/A	Parabolic shear $3 \times \text{Test Load} / 2 \times \text{area} \leq \text{Shear}$:	N/A

⑥ MOUNT GEOMETRY -CHASSIS SIDE

Chassis Mount to Chassis interface		
EQ		
Chassis wall at chassis mount:		N/A
	Young's Modulus (E):	#N/A Pa
	Ultimate Tensile and Bending Strength (S):	#N/A Pa
	Shear:	#N/A Pa
		mm
F.10.5.8.b		mm
		mm
		mm
		Pa
		mm
	0.00E+00	N/A
	#N/A #N/A	N/A
	#N/A #N/A	N/A
	mm	N/A
	0 mm	N/A
		N/A
F.10.1.5	N/mm ²	N/A
F.10.1.5	N/mm ²	N/A
	mm ²	N/A
F.5.5.3	mm	N/A
	mm	N/A

⑦ Chassis Mount to Chassis interface

As a preliminary preparation, decide on U22 mounting method

Sufficient bending strength is needed for the fastener trying to move ALONG its axis, gusset thickness parallel to the axis:

F.10.5.6-7

Mounting Method:

Test Load:

Accumulator mount symmetry:

Chassis mount symmetry:

EQ

EQ

EQ

EQ

This will change the names of sections.

This will change the names of sections.

Mass Based = Load Based

Corner Attachments

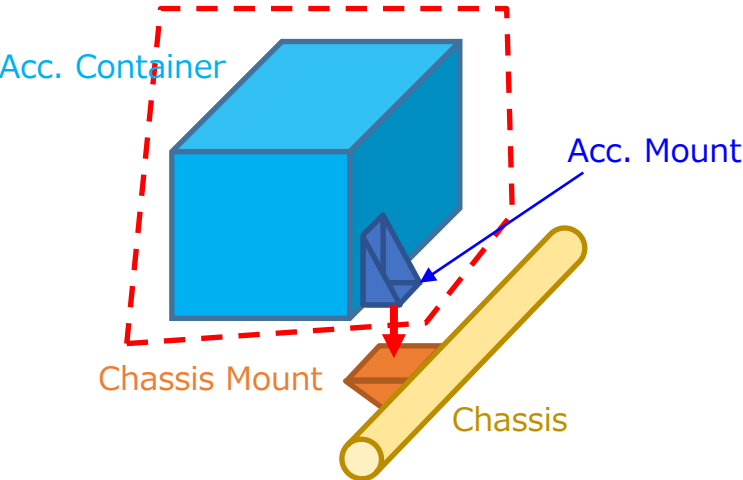
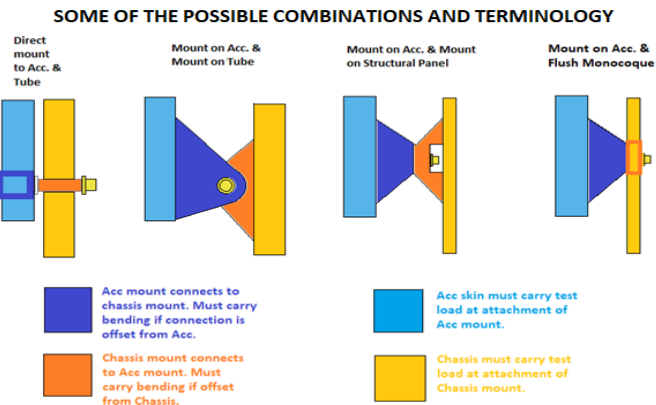
F.10.5.7 Accumulator Attachment – Load Based

- a. The minimum number of attachment points depends on the total mass of the container:
- | Accumulator Weight | Minimum Attachment Points |
|--------------------|---------------------------|
| < 20 kg | 4 |
| 20 – 30 kg | 6 |
| 30 – 40 kg | 8 |
| > 40 kg | 10 |
- b. Each attachment point, including any brackets, backing plates and inserts, must be able to withstand 15 kN minimum in any direction

F.10.5.6 Accumulator Attachment – Corner Attachments

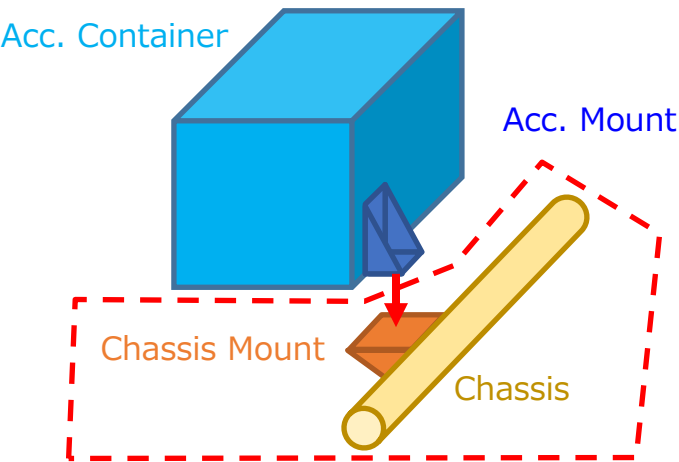
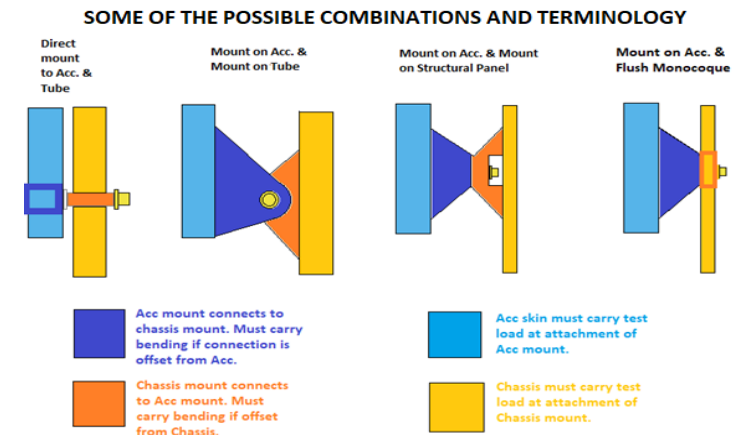
- a. Eight or more attachments are required for any configuration.
- One attachment for each corner of a rectangular structure of multiple Accumulator Segments
 - More than the minimum number of fasteners may be required for non rectangular arrangements
- Examples: If not filled in with additional structure, an extruded L shape would require attachments at 10 convex corners (the corners at the inside of the L are not convex); an extruded hexagon would require 12 attachments*
- b. The mechanical connections at each corner must be 50 mm or less from the corner of the Segment
- c. Each attachment point must be able to withstand a Test Load equal to 1/4 of total mass of the container accelerating at 40 g

- Requirements vary depending on the Mounting Method
- Although this document explains based on Mass Based, the content to be written for each mount is the same.



BLANK		Accumulator Mount 1		
ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount				
BLANK				
Intersection of fastener axis and fastener shear plane.				EQ
	the front/rear planes of the accumulator segments:		mm	BLANK
	the top/bottom planes of the accumulator segments:		mm	BLANK
	the left/right planes of the accumulator segments:		mm	BLANK
	Total Surface Offset, zero for an internal hardpoint:	0	mm	EQ
	Mount material (Accumulator skin if directly mounted):			EQ
	Young's Modulus (E):	#N/A	Pa	EQ
	Ultimate Tensile and Bending Strength (S):	#N/A	Pa	EQ
	Shear:	#N/A	Pa	EQ
F.10.5.8.b	--Pullout--Face thickness, do not include core:		mm	BLANK
--Tearout--Minimum - Fastener spacing, edge, or corner distance:			mm	BLANK
	Number of fasteners used (2x if in double shear):			BLANK
	Fastener shear diameter:		mm	BLANK
	Threads in shear:			BLANK
	Fastener UTS:		Pa	BLANK
	--Pullout--Min total perimeter of washers or inserts on one surface:		mm	BLANK
F.10.5.8.a	--Shear-- $0.577 * \text{fasteners} * \text{UTS} * \pi * r^2 \geq \text{Test Load}$:	0.00E+00		EQ
	--Pullout--Mount shear*thickness*perimeter $\geq \text{Test Load}$:	#N/A	#N/A	#N/A
	--Tearout--Mount shear*thickness*edge distance $\geq \text{Test Load}$:	#N/A	#N/A	#N/A
	Thread pullout $\min(\text{UTS}) * \text{face_thickness} * \pi * r^2 \geq \text{Test Load}$:	#N/A	#N/A	#N/A
MOUNT GEOMETRY - ACCUMULATOR SIDE				
EQ				
	Mount cross section on accumulator skin:			N/A
	Mount thickness (B):		mm	N/A
	Mount length (L):		mm	N/A
	Minimum gusset thickness (T):		mm	N/A
	Minimum gusset height normal to mount face (H):		mm	N/A
F.3.5	0.0 15000N Bending in shear $M * y / I < S_u$:			N/A
#N/A	0.0 15000N Bending normal $M * y / I < S_u$:			N/A
#N/A	Parabolic shear $3 * \text{Test Load} / 2 * \text{area} \leq \text{Shear}$:			N/A
ACCUMULATOR MOUNT :: Accumulator Skin interface				
EQ				
	Accumulator skin at accumulator mount:	Exterior Wall	6061-T6 Welded	N/A
	Young's Modulus (E):	6.90E+10	Pa	N/A
	Ultimate Tensile and Bending Strength (S):	1.75E+08	Pa	N/A
	Shear:	1.01E+08	Pa	N/A
		3.2	mm	N/A
F.10.5.8.b		Continuous		N/A
			mm	N/A
			mm	N/A
			mm	N/A
			Pa	N/A
			mm	N/A
		0.00E+00		N/A
		0.00E+00		N/A
		0.00E+00		N/A
		54.0	mm	N/A
		3.2	mm	N/A
		1.74E+04	116.3%	N/A
F.10.1.5			N/mm^2	N/A
F.10.1.5			N/mm^2	N/A
			mm^2	N/A
F.5.5.3				N/A
			mm	N/A
			mm	N/A
				N/A

- Acc. Side Strength of the joint between Acc. and Chassis Mount
- Bolt Shear
 - Perimeter Shear
 - Tearout to nearest Edge
- Strength of Acc. Mount Bracket
- Shear
 - Bending
 - Parabolic Shear
- Strength of Wall/Skin of Acc. Container
- Evaluation items vary depending on the structure



BLANK		Chassis Mount 1	
CHASSIS MOUNT: Where fastener passes through to Accumulator Mount			
BLANK			
Intersection of fastener axis and fastener shear plane.			BLANK
Review sections below: mounts per tube, bending if fastener shear is offset.			EQ
Offset from composite panel or radially from tube surface:			mm
Mount material (Composite skin for internal hardpoint):			N/A
Young's Modulus (E):		#N/A	Pa
Ultimate Tensile and Bending Strength (S):		#N/A	Pa
Shear:		#N/A	Pa
F.10.5.8.b	--Pullout--Face thickness, do not include core:		mm
Tearout-- Minimum - Fastener spacing, edge, or corner distance:			mm
From	Number of fasteners used (2x if in double shear):	1	N/A
Accumulator Mount 1 Fastener shear diameter:		8	mm
Threads in shear:		Yes	N/A
Fastener UTS: 8.00E+08 Pa			N/A
Pullout--Min total perimeter of washers or inserts on one surface:		43	mm
F.10.5.8.a	--Shear--0.577*fasteners*UTS*pi*r^2 >= Test Load:	2.32E+04	154.7%
--Pullout--Mount shear*thickness*perimeter >= Test Load:		#N/A	#N/A
--Tearout--Mount shear*thickness*edge distance >= Test Load:		#N/A	#N/A
TUBE CHECK: < 95% not a cause for rejection in 2024. See cell AC12.			
BLANK			
Chassis type at mount:			BLANK
F.3.2.1	Square side:		mm
Chassis tube wall:			mm
F.10.5.2.a	Number of chassis mounts on this tube:		BLANK
F.3.4.2	Ultimate Strength (Su):	#N/A	Pa
Acc Mount Tube second moment of inertia (I): 0.00E+00			mm^4
Tube Length (L):			mm
Chassis mount distance to closest triangulated node (a):			mm
F.10.1.1.a	Tube Max Bending Force (Su*I)/(a*(1-a/L)*OD/2):		BLANK
https://engineeringlibrary.org/reference/beam-forces-moments-air-force-stress-manual			
MOUNT GEOMETRY - CHASSIS SIDE			
EQ			
Mount cross section on chassis surface:			N/A
Mount thickness (B):			mm
Mount length (L):			mm
Minimum gusset thickness (T):			mm
Minimum gusset height normal to mount face (H):			mm
#N/A	0.0	15000N Bending in shear M*y / I < Su:	N/A
#N/A	0.0	15000N Bending normal M*y / I < Su:	N/A
#N/A	Parabolic shear 3*Test Load/2*area <= Shear:		N/A
Chassis Mount to Chassis Interface			
EQ			
Chassis wall at chassis mount:			N/A
Young's Modulus (E):		#N/A	Pa
Ultimate Tensile and Bending Strength (S):		#N/A	Pa
Shear:		#N/A	Pa
F.10.5.8.b			mm
			mm
			mm
			mm
			Pa
			mm
		0.00E+00	N/A
		#N/A	#N/A
		#N/A	#N/A
			mm
		0	mm
			N/A
F.10.1.5			N/mm^2
F.10.1.5			N/mm^2
			mm^2
F.5.5.3			N/A
			mm
			mm
			N/A

Chassis Side Strength of the joint between Acc. and Chassis Mount

- Bolt Shear
- Perimeter Shear
- Tearout to nearest Edge

Strength of Tube (Tube Only)

- Bending
- Number of Attachment on one tube(10.5.2a)

Strength of Chassis Mount Bracket

- Shear
- Bending
- Parabolic Shear

Strength of Tube Surface / Laminate

①ACCUMULATOR MOUNT Guidance

ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount

CHECK			
Intersection of fastener axis and fastener shear plane			
Between	the front/rear planes of the accumulator segments:	0	mm
Between	the top/bottom planes of the accumulator segments:	0	mm
Outside	the left/right planes of the accumulator segments:	13.32	mm
Total Surface Offset, zero for an internal hardpoint:		13.32	mm
Mount material (Accumulator skin if directly mounted):		core	
Young's Modulus (E):		4.62E+10	Pa
Ultimate Tensile and Bending Strength (S):		3.89E+08	Pa
Shear:		1.08E+08	Pa
F.10.5.7.b	Mounting face thickness (Do not include core.):	8.8	mm
Minimum - Fastener spacing, edge, or corner distance:		8.7	mm
Number of fasteners used (2x if in double shear):		1	
Fastener diameter:		6	mm
Threads in shear:		Yes	CHECK
Fastener UTS:		1.40E+09	Pa
Min total perimeter of all washers, inserts, brackets on one surface:		20.7345	mm
F.10.5.7.c --Shear-- $0.577 * \text{fasteners} * \text{UTS} * \pi * r^2 \geq \text{Test Load}$:		2.28E+04	153.3%
--Pullout-- $\text{Mount shear} * \text{thickness} * \text{perimeter} \geq \text{Test Load}$:		1.97E+04	131.5%
--Tearout-- $\text{Mount shear} * \text{thickness} * \text{edge distance} \geq \text{Test Load}$:		1.65E+04	110.3%

Dimension from "Nearest Segment" to "Joint point between Acc. and Chassis Mount"

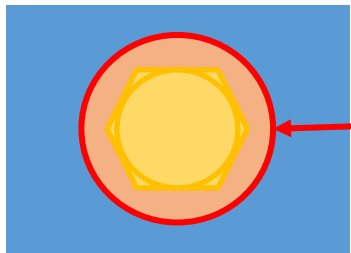
Distance from Bolt hole to nearest Edge

Minor Diameter if threads are in shear (F.10.5.8a)

Select "Yes" if shearing load in longitudinal direction(F.10.1.1a)

Bolt Strength

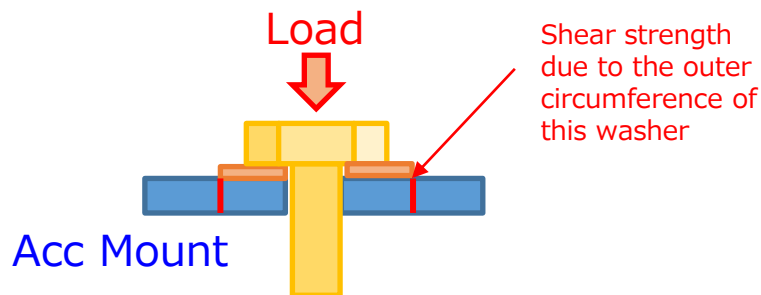
Minimum Perimeter of something shears Acc. Mount (Washer, Bolt head, Insert...etc.)



※An example of Min total Perimeter

In the case that there is Small diameter collar between Acc. Mount Chassis Mount, The minimum perimeter may be length of the collar.

If you make thread directly on the bracket, Enter the circumference of the thread and enter the thread depth in Thickness.
(This is a general calculation of thread pullout strength)



①ACCUMULATOR MOUNT Guidance

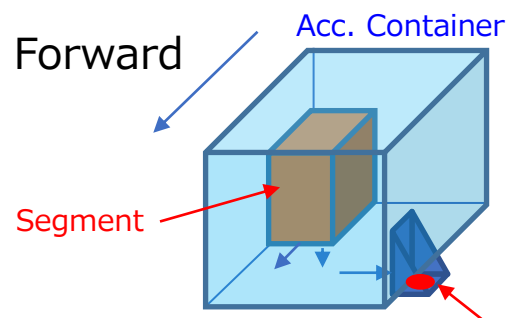
ACCUMULATOR MOUNT: Where fastener passes through to Chassis Mount

CHECK		
Intersection of fastener axis and fastener shear plane		
Between	the front/rear planes of the accumulator segments:	0 mm
Between	the top/bottom planes of the accumulator segments:	0 mm
Outside	the left/right planes of the accumulator segments:	13.32 mm
Total Surface Offset, zero for an internal hardpoint:		13.32 mm
Mount material (Accumulator skin if directly mounted):		core
Young's Modulus (E):		4.62E+10 Pa

Many input mistakes

For the distance, enter the distance between the nearest Segment and fastening point with Chassis Mount.
(Rarely everything is "between" at the same time)

Examples : How to select Outside or Between

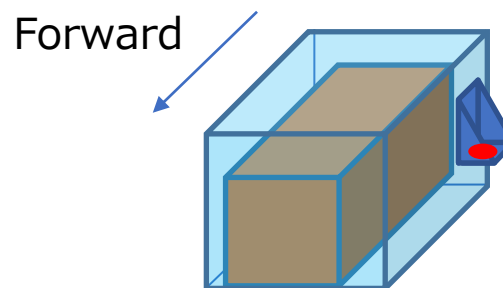


"Outside" the front/rear
"Outside" the top/bottom
"Outside" the left/right

Front/Rear -> Outside
Fastening point is ahead of the segment

Top/Bottom -> Outside
Fastening point is lower than the segment by floor thickness.

Left/Right -> Outside
Fastening points is left of the segment

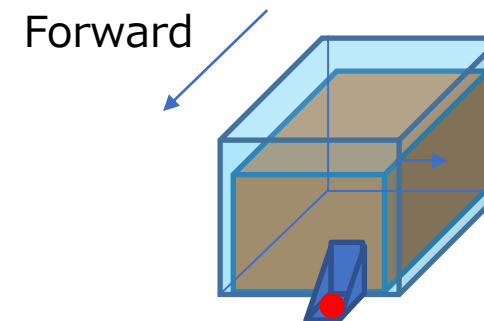


"Between" the front/rear
"Between" the top/bottom
"Outside" the left/right

Front/Rear -> Between

Top/Bottom -> Between

Left/Right -> Outside
Fastening points is left of the segment



"Outside" the front/rear
"Outside" the top/bottom
"Between" the left/right

Front/Rear -> Outside
Fastening point is ahead of the segment

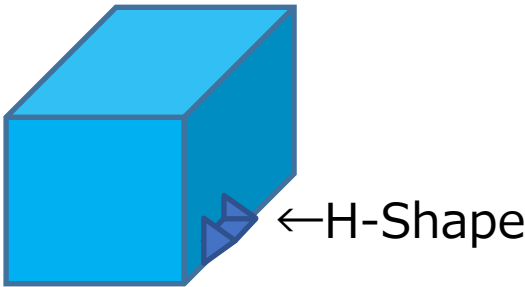
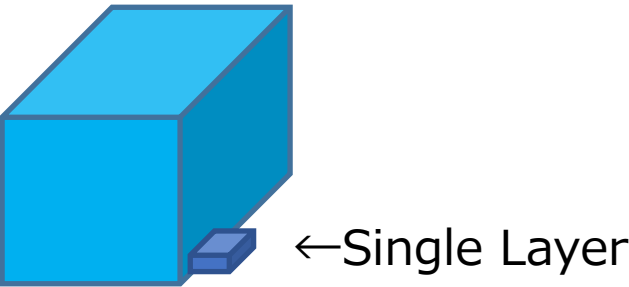
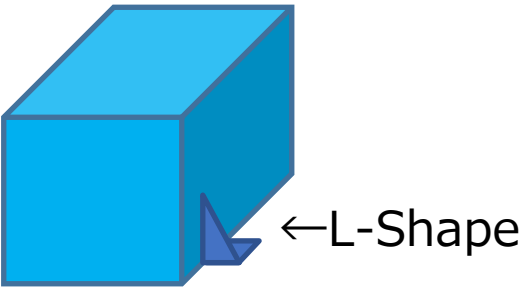
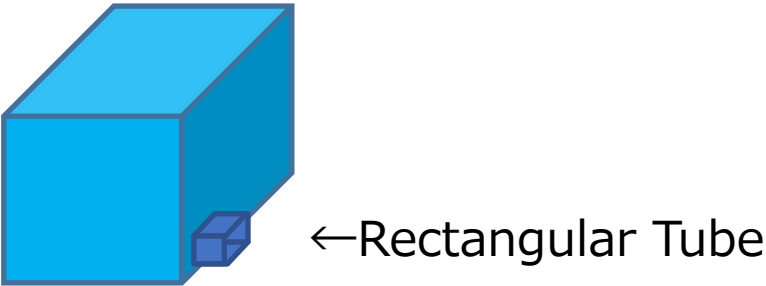
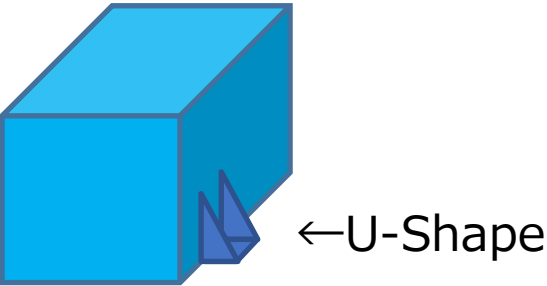
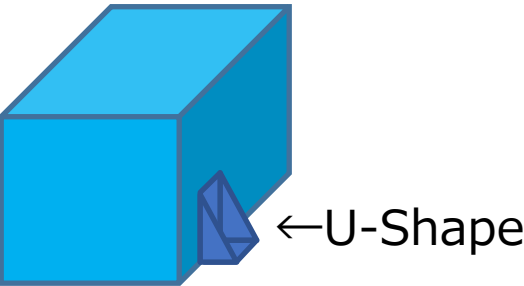
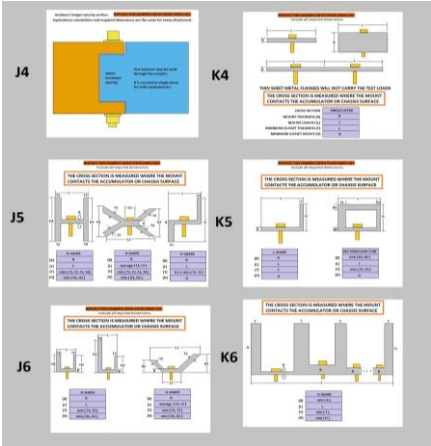
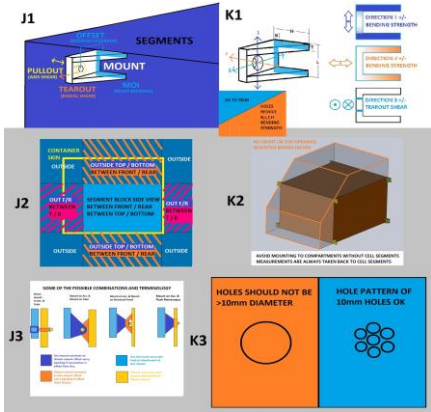
Top/Bottom -> Outside
Fastening point is lower than the segment by floor thickness.

Left/Right -> Between

②MOUNT GEOMETRY –ACCUMULATOR SIDE Guidance

MOUNT GEOMETRY - ACCUMULATOR SIDE					
EQ					
Mount cross section on accumulator skin:		U-Shape		EQ	
Mount thickness (B):		8.8	mm	EQ	
Mount length (L):		24	mm	EQ	
Minimum gusset thickness (T):		2.7	mm	EQ	
Minimum gusset height normal to mount face (H):		63.8	mm	EQ	
F.3.5	12.0	15000N Bending in shear $M*y / I < Su: 4.00E+07$		10.3%	EQ
3.89E+08	26.8	15000N Bending normal $M*y / I < Su: 1.92E+07$		4.9%	EQ
1.08E+08	Parabolic shear $3*Test\ Load/2*area <= Shear: 4.05E+07$			37.5%	EQ

See Guidance in SES



③ACCUMULATOR MOUNT::Accumulator Skin Interface Guidance



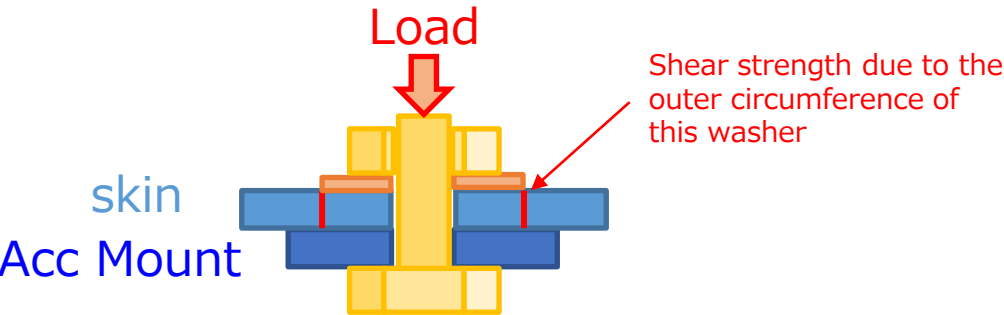
ACCUMULATOR MOUNT :: Accumulator Skin interface				
BLANK				
Accumulator skin at accumulator mount:	Exterior Wall	MHBS F.4.3		EQ
	Young's Modulus (E):	4.96E+10 Pa		EQ
	Ultimate Tensile and Bending Strength (S):	1.78E+08 Pa		EQ
	Shear:	5.01E+07 Pa		EQ
	Accumulator total skin/wall thickness:	0 mm		BLANK
F.10.5.7.c	Mount interface with accumulator:	Bolted		EQ
Minimum - Fastener spacing, accumulator edge, or corner distance:		mm		BLANK
	Number of fasteners used:			BLANK
	Fastener diameter:	mm		BLANK
	Threads in shear:			EQ
	Fastener UTS:	Pa		BLANK
Min total perimeter of all washers, inserts, brackets on one surface:		mm		BLANK
	Fastener shear >= Test Load:	0.00E+00		EQ
	Accumulator Pullout >= Test Load:	0.00E+00		EQ
	Accumulator Tearout >= Test Load:	0.00E+00		EQ
		0.00E+00 0.0%		N/A
		mm		N/A
		0 mm		N/A
				N/A
		N/mm^2		N/A
		N/mm^2		N/A
		mm^2		N/A
F.5.5.3				N/A
		mm		N/A
		mm		N/A
				N/A

Mount interface with accumulator
Continuous is selected when integral molding (Laminate) or Cutting processing with wall

In the case of Bolted
What is entered in Perimeter of ~ is below

Monocoque	Shorter Perimeter of Acc. Mount, Backing Plate, Bolt Head, Insert
Tube	The Shorter Perimeter of Backing Plate, Bolt Head, Nut or Acc. Mount

The case of bolting Acc. Skin with Acc. Mount



③ACCUMULATOR MOUNT::Accumulator Skin Interface 入力ガイダンス



ACCUMULATOR MOUNT :: Accumulator Skin interface			
BLANK			
Accumulator skin at accumulator mount:	Exterior Wall	MHBS F.4.3	EQ
	Young's Modulus (E):	4.96E+10 Pa	EQ
	Ultimate Tensile and Bending Strength (S):	1.78E+08 Pa	EQ
	Shear:	5.01E+07 Pa	EQ
	Accumulator total skin/wall thickness:	0 mm	BLANK
F.10.5.7.c	Mount interface with accumulator:	Bolted	EQ
Minimum - Fastener spacing, accumulator edge, or corner distance:		mm	BLANK
	Number of fasteners used:		BLANK
	Fastener diameter:	mm	BLANK
	Threads in shear:		EQ
	Fastener UTS:	Pa	BLANK
Min total perimeter of all washers, inserts, brackets on one surface:		mm	BLANK
	Fastener shear >= Test Load:	0.00E+00	EQ
	Accumulator Pullout >= Test Load:	0.00E+00	EQ
	Accumulator Tearout >= Test Load:	0.00E+00	EQ
		0.00E+00 0.0%	N/A
		mm	N/A
		0 mm	N/A
			N/A
		N/mm^2	N/A
		N/mm^2	N/A
		mm^2	N/A
F.5.5.3			N/A
		mm	N/A
		mm	N/A
			N/A

Welded

Length of total weld perimeter

Bonded

Adhesive strength (Pure Shear & T-Peel)

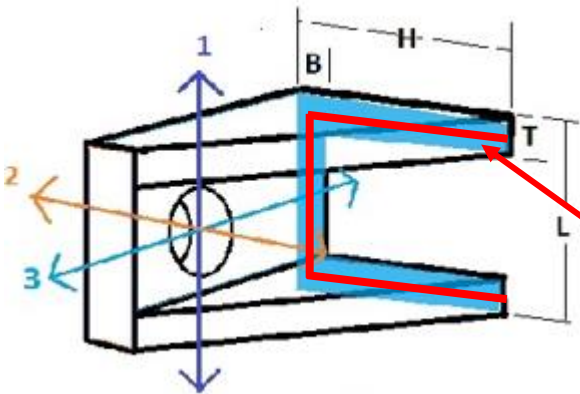
Bonding Area

Perimeter of Bonding area

Thickness of Wall/Skin of Acc. Container

Continuous

Centerline Length (refer to left figure)



Centerline length when "Continuous"

④CHASSIS MOUNT Guidance

CHASSIS MOUNT: Where fastener passes through to Accumulator Mount			
CHECK			
Intersection of fastener axis and fastener shear plane:	Offset Mounts	EQ	
Review sections below: mounts per tube, bending if fastener shear is offset.		EQ	
Offset from composite panel or radially from tube surface:	20 mm	EQ	
Mount material (Composite skin for internal hardpoint):	Steel Welded	EQ	
Young's Modulus (E):	2.00E+11 Pa	EQ	
Ultimate Tensile and Bending Strength (S):	3.00E+08 Pa	EQ	
Shear:	1.73E+08 Pa	EQ	
F.10.5.8.b --Pullout--Face thickness, do not include core:	3.2 mm	EQ	
--Tearout--Minimum - Fastener spacing, edge, or corner distance:	20 mm	EQ	
From		EQ	
Number of fasteners used (2x if in double shear):	1	EQ	
Accumulator Mount 1		CHECK	
Fastener shear diameter:	8 mm	CHECK	
Threads in shear:	Yes	EQ	
Fastener UTS:	8.00E+08 Pa	EQ	
--Pullout--Min total perimeter of washers or inserts on one surface:	45 mm	EQ	
F.10.5.8.a --Shear-- $0.577 \times \text{fasteners} \times \text{UTS} \times \pi \times r^2 \geq$ Test Load:	2.32E+04 154.7%	EQ	
--Pullout--Mount shear*thickness*perimeter \geq Test Load:	2.49E+04 166.2%	EQ	
--Tearout--Mount shear*thickness*edge distance \geq Test Load:	2.22E+04 147.7%	EQ	

Interface type (See fig.①)

Distance from tube surface to Fixing point between Acc. Mount and Chassis Mount (See fig.②)

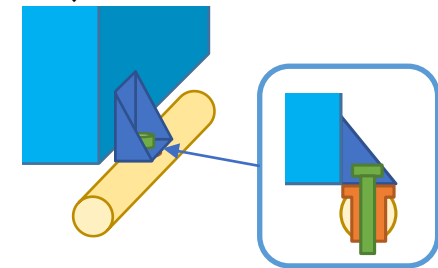
Material of Chassis Mount

Thickness of Chassis Mount

Distance from fastener edge to edge or corner of structure

Minimum Perimeter in washer, bolt head, Acc. Mount ...etc.(fig.③)

Fig.① Centerline Inserts



Flush Monocoque

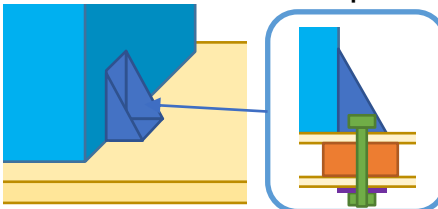


Fig.②

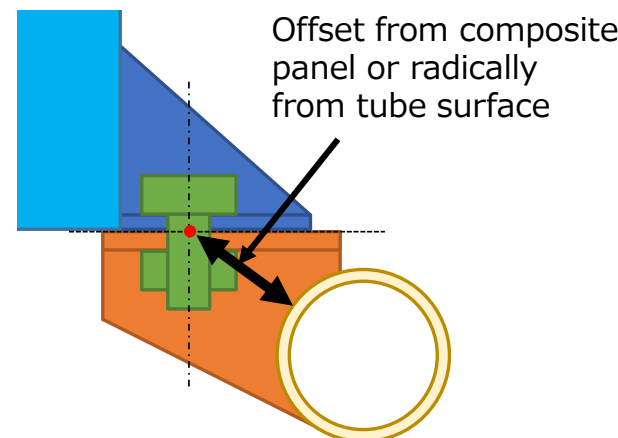
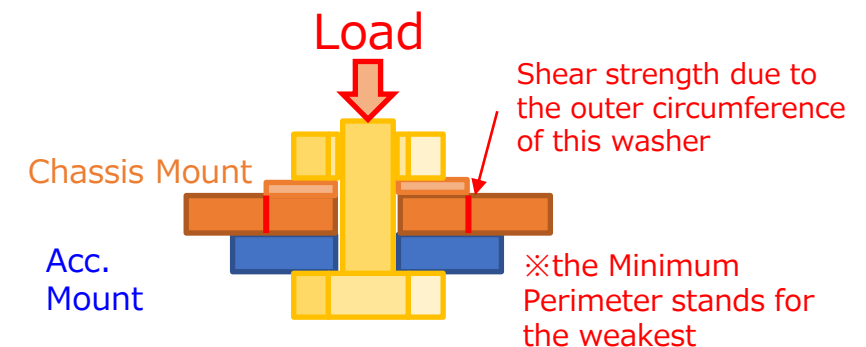


Fig.③ Min-Perimeter of Chassis Mount



Everything except the above is Offset Mounts

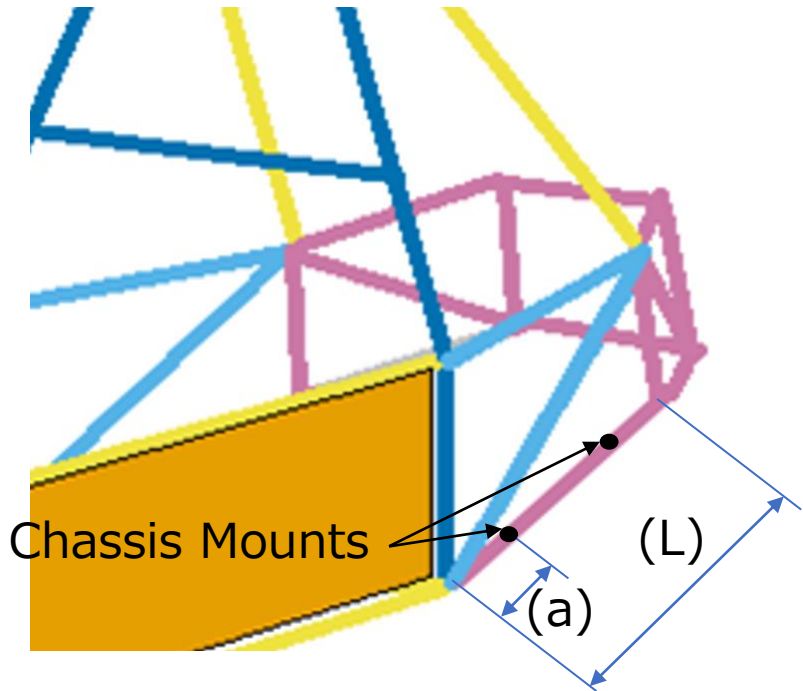
TUBE CHECK: < 95% not a cause for rejection in 2024. See cell AC12.

EQ	
Chassis type at mount:	Tube
	Round
F.3.2.1 Chassis tube diameter:	25.4 mm
Chassis tube wall:	1.6 mm
F.10.5.2.a Number of chassis mounts on this tube:	2
F.3.4.2 Ultimate Strength (Su):	3.00E+08 Pa
Acc Mount Tube second moment of inertia (I):	8.51E+03 mm^4
Tube Length (L):	250 mm
Chassis mount distance to closest triangulated node (a):	15 mm
F.10.1.1.a Tube Max Bending Force (Su*I)/(a*(1-a/L)*OD/2):	1.43E+04 95.03%
https://engineeringlibrary.org/reference/beam-forces-moments-air-force-stress-manu	

Tube Frame Only

A maximum of two attachment points may be on a chassis tube. F.10.5.2a

Tube length(L)、 distance from nearest node(a)
See figure below.



strength calculation
In 2024SES, even if it is less than 95%, it will not be rejected. Calculated with 1-point concentrated load or 2-point load on a beam fixed at both ends. If there are two Chassis Mounts in one tube, the moment at the node will be quite large, so it is desirable to have at least one Chassis Mount at the node. If one is installed on the node, there will only be one point on the tube, so set the number to 1 and write about the other Chassis Mount.

⑦Chassis Mount to Chassis Interface Guidance

Chassis Mount to Chassis Interface

EQ

Chassis wall at chassis mount: Steel Welded EQ

Young's Modulus (E): 2.00E+11 Pa EQ

Ultimate Tensile and Bending Strength (S): 3.00E+08 Pa EQ

Shear: 1.73E+08 Pa EQ

Chassis total skin/wall thickness: 1.6 mm EQ

Mount interface with chassis: Welded EQ

F.10.5.8.b

mm N/A

mm N/A

mm N/A

Pa N/A

mm N/A

0.00E+00 N/A

0.00E+00 N/A

0.00E+00 N/A

Total weld perimeter: 60.0 mm EQ

Thickness is assumed = skin thickness: 1.6 mm EQ

Shear strength >= Test Load: 1.66E+04 110.8% EQ

F.10.1.5

F.10.1.5

F.5.5.3

N/mm² N/A

N/mm² N/A

N/mm² N/A

N/A N/A

N/A N/A

N/A N/A

N/A N/A

N/A N/A

When Offset Mounts OR Centerline Inserts or Flush Monocoque and Offset≠0, Interface strength between Chassis and Chassis Mount is calculated in this section. The contents to be filled in are the same as on the Acc. Mount side.

The case Centerline Inserts and Offset=0

This section is N/A -> F.3.4.3 Welded Inserts sheet must be described.

The case Flush Monocoque And Offset=0

This section is N/A -> [Accumulator To Mono, Hybrid Panels] in F.7.8-9 Attachments sheet must be described.

BLANK

ASSEMBLED

TUBE + HOLE

FULL CROSS-SECTION

INSERT

BLANK

mm

Welded Tube Insert

Welded Tube Insert

Welded Tube Insert

Minimum Tube With Hole

Material

Original tube

Weld thickness

Round hole

Tube cross sectional area (A₁)

Tube second moment of inertia (I₁)

Tube with hole cross sectional area (A₂)

Tube with hole second moment of inertia (I₂)

Insert cross sectional area (A₃)

Insert second moment of inertia (I₃)

Insert collar cross sectional area (A₄)

Insert collar second moment of inertia (I₄)

Young's Modulus (E)

Unstressed Yield Strength (S_y)

Unstressed Ultimate Strength (S_u)

Welded Yield Strength (S_w)

Welded Ultimate Strength (S_w)

Backing Modulus

Yield

Ultimate

Bending

Deflection

Energy

BLANK Accumulator To Mono, Hybrid Panels

F.7.9.6 The tube centerline should intersect the bolt centerline between the skins.

Brackets without gussets are unacceptable.

BLANK

F.7.8 EV Accumulator Mounts, Flush to Monocoque: Bolted EQ

Type SES Tab Name, EV Accumulator Attachment Layout: BLANK

F.7.8.8 EV Accumulator Attachment: Skin-Insert-Skin EQ

Fastener diameter: mm BLANK

No. of fasteners per mount: BLANK

is and other cores are not insert material. Panel thickness: 0 mm EQ

Insert material: mm BLANK

Insert thickness: mm EQ

Scaling option, layout repeats: Layup mm EQ

Scaling option, layout repeats: Inner skin thickness: Typo mm EQ

For multiple mounts of the same design, enter each worst case value.

For multiple mounts on different layouts, screenshot this section or copy this tab.

Backing perimeter on monocoque skin: mm BLANK

F.7.8.6 Backing: 0.00E+00 0.00E+00 mm 0.00% BLANK

Accumulator Mount Perimeter on monocoque skin: mm BLANK

Min - Fastener spacing, edge, weaker layup, or corner distance: mm BLANK

F.7.9.1 Skin shear strength: Typo Pa EQ

Perimeter shear strength >15000N: 0.00% EQ

Perimeter shear strength >15000N: 0.00% EQ

Tearout shear strength >15000N: 0.00% EQ