Accumulator Charge Pressure for ME engines

ENGINE TYPE: ME

1. Background

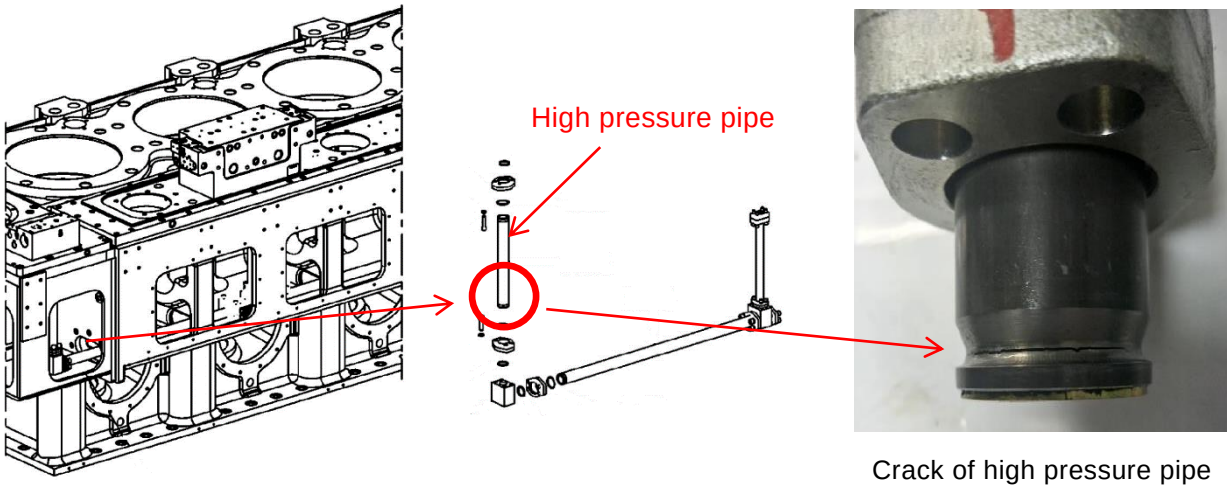
Accumulators are provided for ME type engines for minimizing pulsation of hydraulic system of FO booster pump and exhaust actuator.
In order to maintain normal function of the accumulator, it is needed to keep appropriate charge pressure. Therefore, in case of significant charge pressure drop, there is a possibility of breakage caused on parts such as high pressure pipe and support, accumulator diaphragm and housing due to pressure pulsation. As per Accumulator maintenance, we issued the HSD-B0603 of the same title before. There are some cases where serious secondary disaster has occurred by pressure drop from some of service vessels (refer section 2). And, according to recent information from Licenser, the accumulator was ruptured due to charge pressure drop. Such malfunctions can lead to serious damage to the main engine, injuries to the crew and, in the worst case, death. In view that there are 2 type of hydraulic pressure system of 200 and 300 bar, and accumulator regular maintenance period has been reviewed based on actual service experiences, we'd like to reissue our service data again for your better understanding and maintenance plan.

2. Examples of serious accident due to drop of accumulator charge pressure

The following shows examples of serious secondary disaster such as engine's inoperability by damage of parts due to drop of accumulator charge pressure, which could not minimize pulsation of hydraulic oil.

1) Crack of high pressure pipe

As shown in Fig.1, crack occurred at high pressure pipe, and hydraulic oil was leaked, so that oil pressure could not be maintained.



Crack of high pressure pipe

Fig.1 Crack of high pressure pipe

REMARKS : 1st edition: 10 April 2017
Rev. 1: Quality of Nitrogen gas and Adapter for Nitrogen gas charging are added. 23 Aug. 2017
Rev. 2: Charge pressure interval is revised that 2,000 hours or every 6 months whichever occurs first. Minimum allowable pressure is added. 18 Jan. 2018
Rev. 3: "Section 2. Examples of serious accident due to drop of accumulator charge pressure" was added. 15 March 2019
Rev. 4: Charge pressure check interval was changed according to Licenser's latest information (every 2000 hours or 6 months → every 1 month) 6 Sep. 2019

2) FIVA valve malfunction due to accumulator diaphragm damage
The diaphragm was damaged and damaged pieces entered inside of FIVA valve causing FIVA valve to malfunction.

HCU unit　　Diaphragm damage

Fig.2　Accumulator diaphragm damage

3. Checking Accumulator charge pressure
As per ME type engines, there are 2 type of hydraulic pressure system, i. e. 200 and 300 bar system, and accumulator charge pressure varies depending on the system respectively. So please check the system type by referring the instruction book, VOL. Ⅱ Maintenance, page 106-23 or 4565-0550. (Accumulator charge pressure at each accumulator temperature of the table 1 and 2 of P3 are also shown in the instruction book.) Although filling pressure is written as 104.3bar/20℃ on some ME type engines, please follow Table 1, Accumulator charge pressure at each accumulator.

4. Accumulator maintenance/Caution point

1) Accumulator charge pressure decreases for 2~5 bar per month. In order to maintain appropriate charge pressure, check and recharge pressure first within 1 week after the vessel delivery and then at every 1 month depending on accumulator actual temperature (surrounding temperature) by referring table 1 or table 2. And please be careful not to fail below the minimum allowable pressure.

Note: If the check interval of the caution plate attached to the accumulator is the old standard “2000 hours”, revise it with “1 month” (see Fig. 3).

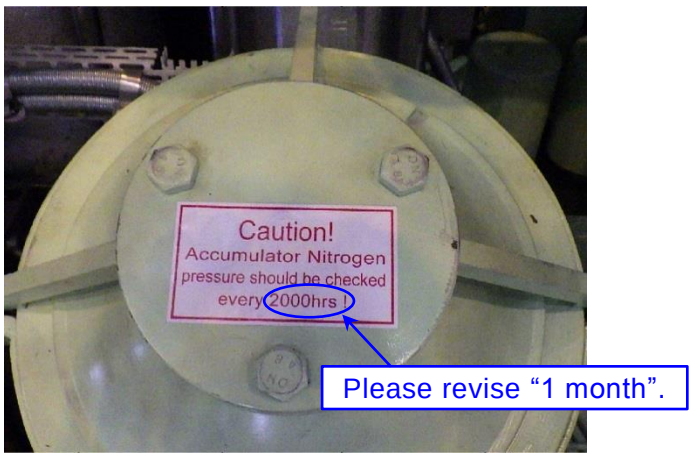


Fig.3　Revise of Accumulator’s caution plate

2) Please use Nitrogen gas surely, as water contained in air could bring harmful effects in case of using air for recharging.
3) It is recommended to keep these check/recharge records so that you can refer these data later.
4) After recharging, confirm the inlet is securely sealed by means such as check spray. As the inlet cap has subsidiary seal efficiency, seal all of them securely. As per cap, tighten it not by tools, but by hands.
5) In case of diaphragm damage is suspicious due to large drop of recharge pressure, carry out replacement of the diaphragm by referring the instruction book, VOL. Ⅱ Maintenance 906-23.3 or 4565-0551. As expected lifetime of diaphragm is 5 years (32,000 hrs), carry out replacement at every 5 years.
6) Please use Nitrogen gas that satisfy Table 3 for filling. Also, when the filling tool and the plug of the nitrogen gas bottle do not match, the adapters shown in Table 4 are supplied together with the nitrogen gas filling tool, so please select adapter that matches the screw on the bottle side.
7) If the accumulator was operating without charge pressure, it is highly recommended that the accumulator is fully replaced because the accumulator housing might be damaged.

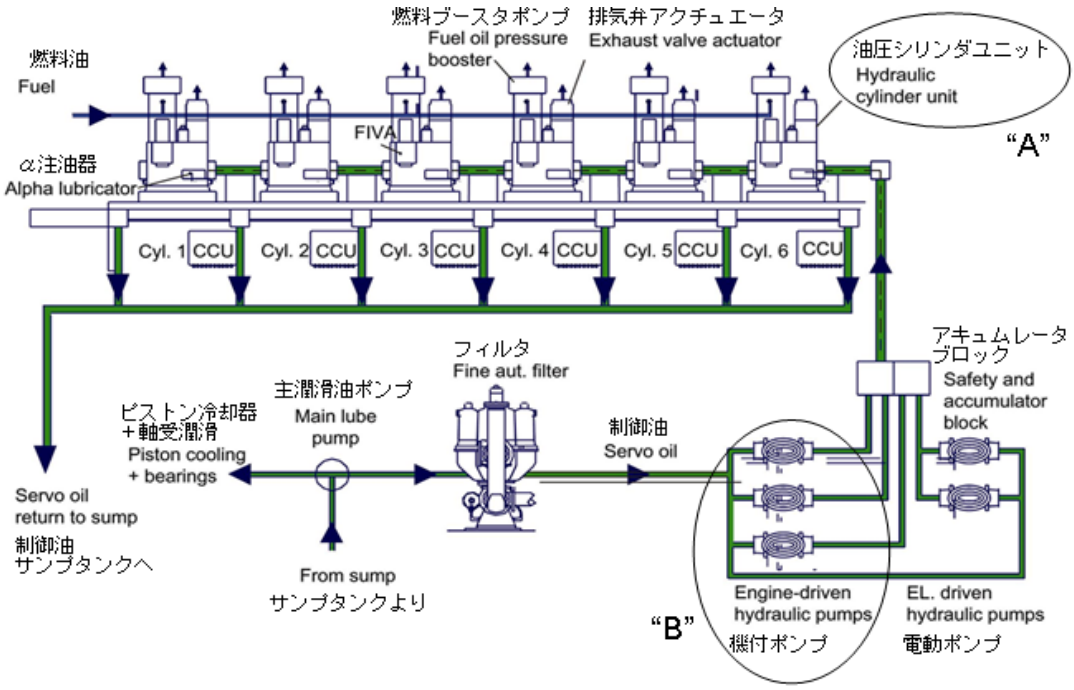
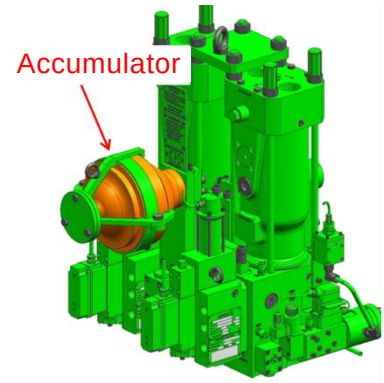
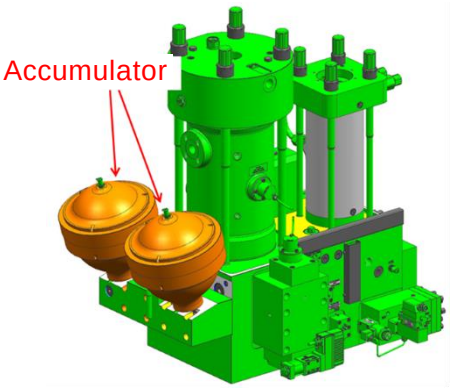


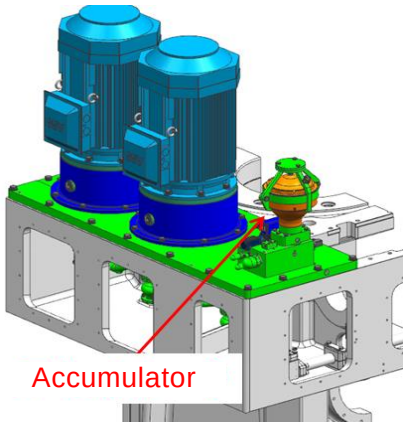
Fig. 4 ME Hydraulic Oil System



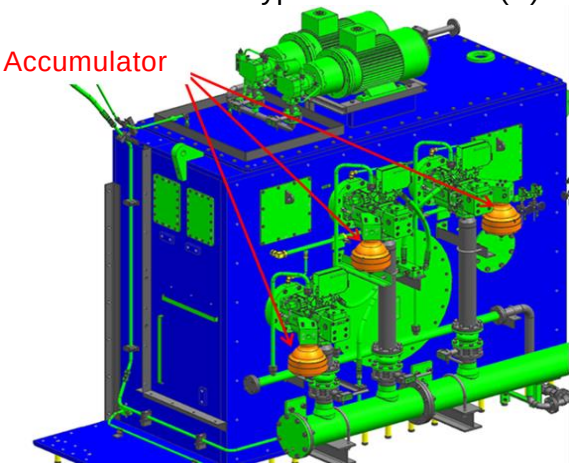
ME-B HCU type Accumulator (A)



ME-C HCU type Accumulator (A)



ME-B HPS type Accumulator (B)



ME-C HPS type Accumulator (B)

Fig. 5 Accumulator layout

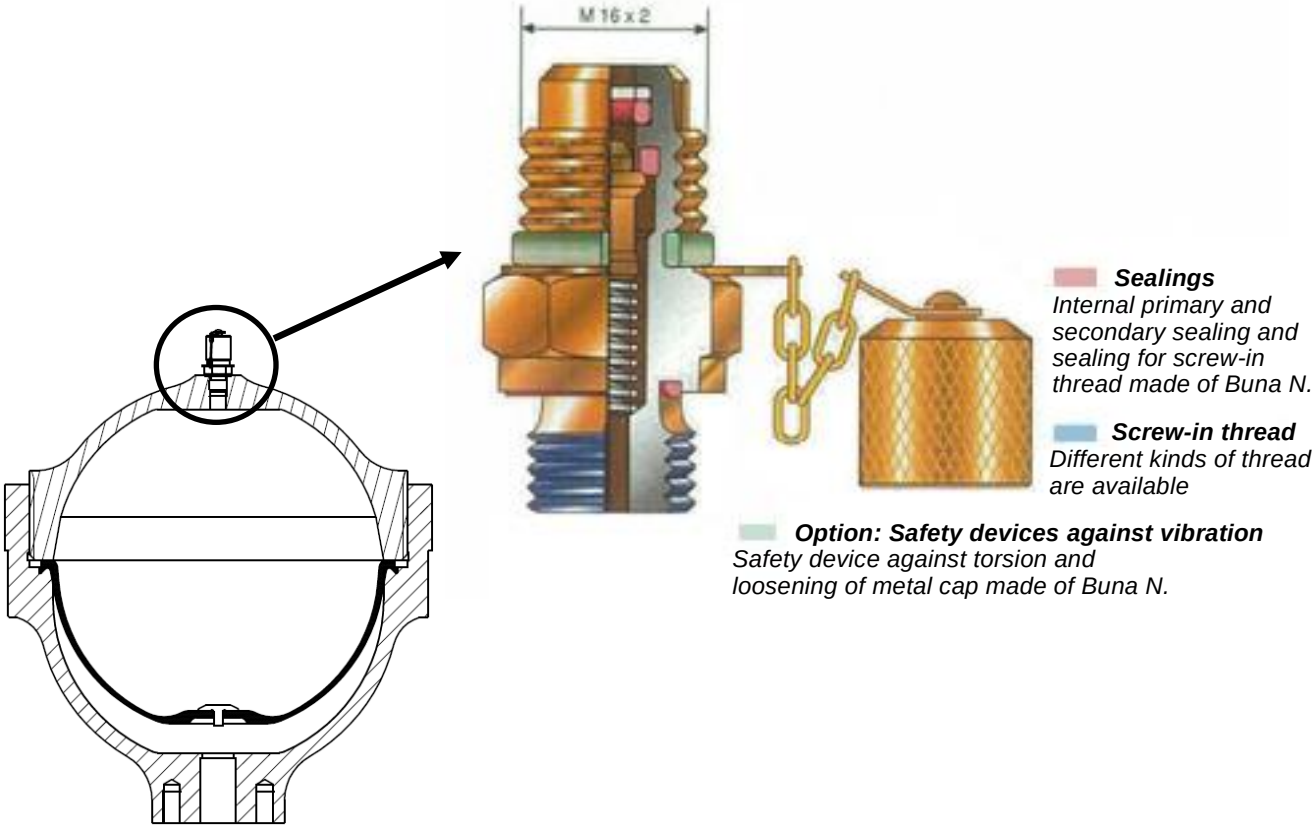


Fig. 6 Accumulator cross section and inlet cap

Table 1 Accumulator charge pressure at each accumulator temperature (200bar system)

Accumulator temperature (℃)	Accumulator pressure (±5 bar)	Minimum allowable pressure (bar)
0	89	59
10	92	62
20	95	65
30	98	68
40	101	71
50	105	75
60	108	78
70	111	81
80	114	84
90	118	88
100	121	91

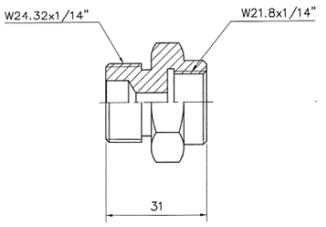
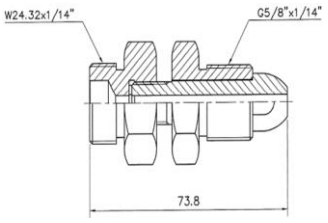
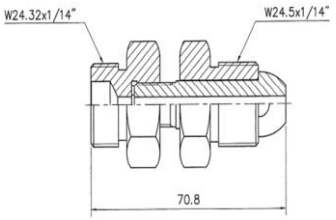
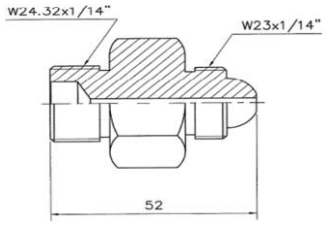
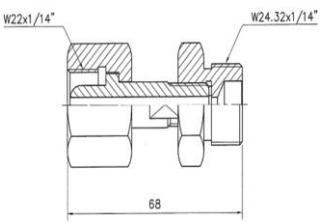
Table 2 Accumulator charge pressure at each accumulator temperature (300bar system)

Accumulator temperature (℃)	Accumulator pressure (±5 bar)	Minimum allowable pressure (bar)
0	124	94
10	130	100
20	136	106
30	142	112
40	148	118
50	154	124
60	160	130
70	166	136
80	172	142
90	178	148
100	185	155

Table 3 Quality of Nitrogen gas

Purity	Vol%	99.9 or more
O2	Wolppm	10.0 or less
Dew point	degC	-60.0 or less

表 4 窒素ガス充填要具アダプタ
Table 4　Adapters for Nitrogen gas charging

No.	① 要具側/Tool side		② ボンベ側/N2 bottle side			図 Drawing of adapters
	サイズ Size	形状 Male or Female	サイズ Size	形状 Male or Female	方向 Handedness	
1	W24.32x1/14	凹/Female	W24.32x1/14	凹/Female	右ネジ Right-handed thread	要具本体の形状/アダプターを用いない場合 Tool original, No adapter No image
2	W24.32x1/14	凸/Male	W21.8x1/14	凹/Female	右ネジ Right-handed thread	
3			G5/8x1/14	凸/Male		
4			W24.5x1/14	凸/Male		
5			W23x1/14	凸/Male		
6			W22x1/14	凹/Female		
7			ISO 228-G3/4	凹/Female