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1 Introduction

Lateral and longitudinal stays are installed where countermeasures against dynamic effects are necessary (for indications refer to Marine Installation Manual, chapter Engine Dynamics). For stay arrangement and details refer also to the relevant installation drawings of the corresponding design group 9715.

It is vital that the stays are fitted correctly to ensure proper operation and to prolong the lifetime of the components.

2 Description and function

The stays are fitted between the engine and the ship hull. They transmit lateral, respectively longitudinal forces, from the engine via friction shims and sheet metal girders to the ship hull. The clamping force of the two clamping bolts is adjusted in such a way that during engine operation the engine's pulsating forces are transmitted to the ship hull. During loading and unloading, the stay is able to adapt the deformations of the ship's hull within its stroke.

To reduce material stress in the stay itself and also in the attachment points, hinge pins are provided in the supports to allow movements in both vertical and longitudinal directions.

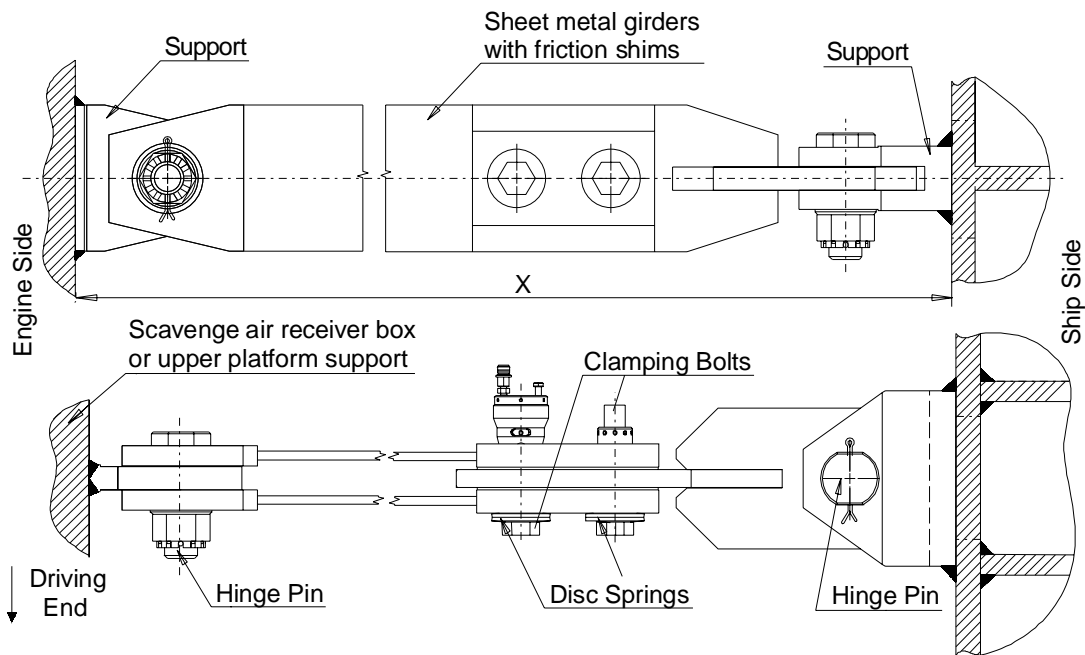


Figure 1: Principal stay arrangement

Substitute for:								PC	Q-Code	X	X	X	X	X
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016		
		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		
WIN GD Winterthur Gas & Diesel		Product W-2S				Assembly Instructions for engine stays, friction type								
Made	27.01.1998	T.Landert		Main Drw.	Page	1 / 8		Material ID	107.246.429					
Chkd	30.01.1998	T.Landert		Design Group	Drawing ID		107.246.429			Rev	H			
Appd	30.01.1998	T.Landert		9715										

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For lateral application the stays are fixed on the engine's exhaust side or fuel side, according to the arrangement shown on the main drawing of design group 9715. For longitudinal application the stays are fixed on engine's free end. Examples of stay arrangements are provided in figure 2, figure 3 and figure 4. Which stay arrangement is applicable depends on the engine type and is specified by the corresponding drawing of design group 9715. As the design of the clamping bolts is similar to that applied for the engine holding down studs, the same hydraulic tool (design group 9411-06) can be used for pre-tensioning.

Lateral arrangement with attachment on scavenge air receiver box

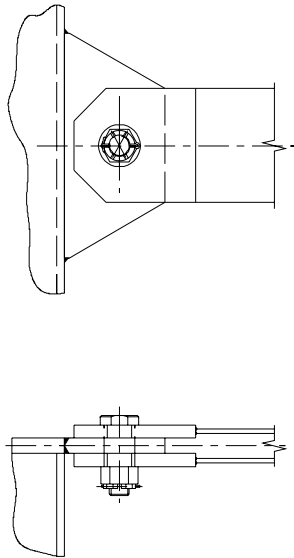


Figure 2

Lateral arrangement with attachment on platform support

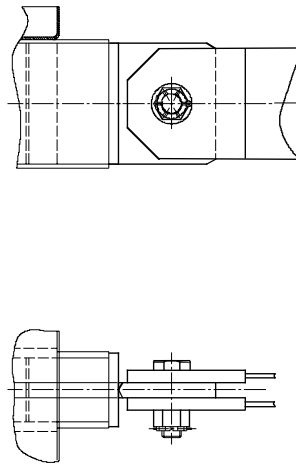


Figure 3

Longitudinal arrangement with attachment on platform support

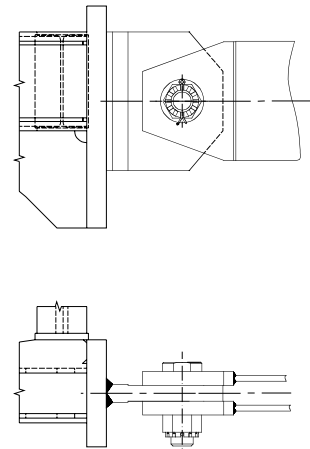


Figure 4

3 Fitting of the stays

3.1 Starting conditions

Before fitting the stays, the following conditions must be fulfilled:

- Ship afloat
- Engine aligned and chocked
- Engine coupled to intermediate shaft
- Engine holding down studs fully tightened
- Side stoppers fitted
- Engine preheated to starting condition

Substitute for:								PC	Q-Code	X	X	X	X	X
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016		
		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		
WIN GD Winterthur Gas & Diesel		Product W-2S				Assembly Instructions for engine stays, friction type								
Made	27.01.1998	T.Landert			Main Drw.	Page	2 / 8		Material ID	107.246.429				
Chkd	30.01.1998	T.Landert			Design Group	Drawing ID		107.246.429						
Appd	30.01.1998	T.Landert			9715								Rev	H


- Relevant installation drawings available
- The attachment points of the stays on engine and ship hull side are marked in the final position according to the relevant main drawing of design group 9715
- Hydraulic tensioning device is ready for use (engine builder's tool kit, code-No. 94145)

Note:

When fitting the stays it is very important that the engine is preheated to starting condition. This is necessary to reduce any possible misalignment of the stay due to engine thermal expansion between fitting and service condition. Excessive horizontal and vertical misalignment of the stay between the engine's and the ship's attachment points may restrict the stay's function. It may even lead to buckling or cracking of the stay. For admissible tolerances refer to table 2. During positioning and fitting use a crane to avoid overstress to the stay.

3.2 Installation steps

1. Prepare all parts and installation tools.
2. Make sure that all starting conditions according to section 3.1 are fulfilled.
3. Assemble the stay according to the relevant assembly drawing of design group 9715 and tighten the clamping bolts slightly by hand.
4. Shift the stay until the nominal position (defined by the distance M in table 1) is achieved. Then tighten the clamping bolts with 100 bar pressure.
5. Check at the marked attachment points on ship hull and engine side that there is no platform support, piping or something else which could collide with the stay. In particular pay attention to the space requirements of the hydraulic tensioning device in order to allow proper tightening of the clamping bolts.
6. Put the stay in the final position between ship hull and engine and align the stay's support without fixing on engine side. Check whether the stay is longer, shorter or equal in relation to the clear width between engine and ship hull.
 - In case the stay is **longer** than the clear width between ship hull and engine, measure its overall length X. Then measure the clear width between ship hull and engine and calculate the difference to the overall stay length X. If the difference exceeds the maximum allowed value limited by the tolerances in table 1, the support on the engine side has to be shortened and the edges must be prepared for welding.
 - In case the stay is **shorter** than the clear width between ship hull and engine, measure the gap between stay end and ship hull directly.

Substitute for:								PC	Q-Code	X	X	X	X	X
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016		
		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		
		Product W-2S				Assembly Instructions for engine stays, friction type								
Made	27.01.1998	T.Landert			Main Drw.	Page	Material ID							
Chkd	30.01.1998	T.Landert			Design Group	3 / 8	107.246.429							
Appd	30.01.1998	T.Landert			9715	Drawing ID	107.246.429					Rev	H	

If the gap exceeds the maximum allowed value limited by the tolerances in table 1, a steel plate has to be added as spacer under the support to compensate the undersize.

- In case stay's length is **equal** to the clear width between ship hull and engine, no modifications are necessary.


Note:

During loading, the ship's hull tends to deform towards the ship's centerline, respectively to engine side. Therefore it is suggested to fit a stay of a length just correct or rather 'too short' than with over-length, in order to allow an extra stroke in longitudinal direction (see table 1).

7. Make sure that the surfaces of the receiver box/platform support and the ship side attachment points are clean.
8. Attach the stay on engine side in the final position and fix the support by spot welding.
9. Align the stay horizontally and vertically (observe the tolerances given in table 2) and fix the support on ship hull side by spot welding.
10. Before accomplishing the final welding, loosen the clamping bolts in order to avoid material stress due to thermal expansion.
11. Perform final welding at the supports on engine and ship hull side.
12. After all parts have cooled down, tighten the clamping bolts with the final pressure according to table 4.
13. Measure the height of each pre-tensioned disc spring pack and check with the relevant assembly drawing of design group 9715 whether the height is according to WinGD's specifications.


If the height deviates from the given value the following need to be checked:

- Was the correct tensioning device used for tensioning the clamping bolts?
 - In case a too small tensioning device was used, re-tighten the clamping bolts with the correct device and given pressure.
 - In case a too big tensioning device was used, calculate whether the maximum permissible yield strength of the clamping bolts, nuts, friction shims and disc springs was already exceeded and the elements need to be replaced due to damage by plastic deformation. Even if the calculation result indicates that the maximum permissible yield strength was not exceeded, make finally a visual check to ensure that no element was damaged due to the wrong tensioning.

Substitute for:										PC	Q-Code	X	X	X	X	X	
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016					
		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date					
		Product W-2S				Assembly Instructions for engine stays, friction type											
Made	27.01.1998	T.Landert			Main Drw.	Page	Material ID 107.246.429										
Chkd	30.01.1998	T.Landert			Design Group	4 / 8											
Appd	30.01.1998	T.Landert			9715	Drawing ID	107.246.429					Rev	H				

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- Were the clamping bolts, nuts, friction shims and disc springs correctly assembled according to the relevant assembly drawing?
 - In case one or more elements were wrong assembled, re-arrange those accordingly.
- Are the material and dimensions of all elements in compliance with WinGD's specifications?
 - In case the material or dimensions of one or more elements are not according to WinGD's specifications replace those accordingly.

Substitute for:										PC	Q-Code	X	X	X	X	X
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016				
		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date				
		Product W-2S				Assembly Instructions for engine stays, friction type										
Made	27.01.1998	T.Landert			Main Drw.	Page	Material ID 107.246.429									
Chkd	30.01.1998	T.Landert			Design Group 9715	5 / 8										
Appd	30.01.1998	T.Landert				Drawing ID	107.246.429					Rev	H			

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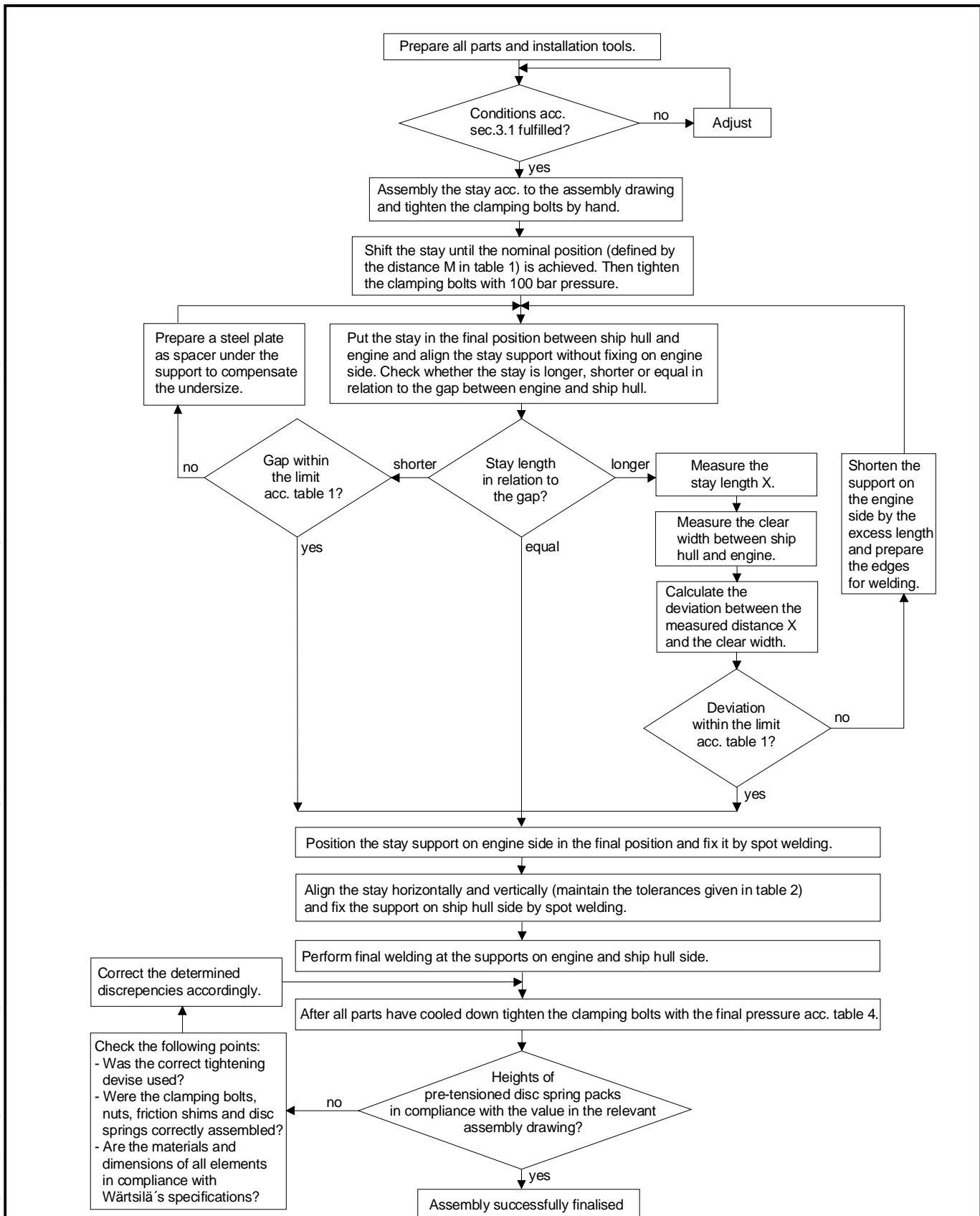


Figure 5: Stay installation process diagram

Substitute for:										PC	Q-Code	X	X	X	X	X
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016				
		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date				
WIN GD		Product W-2S				Assembly Instructions										
Winterthur Gas & Diesel						for engine stays, friction type										
Made	27.01.1998	T.Landert			Main Drw.	Page	6 / 8		Material ID				107.246.429			
Chkd	30.01.1998	T.Landert			Design Group			Drawing ID				107.246.429				
Appd	30.01.1998	T.Landert			9715							Rev	H			

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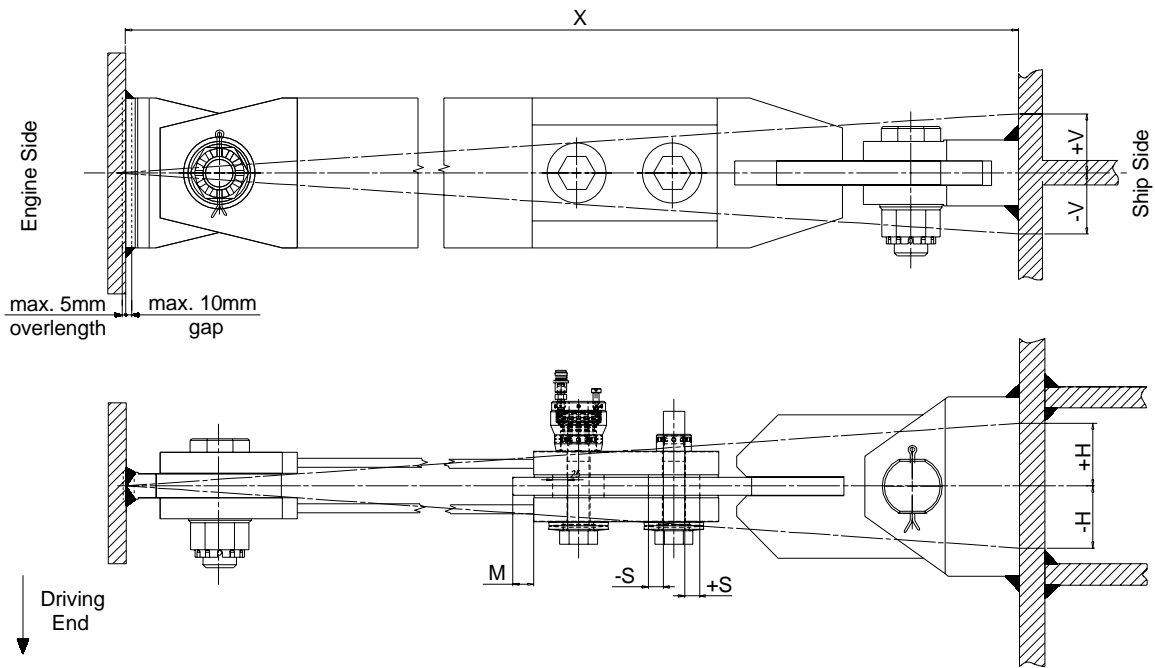


Figure 6 : Stays assembly tolerances

	Deviation of stay length X related to clear width	Reference	Resulting stroke	
			-S	+S
Nominal position	0	25	24.5	24.5
Stay too long (max. over length)	+5	30	29.5	19.5
Stay too short (max. gap)	-10	15	14.5	34.5

Table 1 : Admissible deviation of stay length when commissioning (in mm)

Clear width X	Lateral application				Longitudinal application			
	+V	-V	+H	-H	+V	-V	+H	-H
2000 to 2280	2	0	1.5	0	2	0	1.5	1.5
2281 to 2560	2	0	2	0	2	0	2	2
2561 to 3120	4	0	3	0	4	0	3	3
3121 to 3400	4	0	4	0	4	0	4	4

Table 2 : Admissible vertical and horizontal deviation (in mm)

4 Operational check and final adjustment

4.1 During sea trial

During service check whether relative movements between the ship side attachment device and the sheet metal girders occur.

Substitute for:								PC	Q-Code	X	X	X	X	X	
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016			
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WIN GD		Product W-2S		Assembly Instructions for engine stays, friction type											
Made	27.01.1998	T.Landert			Main Drw.	Page	7 / 8		Material ID		107.246.429				
Chkd	30.01.1998	T.Landert			Design Group			Drawing ID		107.246.429		Rev	H		
Appd	30.01.1998	T.Landert			9715										

If this is the case, the following might be the cause:

- Insufficient or incorrect tightening of the clamping bolts
- Dirty or damaged friction shims
- Material or quality of friction shims is not according to WCH specification
- Incorrect assembly of the stays
- Incorrect fitting or alignment, i.e. welding

4.2 After sea trial


After sea trial, when the engine and machinery space are still in hot condition, check whether measure 'M' remained within the limits given in table 3 and check also whether the stays are still in line with the engine (horizontally and vertically). If not, it may help to loosen the clamping bolts. The sheet metal girders can then move within the clearance of the through holes of the ship side attachment device. Undesirable tension in the stay can release and possible misalignment may be compensated. At a later stage, when the vessel has been loaded and unloaded, check whether a displacement between engine and ship hull has taken place to make sure the stays work properly. Check also whether measure 'M' remained within the limits given in table 3. If this is not the case, refer to the possible causes listed under 4.1 in For maintenance repeat the above mentioned checks i.e. check the pretension of the bolts at intervals as scheduled for the maintenance of the engine holding down studs.

	Reference M (mm)	Loaded state
absolute minimum	2	ballast condition
absolute maximum	48	fully loaded

Table 3 : Admissible values for 'M' in service

Engine type	Hydr. pressure for lateral and longitudinal application (bar)
W-X35/-B	230
W-X40/-B	250
RT-flex48T-D	180
RT-flex50-B/-D/DF	310
W-X52/DF	280
RT-flex58-D/-E	150
W-X62/DF	170
RTA/RT-flex68-D	120
W-X72/DF	190
RTA/RT-flex82C	170
W-X82/-B/DF	180
RTA/RT-flex84T-D	150
W-X92/DF	200
RTA/RT-flex96C-B	200

Table 4 : Pre-tensioning pressure

Substitute for:								PC	Q-Code	X	X	X	X	X	
Modif	E	EAAD083505	16.12.2011	F	EAAD084399	15.01.2013	G	EAAD086161	16.09.2015	H	EAAD086766	15.07.2016			
		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date		Number	Drawn Date			
		Product W-2S				Assembly Instructions for engine stays, friction type									
Made	27.01.1998	T.Landert			Main Drw.	Page	8 / 8		Material ID	107.246.429					
Chkd	30.01.1998	T.Landert			Design Group	9715			Drawing ID	107.246.429			Rev	H	
Appd	30.01.1998	T.Landert													

ASSEMBLY-INSTRUCTION_WinGD-2S_FRICITION-STAYS

TRACK CHANGES

DATE	SUBJECT	DESCRIPTION
2016-10-25	DRAWING SET	First web upload

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