

# J&E HALL COMPRESSOR PRODUCT TRAINING



# VLADIMIR GRYNKO

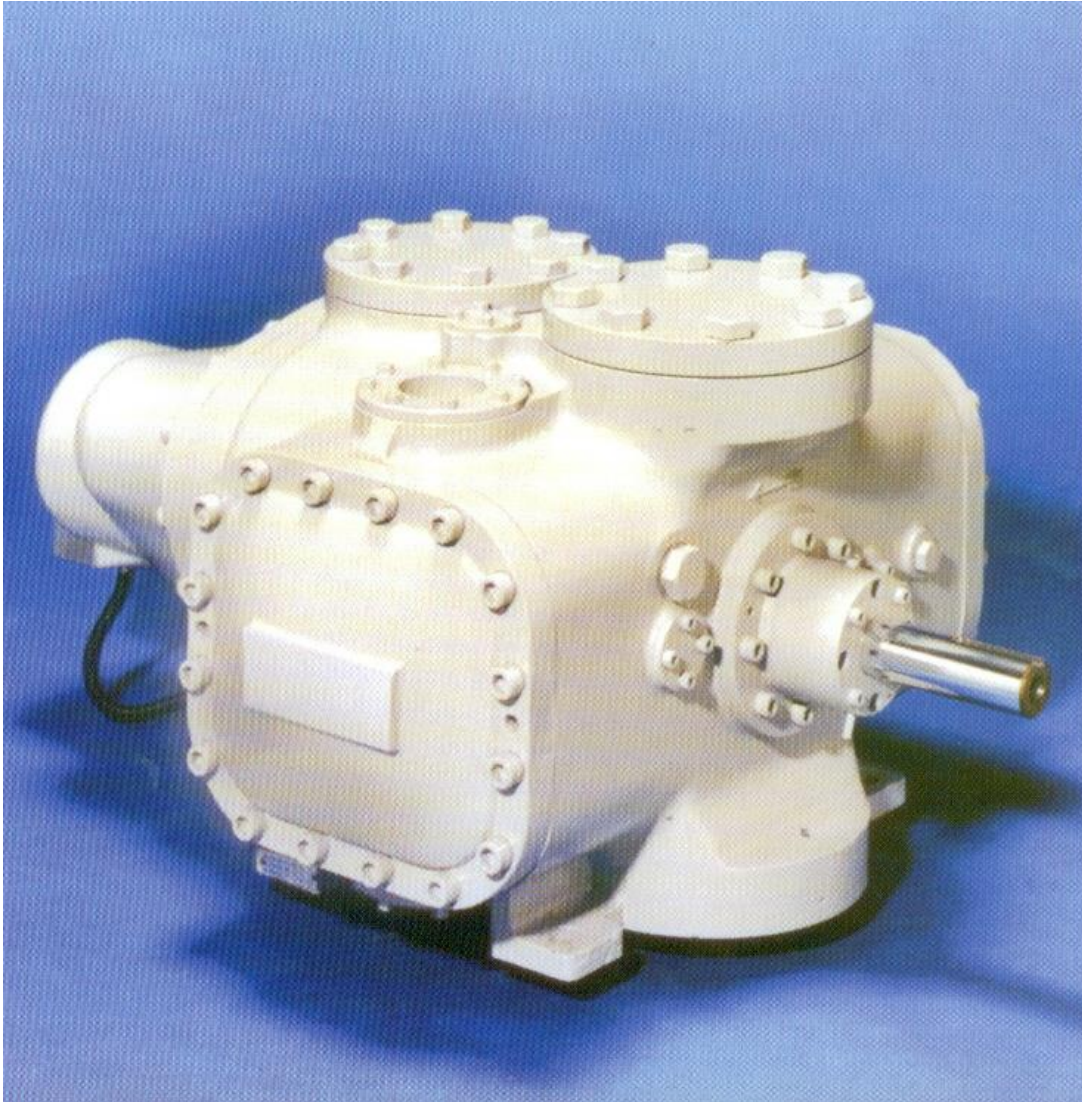
## CEO EUROCOOL



J & E HALL был основан в 1785 года Джоном Холлом

- 1882 Начало холодильной деятельности и презентация оборудования
- 1886 Установка оборудования на борту SS Selembrica, транспортирующего замороженное мясо с Фолклендских островов
- 1890 J&E Hall на пивоварне Arthur Guinness & Sons в Дублине
- 1920 J&E Hall установила холодильное оборудование на более чем половине кораблей, плавающих в мировых водах
- 1940 J&E Hall начал производство поршневого компрессора типа MONOBLOC
- 1950 J&E Hall начал производство поршневого компрессора VEEBLOC
- 1976 J&E Hall начал производство моновинтовых компрессоров HALLSCREW

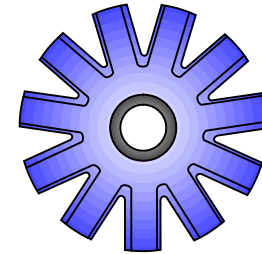
# HSO2000



- СБАЛАНСИРОВАННЫЙ КОМПРЕССОР ПО ОСЕВЫМ И РАДИАЛЬНЫМ НАГРУЗКАМ
- SERVICE-FRIENDLY
- НАДЕЖНЫЙ
- ОДНОВИНТОВОЙ ДИЗАЙН
- ПАТЕНТ 1973 года
- СТАРТ ПРОИЗВОДСТВА 1976

# HallScrew compressors

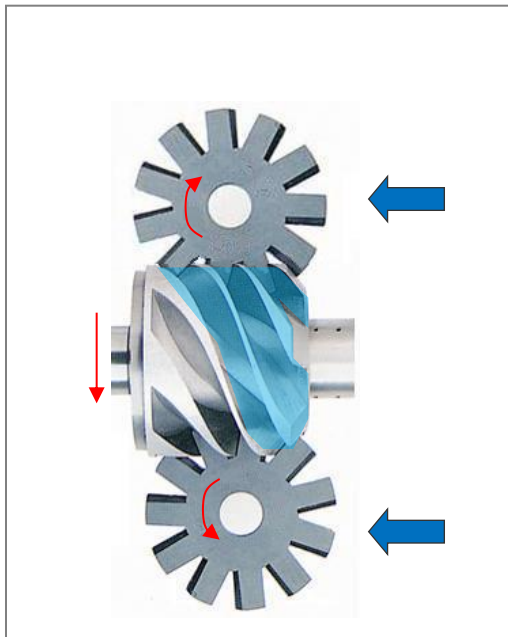
Моновинт – в работе



звезда

сверхпрочный  
материал  
HallPlas!

ВСАСЫВАНИЕ



СЖАТИЕ



НАГНЕТАНИЕ



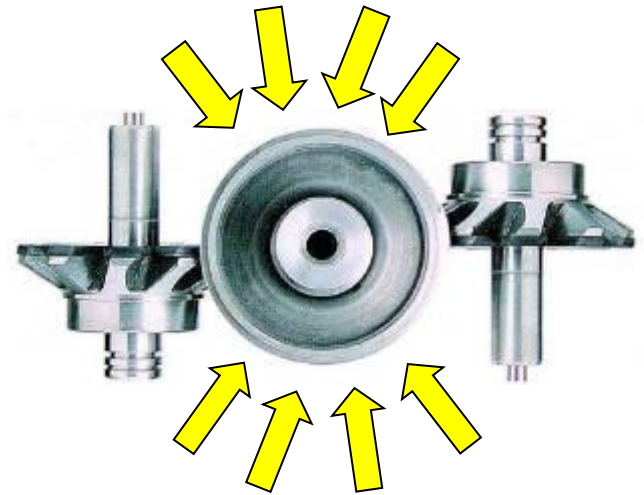
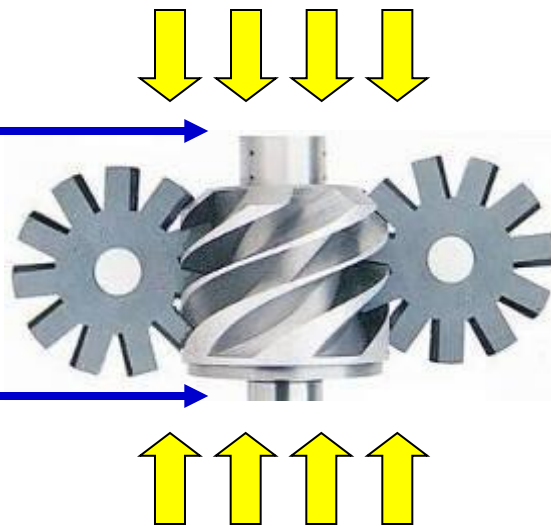
# HallScrew

## Сбалансированное сжатие

Большой диаметр

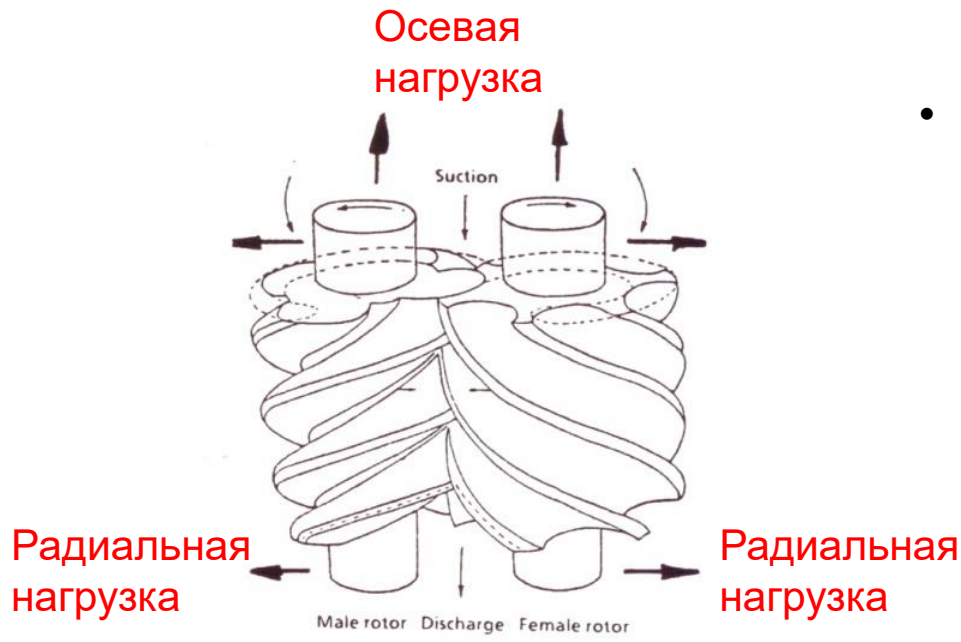


- 100,000 часов срок службы
- Самый большой жизненный цикл до кап.ремонта



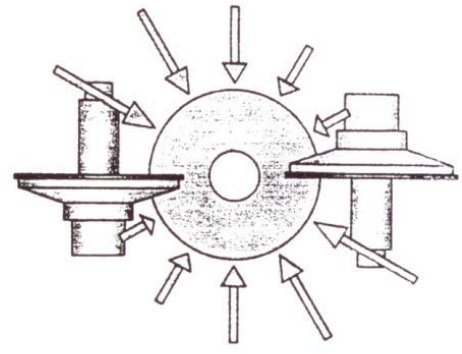
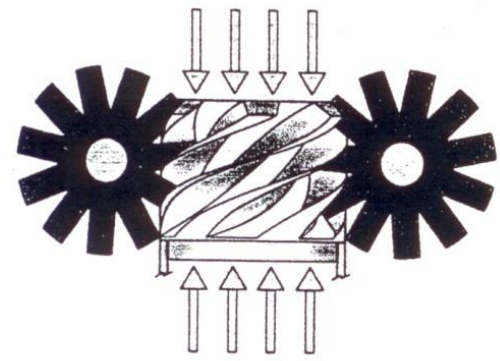
- Нет потерь при передаче мощности другому винту
- Не прихотлив в смазке
- Сбалансированные осевые нагрузки
- Сбалансированные радиальные нагрузки

# Сравнение HallScrew vs twin screw



## • TWIN SCREW

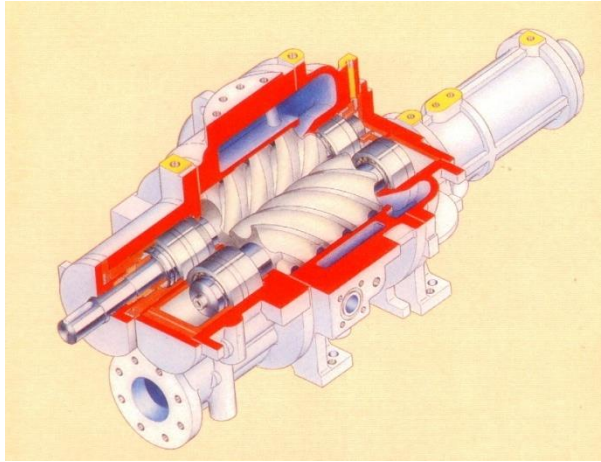
- 25% TO 60% ЭНЕРГИИ ПЕРЕДАЕТСЯ НА ВРАЩЕНИЕ 2-го ВИНТА
- КОНТАКТ МЕТАЛЛА ПО МЕТАЛЛУ В СЛУЧАЕ ПЛОХОЙ СМАЗКИ
- ВЫСОКАЯ ОСЕВАЯ НАГРУЗКА
- ВЫСОКАЯ РАДИАЛЬНАЯ НАГРУЗКА
- 30,000 – 60,000 часов жизни основных подшипников



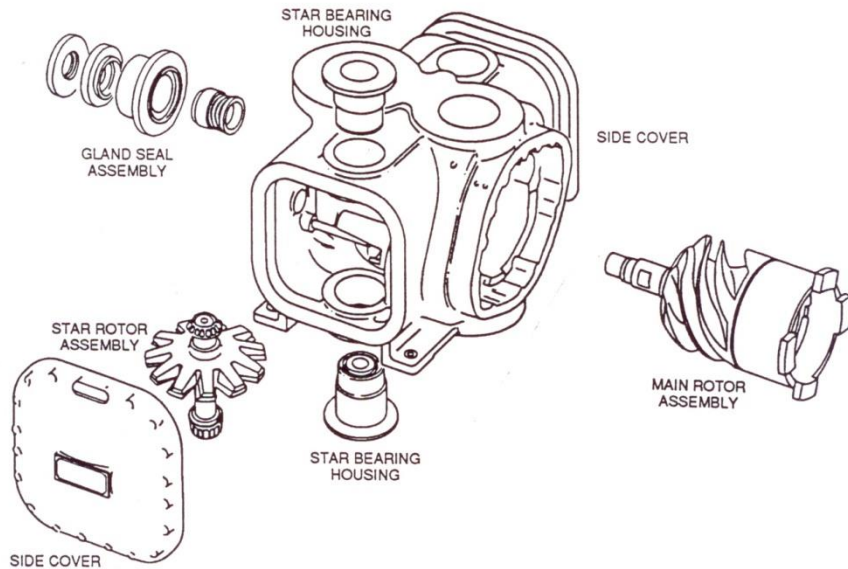
## • HALLSCREW

- НЕТ ПЕРЕДАЧИ ЭНЕРГИИ НЕТ ПОТЕРЬ
- НИЗКИЕ ТРЕБОВАНИЯ К СМАЗКЕ
- Сбалансированные осевые нагрузки
- Сбалансированные радиальные нагрузки
- 100,000 часов жизненного цикла до замены подшипников

# HallScrew vs Twin Screw



- TWIN SCREW
  - СЕРВИС СЛОЖНЫЙ



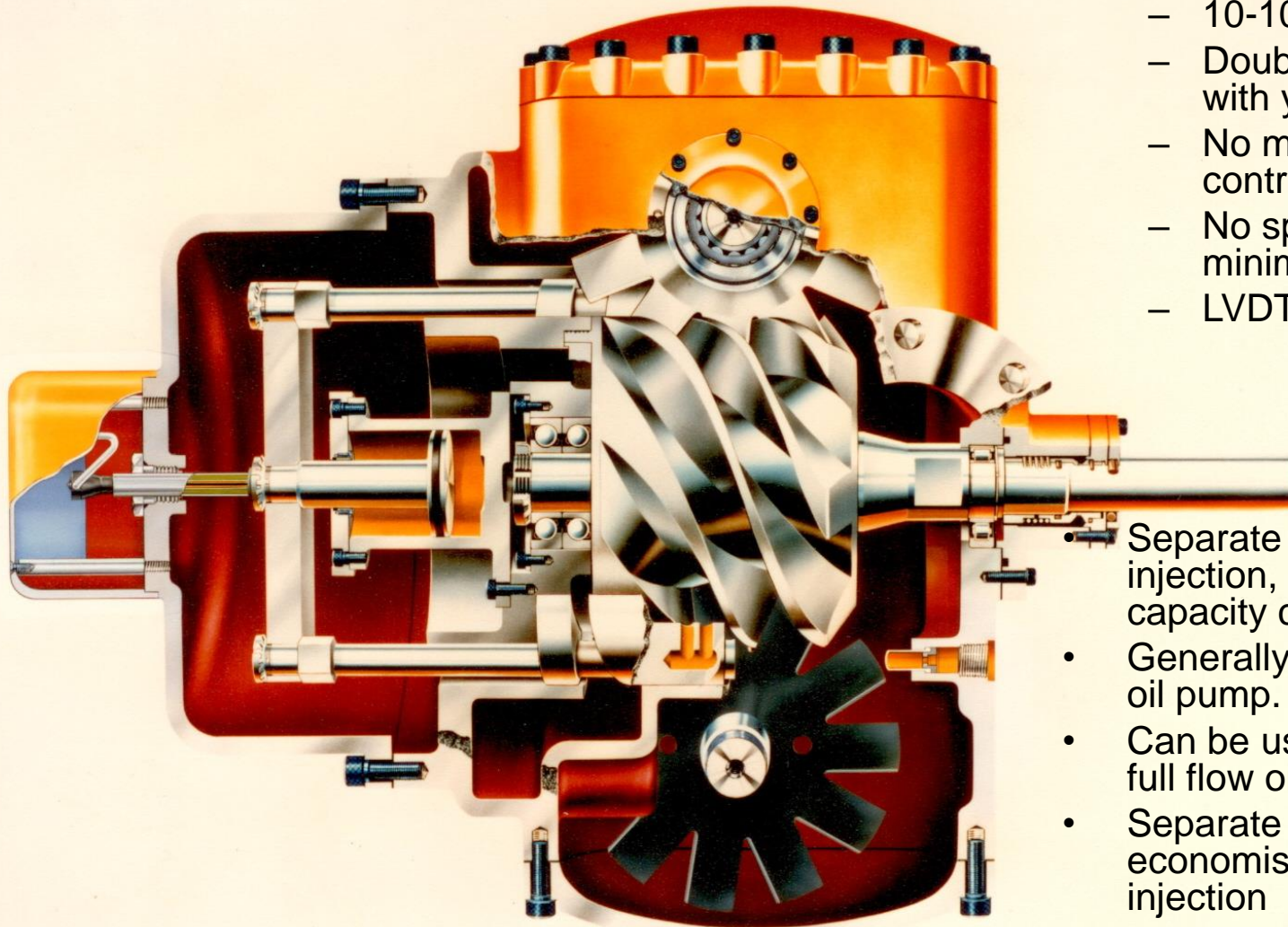
- HALLSCREW
  - ЛЕГКИЙ СЕРВИС И ОСМОТР
  - ВСЕ ДЕТАЛИ МОГУТ УДАЛИТЬСЯ БЕЗ ДЕМОНТАЖА КОМПРЕССОРА И РАЗРЫВА ТРУБОПРОВОДОВ



## Периодичность технического обслуживания

<b>Таблица 6 Контрольный список технического обслуживания</b>		
<b>Параграф</b>	<b>Один раз в двенадцать лет или каждые 50 000 часов наработки</b>	✓
13.5.7	Проверить звезды подшипников и главные подшипники. Заменить в случае, если у вас возникло подозрение в износе.	
	Проверить звезды. Заменить при повреждении или износе прокладки.	
	Проверить механизм контроля производительности на « <u>дрифте</u> »	
<b>Параграф</b>	<b>Один раз в двадцать четыре года или каждые 100 000 часов наработки</b>	✓
13.5.8	Демонтировать компрессор и проверить его компоненты на наличие повреждений или износа. Заменить основные подшипники при необходимости.	
<b>Ссылка на другие графики технического обслуживания</b>		
Смазка подшипников электродвигателя компрессора в соответствии с инструкциями завода изготовителя электродвигателя		
<b>Таблица 6 (продолжение) Контрольный список технического обслуживания</b>		
	код АТЕХ $\text{CE} \text{ II 2 G c T4}$ Проверить радиальный зазор между валом и уплотнительной крышкой кожуха вала	
<b>Параграф</b>	<b>Один раз в три года или каждые 15 000 часов наработки</b>	✓
13.5.5	Полная перезаправка масляной системы	
	Проверить состояние <u>коалесцирующих</u> элементов в маслоотделителе – <i>маслоотделитель оснащен <u>коалесцирующими</u> элементами для двухступенчатой сепарации масла</i>	
	Заменить мембрану муфты/распорного блока привода компрессора	
<b>Параграф</b>	<b>Один раз в шесть лет или каждые 25 000 часов наработки</b>	✓
13.5.6	Вскрыть боковые и торцевые крышки, осмотреть компрессор	

# HSO2000 COMPRESSOR



## General Features

- Counter clockwise rotation
- Capacity control
  - Two slides
  - 10-100%
  - Double acting cylinder with yoke
  - No mounted capacity control solenoids
  - No spring return to minimum load
  - LVDT position sensor
- Separate oil feeds to main injection, bearings and capacity control
- Generally used with pre lube oil pump.
- Can be used as booster with full flow oil pump
- Separate ports for economiser and liquid injection
- No internal relief valves



# HSO2000 SERIES

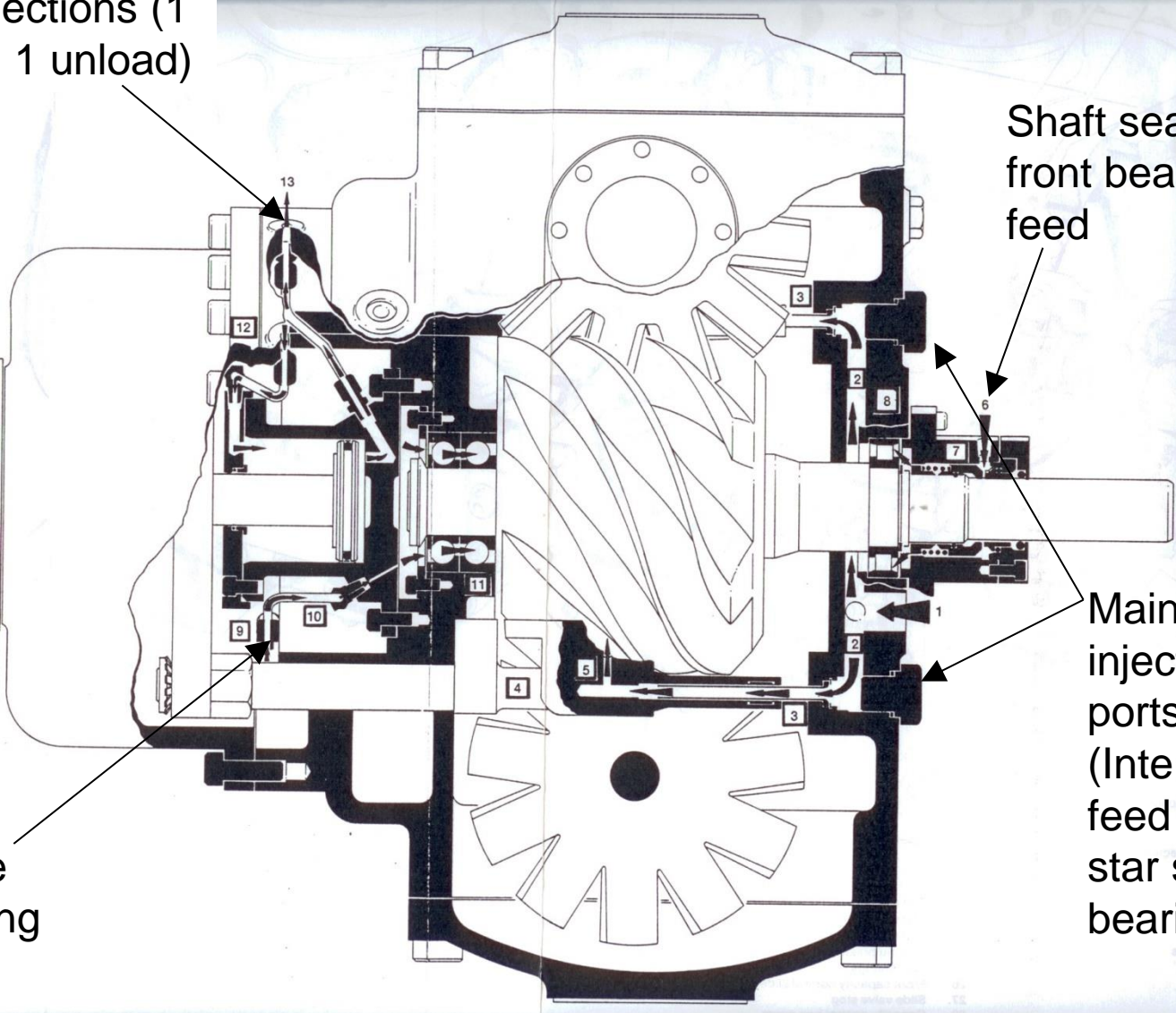
## Separate oil feeds

Capacity Control connections (1 load, 1 unload)

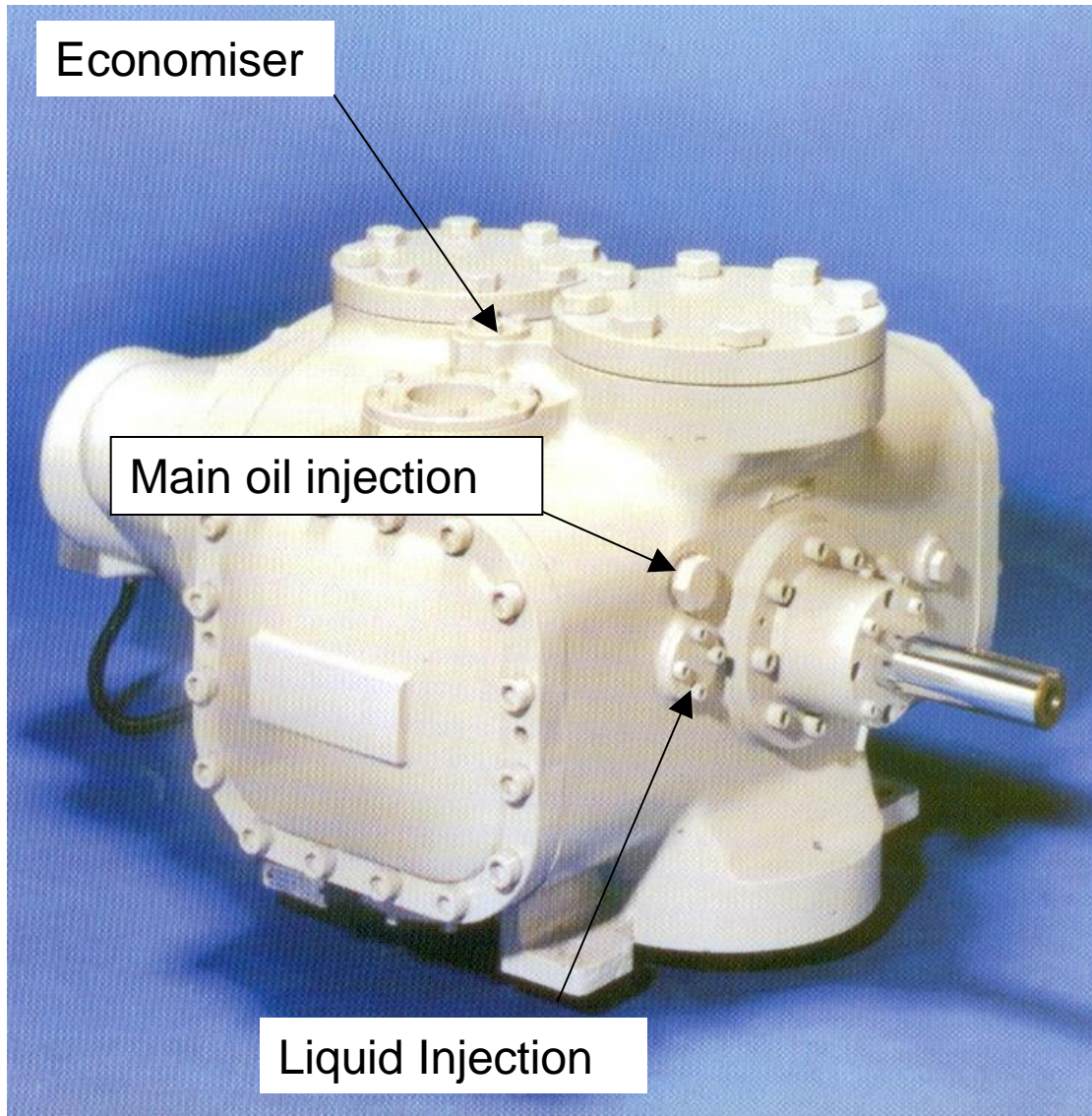
Shaft seal & front bearing feed

Main oil injection (2 ports). (Internal feed to top star shaft bearings)

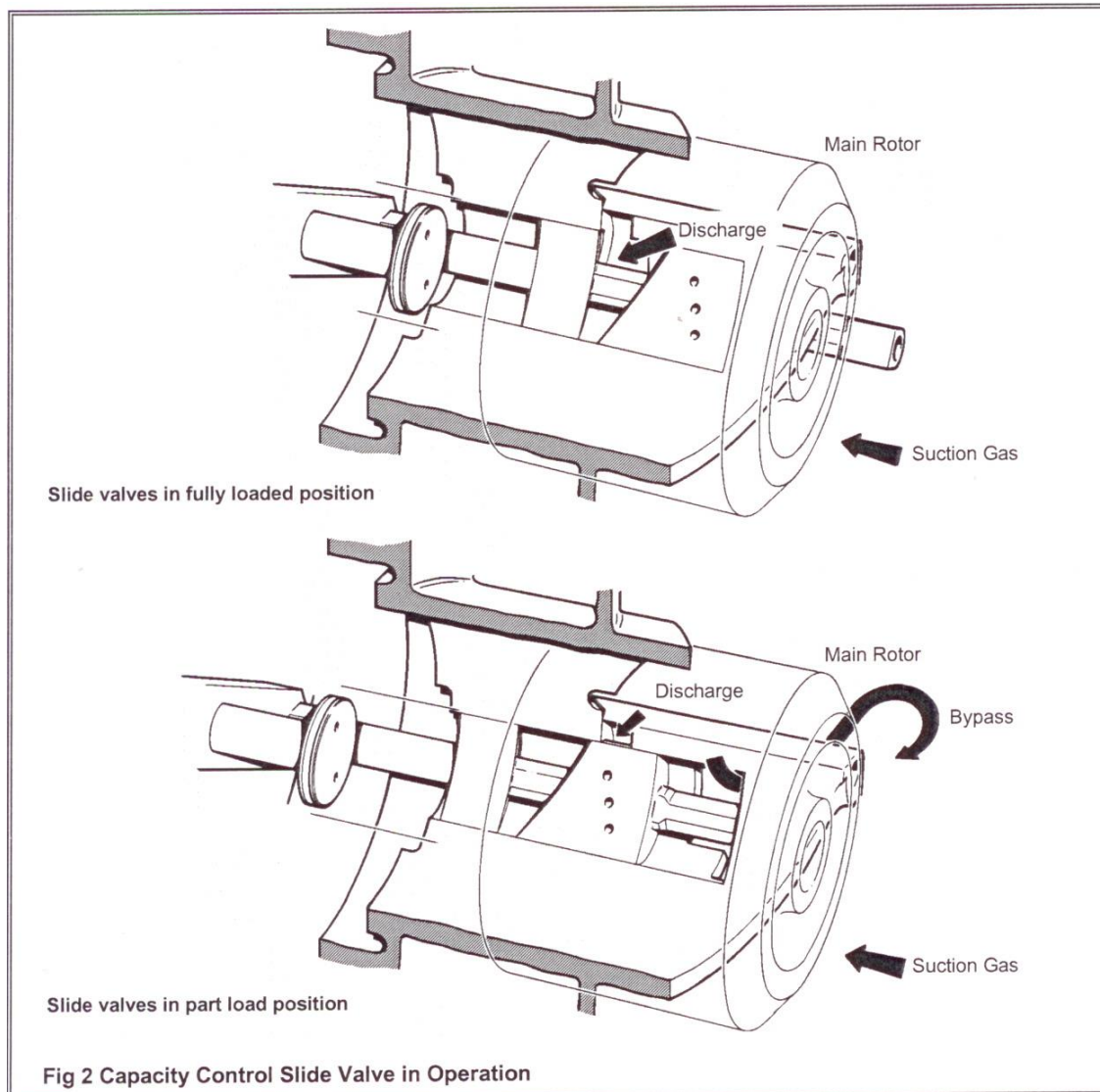
Discharge end bearing feed



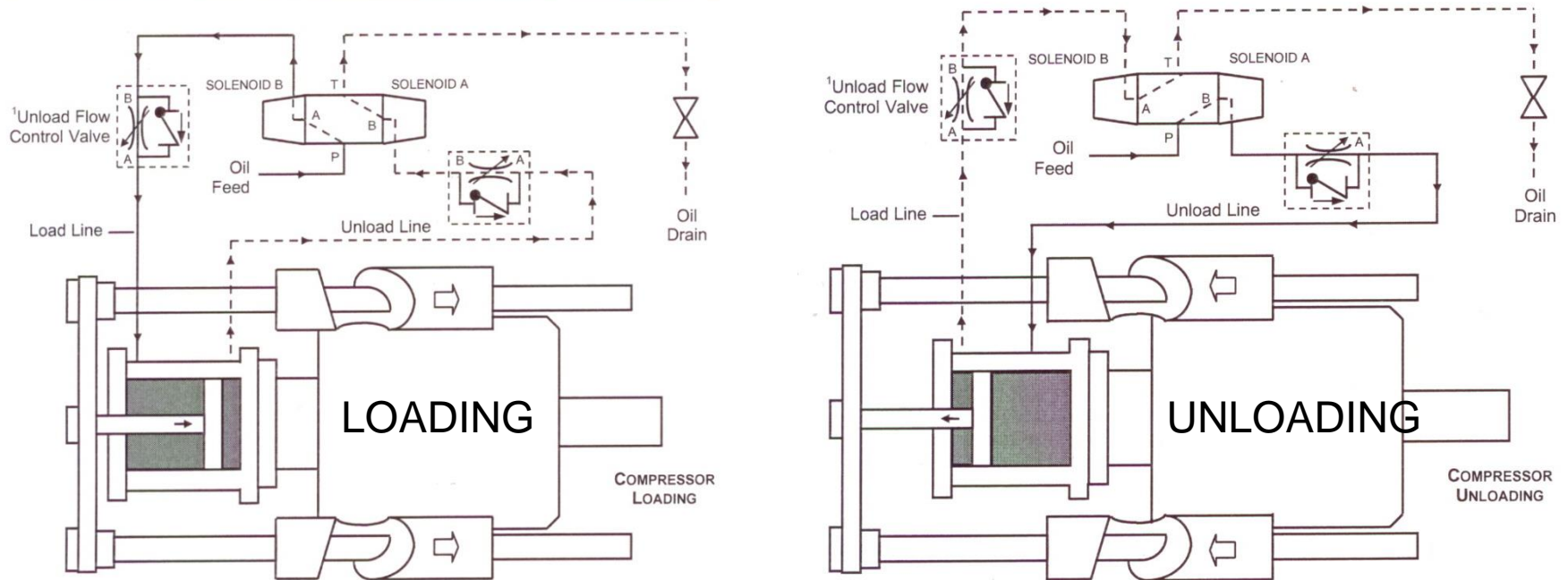
# HSO 2000 SERIES Connections



# НСО2000 ПЛАВНАЯ РЕГУЛИРОВКА ПРОИЗВОДИТЕЛЬНОСТИ



# HSO2000 CAPACITY ACTUATION



CAPACITY CONTROL ACTION	<sup>2</sup> SOLENOID A	<sup>2</sup> SOLENOID B	OIL FLOW
Load compressor	Energise	De-energise	P → A, B → T
Unload compressor	De-energise	Energise	P → B, A → T
Hold slide valve position	De-energise	De-energise	No flow

<sup>1</sup>Flow control valves enclosed in boxes incorporate NRV as shown in Fig 7.

<sup>2</sup>The solenoids on the 4-way valve are normally closed, energise to open.

**Fig 4 Capacity Control Arrangement Using a 4-Way Solenoid Valve**

# HallScrew Compressor Ranges



HSS 4200/  
HS L/M 4200



HSS 3200



HSS 3100



HS L/M 3200



HS L/M 3100



HSO 4200



HSO 3200



HS 2000



# Semi-hermetic Air Conditioning Compressors



HSS3100



HSS4200

Model	m3/h	CFM
HSS	50Hz	60Hz
3118	175	124
3120	213	150
3121	250	177
3122	292	206
3123*/**	338	239
3216	286	202
3218	343	242
3220	415	293
3221	471	333
4221	504	356
4222	611	432
4223	716	506
4224**	828	585



HSS3200

\*Not in current selection software

\*\*R134a only

# Semi-hermetic Refrigeration Compressors

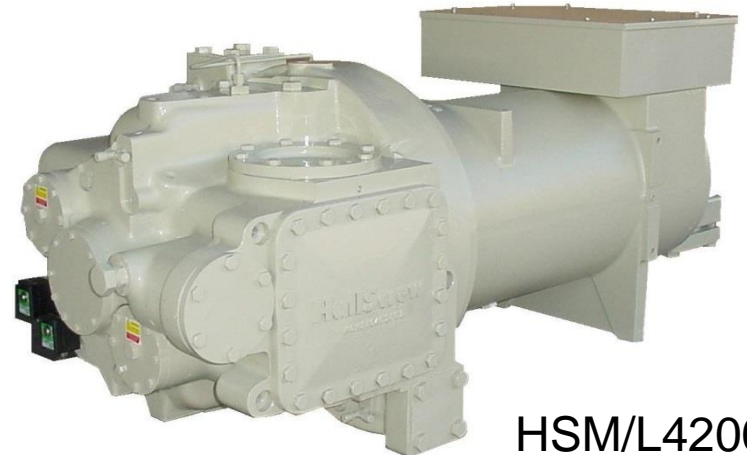


HSM/L3100

Model	m3/h	CFM
HSM/L	50Hz	60Hz
3118	175	124
3120	213	150
3121	250	177
3122	292	206
3123*/**	338	239
<b>3216</b>	<b>286</b>	<b>202</b>
3218	343	242
3220	415	293
3221	471	333
4221	504	356
4222	611	432
4223	716	506
4224**	828	585



HSM/L3200



HSM/L4200

\*Not in current selection software

\*\*R134a only

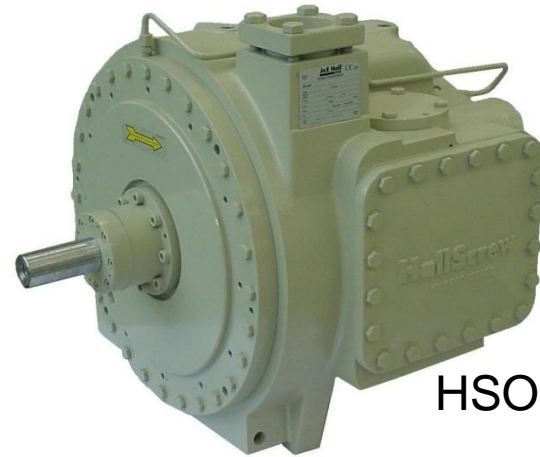
# Open Drive Compressors



HSO3200

Model	m3/h	CFM
HSO	50Hz	60Hz
3216	286	202
3218	343	242
3220	415	293
3221	471	333
4221	504	356
4222	611	432
4223	716	506
4224*	828	585
2024	853	602
2028	1273	899
2031	1728	1220
2035	2486	1756

\*limited envelope



HSO4200

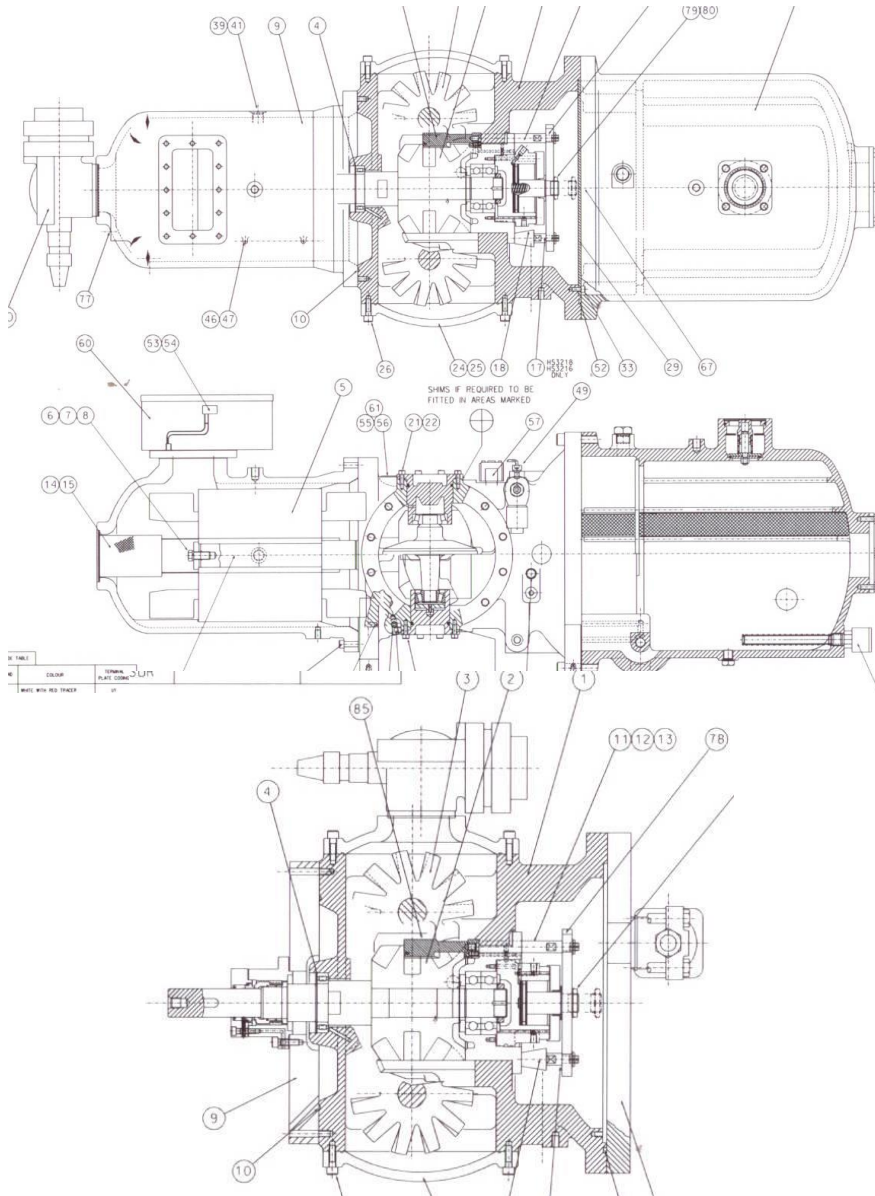


HSO2000



HSI3200

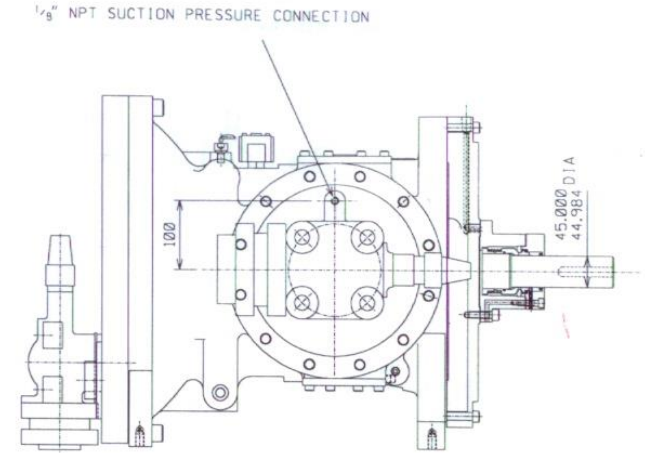
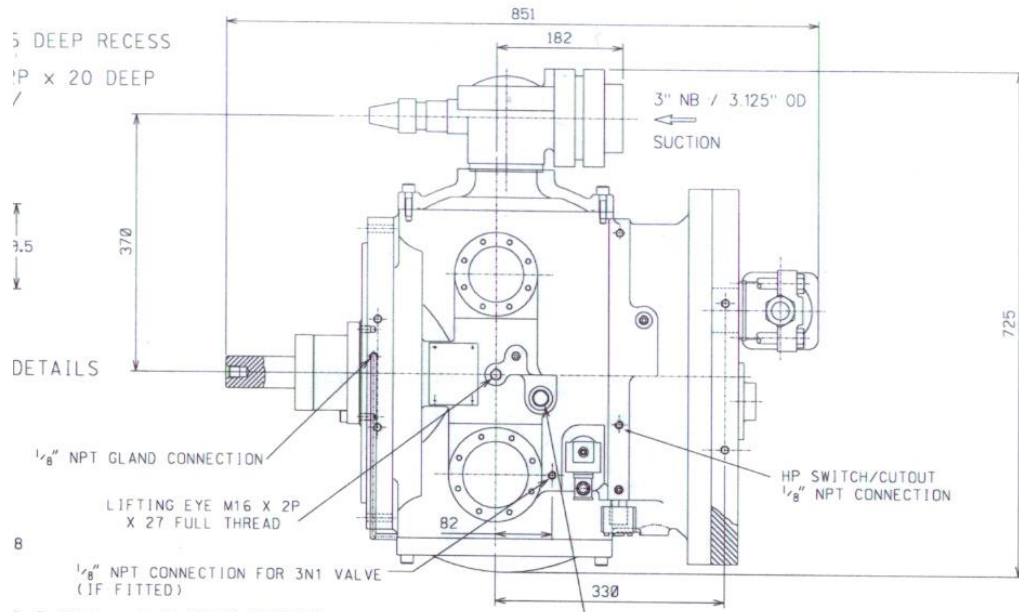
# 3200 Series design



## General Features

- Counter clockwise rotation
- Capacity control
  - 25-100%
  - Single cylinder with yoke
  - Single acting cylinder
  - Discharge pressure loads/oil pressure unloads.
  - One load/one unload solenoid valve mounted.
  - Spring return to minimum load.
- Single oil feed to main injection, bearings and capacity control
- No pre lube oil pump required.
- Cannot be used as booster (without modification).
- Single port for economiser and liquid injection
- Internal bypass relief valves 24bar (350psig) R134a, 31bar (450psig) others

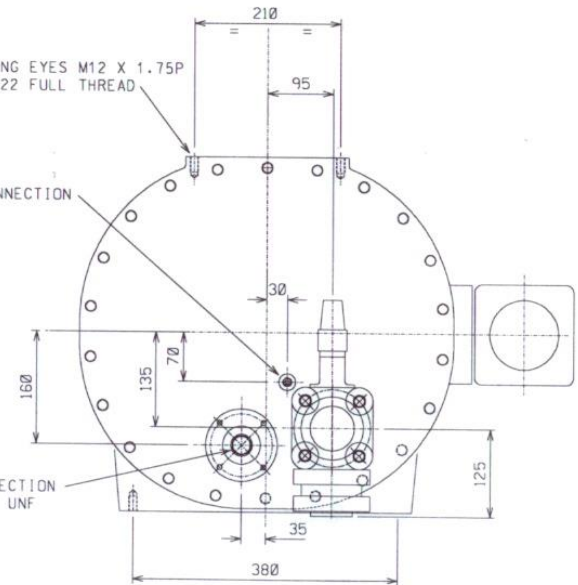
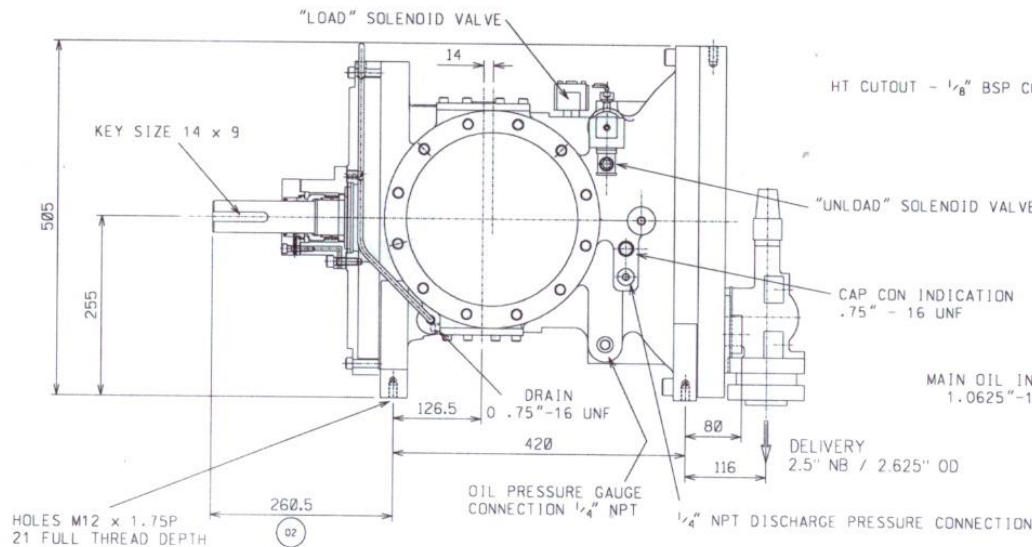
# HSO 3200 Physical



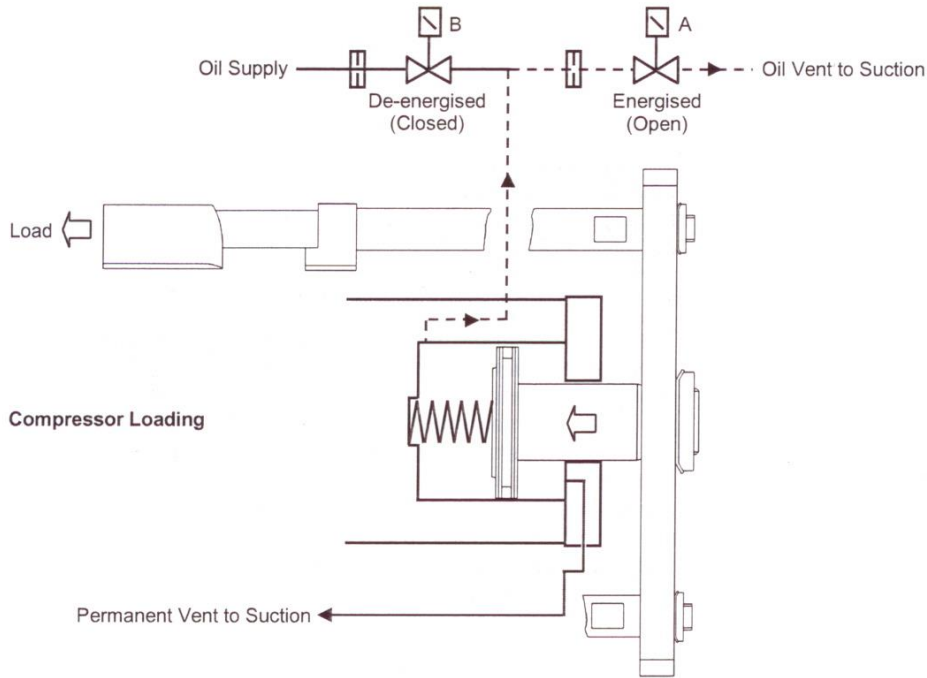
0.5 DIA x 1.6 DEEP RECESS

ECONOMISER/LIQUID INJECTION 1.0625"-12 UNF (ONE TOP ONE BOTTOM) 2 LIFTING EYES M12 X 1.75P X 22 FULL THREAD

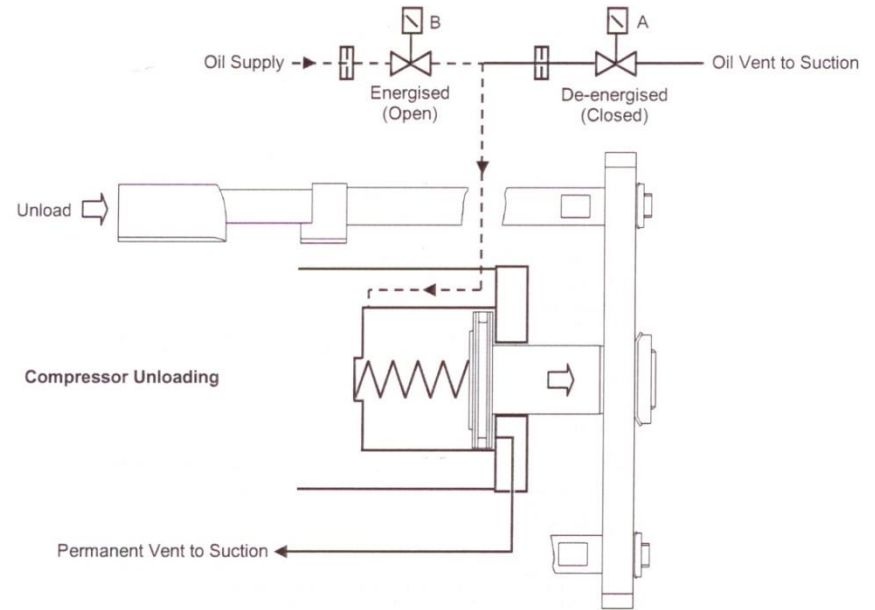
N DETAILS



# 3200 Capacity Control



Suction/Discharge Differential Pressure > Spring Force = Slides and Piston Move Towards Load

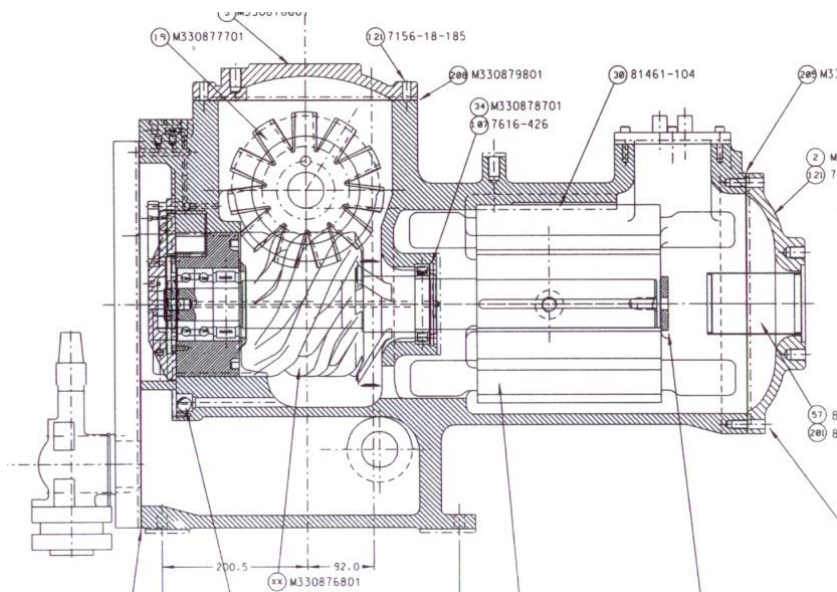
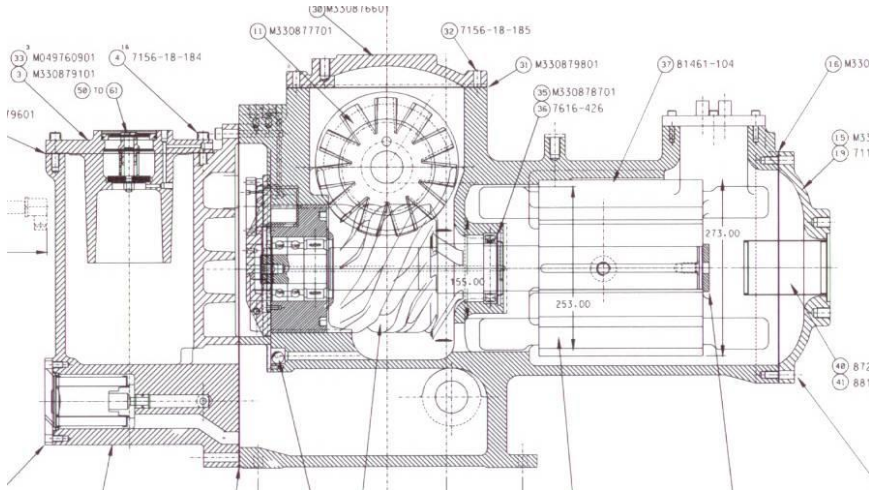


Oil Pressure + Spring Force > Suction/Discharge Differential Pressure = Slides and Piston Move Towards Unload

CAPACITY CONTROL ACTION	SOLENOID VALVE A	SOLENOID VALVE B
<b>Load compressor</b> Oil is vented from the capacity control cylinder. The action of the suction/discharge differential pressure on the slide/piston assembly overcomes the force of the unloading spring and moves the slide valve towards the maximum load position.	Energise (open)	De-energise (close)
<b>Unload compressor</b> High pressure oil is admitted to the capacity control cylinder. Oil pressure supplements the force of the spring acting on the unload side of the piston. The combined force is sufficient to overcome the action of the suction/discharge differential pressure and move the slide valve towards the minimum load position.	De-energise (close)	Energise (open)
<b>Hold slide valve position</b> The slide valve is hydraulically locked at the desired load position.	De-energise (close)	
<b>Start-up</b> Start Request      Compressor Starts (Loading Inhibited)      Compressor Permitted to Load Compressor Stopped      ← 60 Seconds →      ← 60 Seconds →      → Time		
← Solenoid Valve B Energised (Open) →      ← Solenoid Valve B De-energised (Closed) →      ← Solenoid Valve B Energised (Open) Until Compressor Required to Load →		
<small>*Refer to 2.2.2. Uncontrolled Stop.</small>		

Fig 3 Continuously Variable Capacity Control

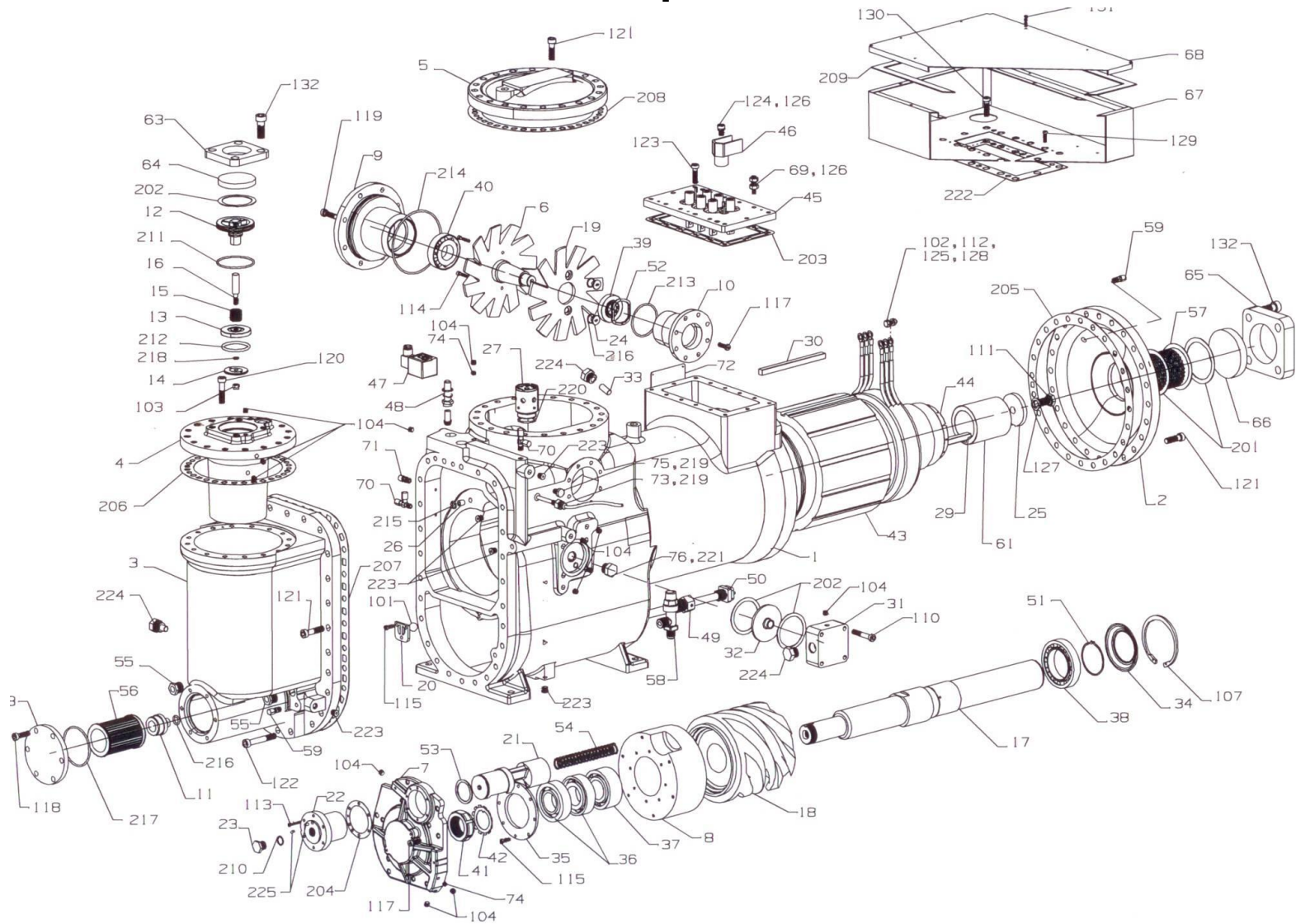
# 3100 Series Design



## General Features

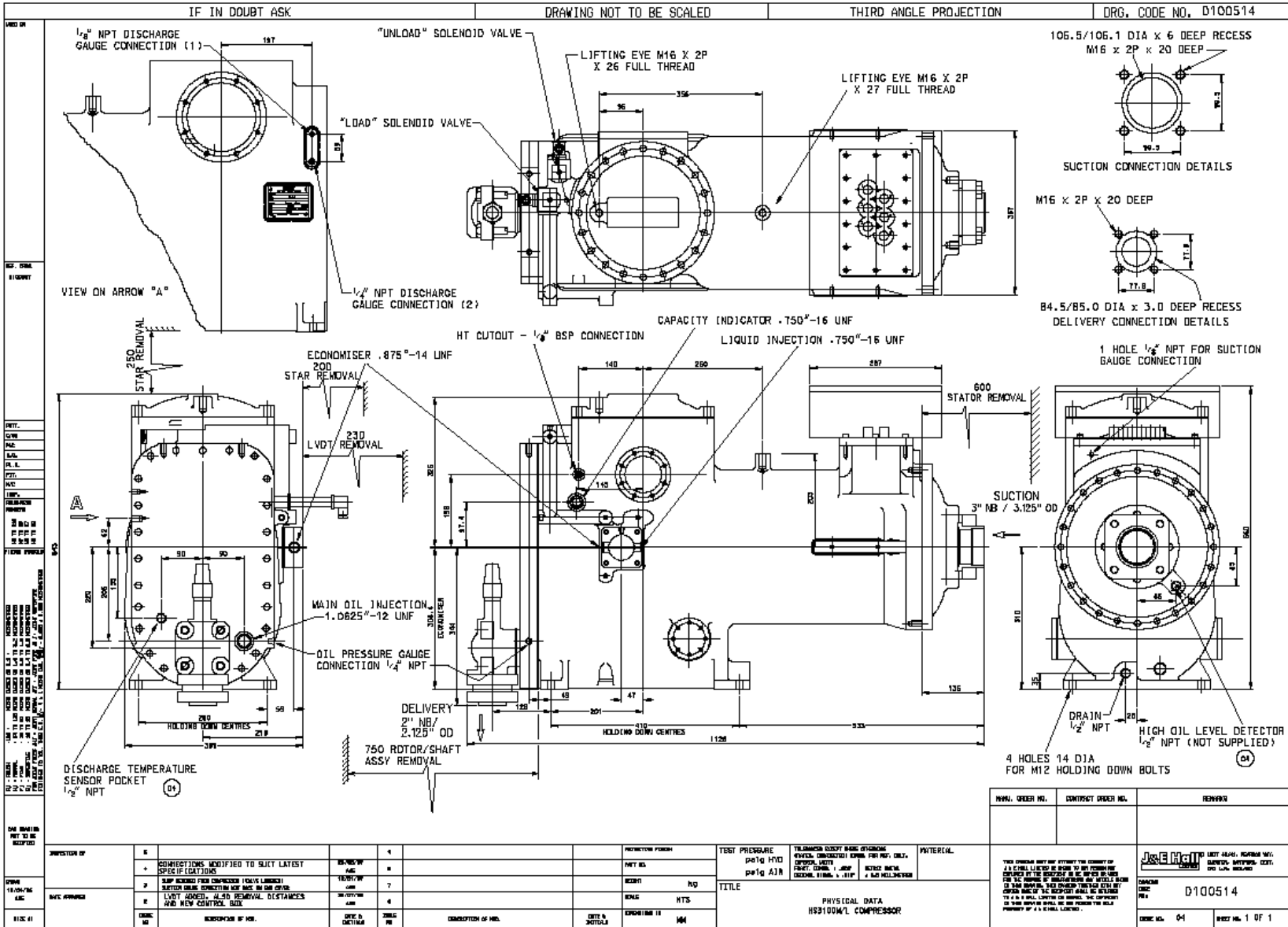
- Clockwise rotation
- Capacity control
  - 25-100%
  - Single cylinder
  - Single acting cylinder
  - Oil pressure loads/discharge pressure unloads
  - One load/one unload solenoid valve mounted.
  - Spring return to minimum load.
- Single oil feed to main injection, bearings and capacity control
- No pre lube oil pump required.
- Cannot be used as booster (without modification).
- Dual ports for economiser and liquid injection with muffler
- Internal bypass relief valves 24bar (350psig) R134a, 31bar (450psig) others

# HSS3100 exploded view

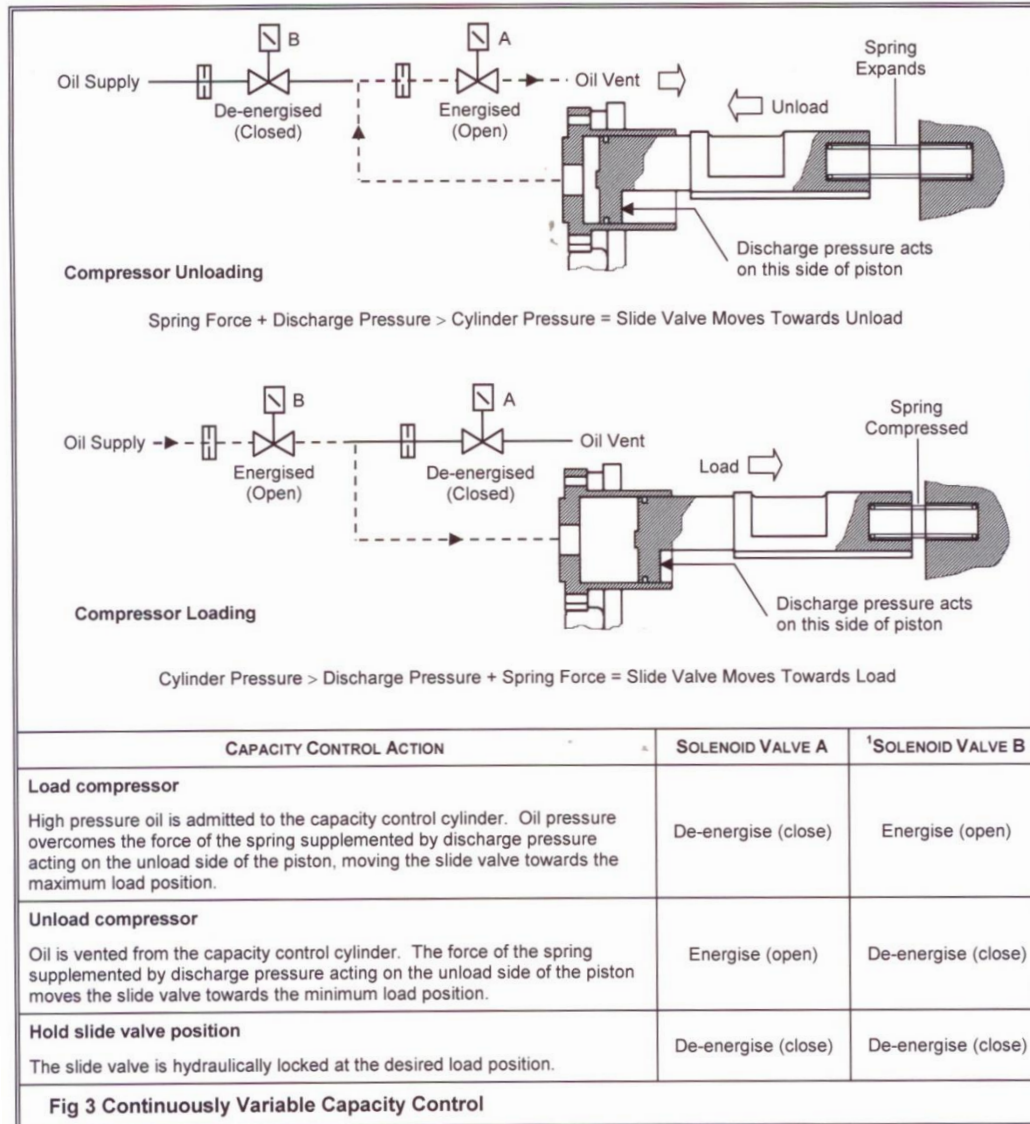




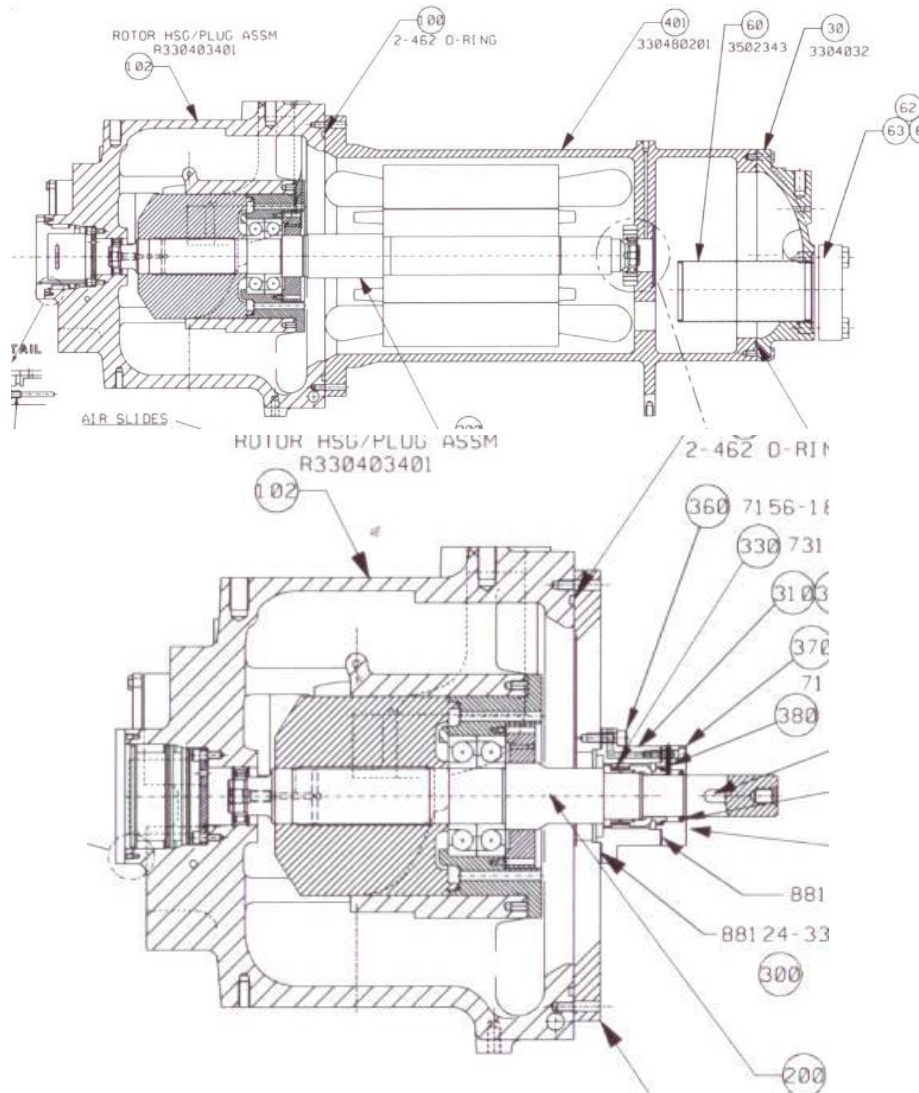
# HSM/L3100 Physical



# HS3100 Capacity Control



# 4200 Series Design



## General Features

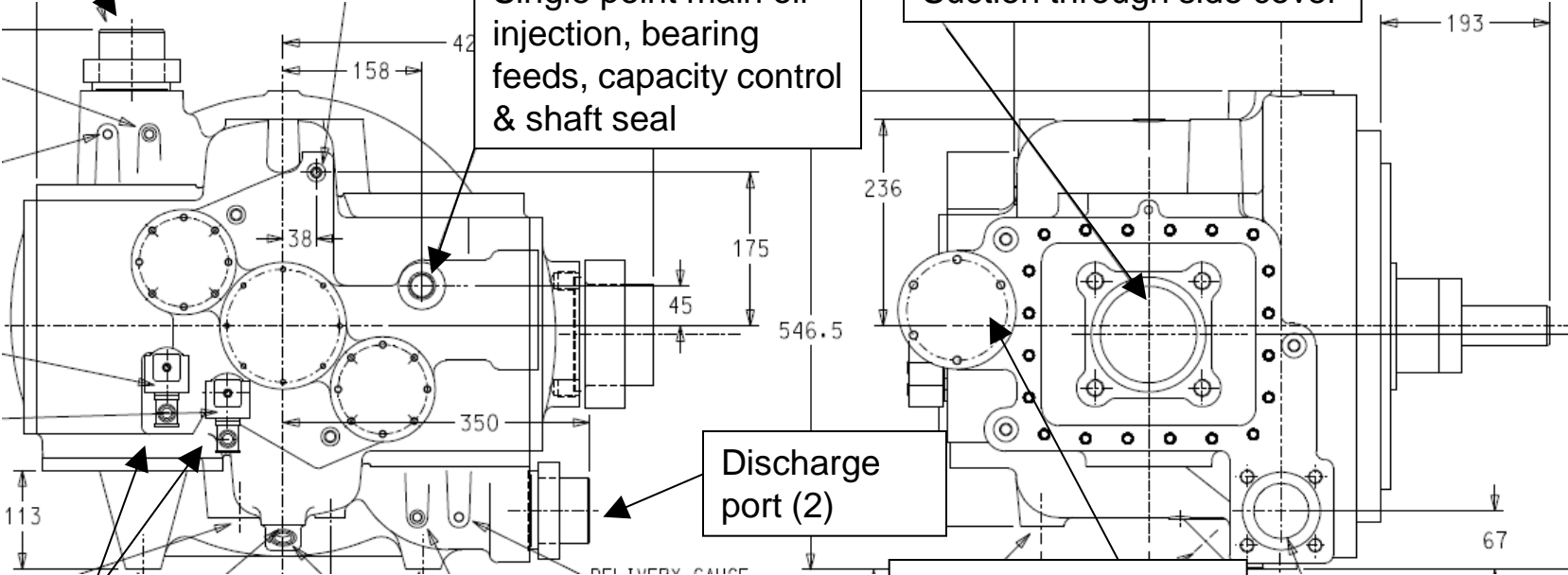
- Clockwise rotation
- Capacity control
  - 25-100%
  - Two cylinders joined hydraulically
  - Single acting cylinders.
  - Discharge pressure loads/oil pressure unloads.
  - One load/one unload solenoid valve mounted.
  - Spring return to minimum load.
- Single oil feed to main injection, bearings and capacity control
- No pre lube oil pump required.
- Cannot be used as booster (without modification).
- Single port for economiser and liquid injection
- Internal bypass relief valves 24bar (350psig) R134a, 31bar (450psig) others

# H504200 Physical

Discharge port (1)

Single point main oil injection, bearing feeds, capacity control & shaft seal

Suction through side cover

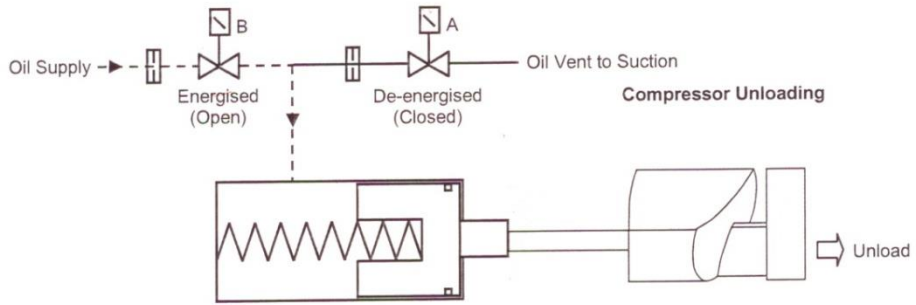


Capacity control solenoid coils

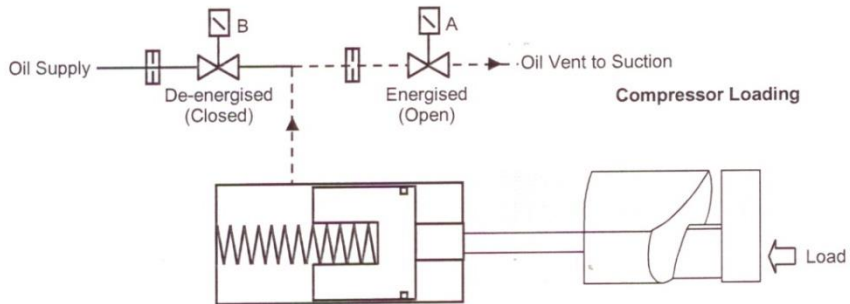
Discharge port (2)

Internal oil filter must be removed if external filter fitted

# 4200 Capacity Control



Oil Pressure + Spring Force > Suction/Discharge Differential Pressure = Slide and Piston Move Towards Unload



Suction/Discharge Differential Pressure > Spring Force = Slide and Piston Move Towards Load

CAPACITY CONTROL ACTION	SOLENOID VALVE A	SOLENOID VALVE B
<b>Load compressor</b> Oil is vented from the capacity control cylinder. The action of the suction/ discharge differential pressure on the slide/piston assembly overcomes the force of the unloading spring and moves the slide valve towards the maximum load position.	Energise (open)	De-energise (close)
<b>Unload compressor</b> High pressure oil is admitted to the capacity control cylinder. Oil pressure supplements the force of the spring acting on the unload side of the piston. The combined force is sufficient to overcome the action of the suction/discharge differential pressure and move the slide valve towards the minimum load position.	De-energise (close)	Energise (open)
<b>Hold slide valve position</b> The slide valve is hydraulically locked at the desired load position.	De-energise (close)	
<b>Start-up</b> Start Requested      Compressor Starts (Loading Inhibited)      Compressor Permitted to Load	Time Compressor Stopped      ← 60 Seconds →      ← 60 Seconds →      → ← Solenoid Valve B Energised (Open) →      ← Solenoid Valve B De-energised (Closed) →      Solenoid Valve B Energised (Open) Until Compressor Required to Load →	
<sup>1</sup> Refer to 2.2.2. Uncontrolled Stop.		

Fig 3 Continuously Variable Capacity Control

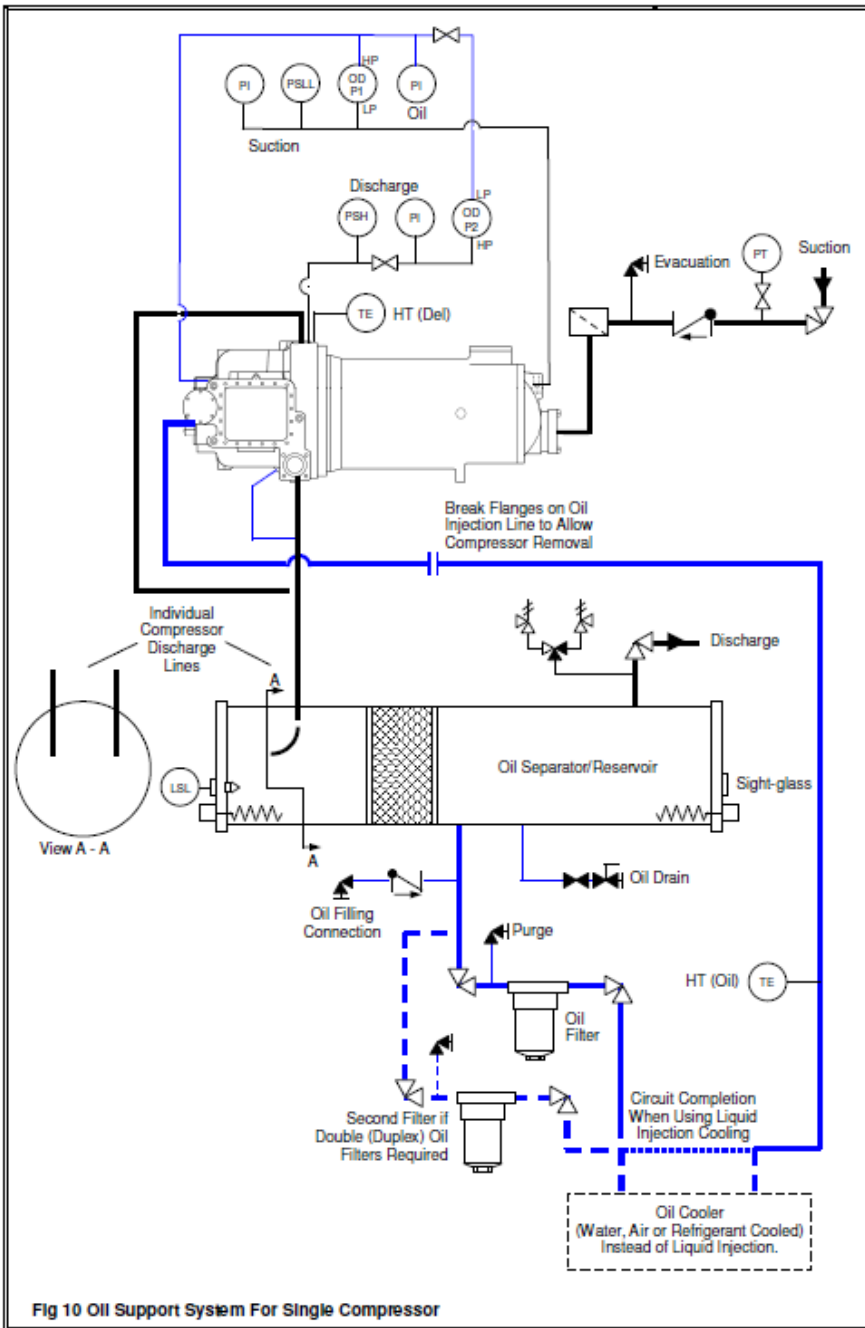


Fig 10 Oil Support System For Single Compressor

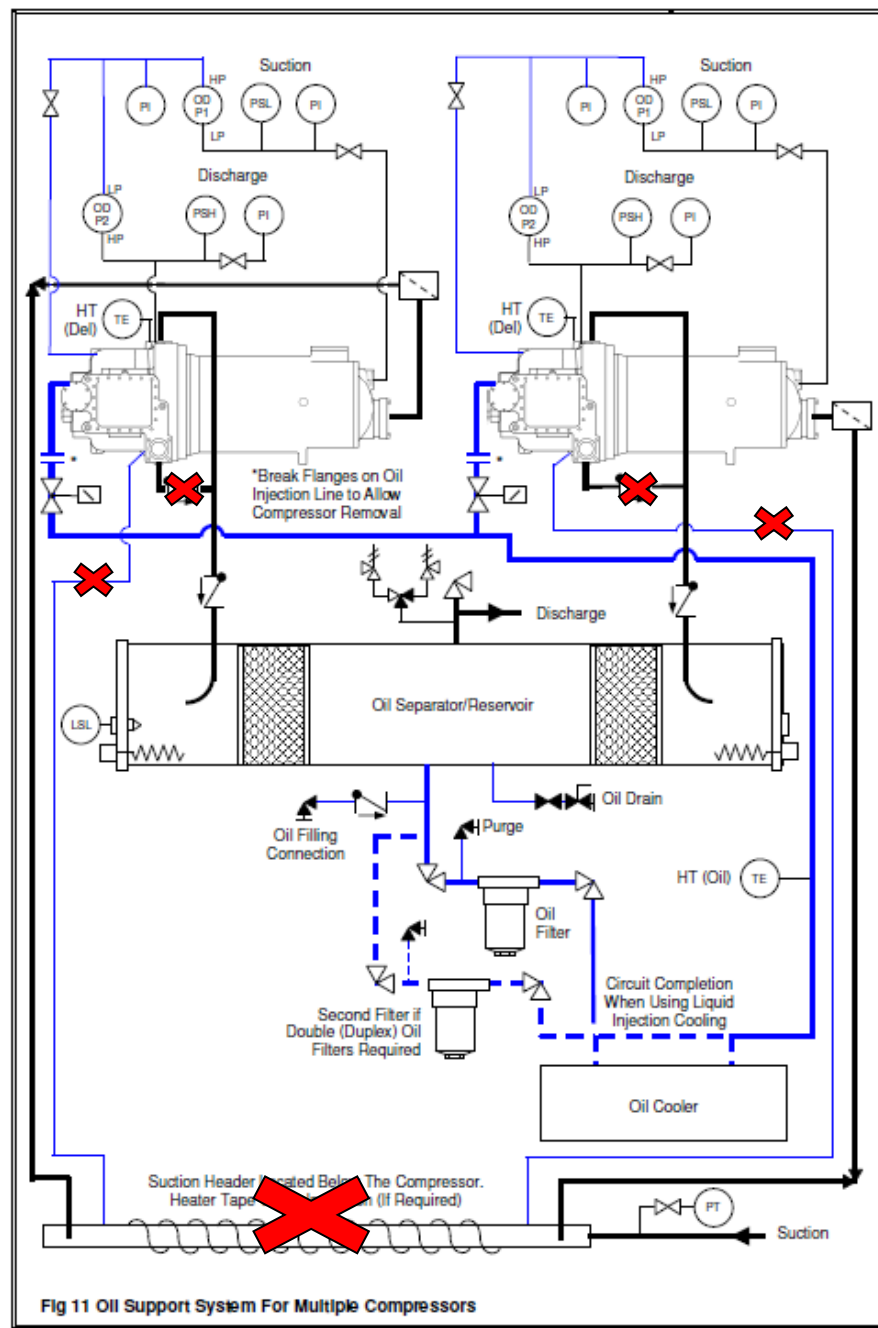


Fig 11 Oil Support System For Multiple Compressors

# РАСШИРЕНИЕ ЛИНЕЙКИ

# COMPLETE COMPRESSOR RANGE

Swept	SERIES	SEMI		SEMI	OPEN
volume		A/C		REFRIGERATION	DRIVE
50Hz		R134a/HFO	other HFC	All HFC/HFO	All HFC/HFO HC/R717
175	3100 Series	HSS3118	HSS3118	HSH/M/L3118	
213		HSS3120	HSS3120	HSH/M/L3120	
250		HSS3121	HSS3121	HSH/M/L3121	
292		HSS3122	HSS3122	HSH/M/L3122	
338		HSS3123			
286	3200 Series	HSS3216	HSS3216	HSH/M/L3216	HSO/13216
343		HSS3218	HSS3218	HSH/M/L3218	HSO/13218
415		HSS3220	HSS3220	HSH/M/L3220	HSO/13220
471		HSS3221	HSS3221	HSH/M/L3221	HSO/13221
506	4200 Series	HSS4221	HSS4221	HSH/M/L4221	HSO4221
611		HSS4222	HSS4222	HSH/M/L4222	HSO4222
716		HSS4223	HSS4223	HSH/M/L4223	HSO4223
828		HSS4224	HSS4224	HSH/M/L4224	HSO4224
817	4200+ Series	HSS4224T*			
853	2000 Series				HSO2024
898	4200+ Series	HSS4225T*/HSH/M4225			HSO4225
980		HSS4226T*/HSH/M4226			HSO4226
1108		HSS4227T*/HSH/M4227			HSO4227
1273	2000 Series				HSO2028
1273	5200 Series	HSH/M5228			HSO5228
1500		HSH/M5230			HSO5230
1728	2000 Series				HSO2031
1728	6200 Series	HSH/M6231			HSO6231
2100		HSH/M6233			HSO6233
2486	2000 Series				HSO2035
2486	7200 Series	HSH/M7235			HSO7235
2950		HSH/M7237			HSO7237
3384		HSH/M7239			HSO7239
4972	8200 Series				HSO8435

\*Asymmetric models (used with vfd)



# 4200+, 5200, 6200 SERIES COMPRESSOR SPECIFICATIONS

- **OPTION 1;**
  - FIXED VR 2.2, 2.6, 3.5, 4.9, 7.0 (R717 ONLY)
  - FIXED SPEED MOTOR
  - SLIDE LOAD / UNLOAD
- **OPTION 2;**
  - VARIABLE VR 2.0, 2.6, 3.4, 4.9
  - VARIABLE SPEED MOTOR
  - VARIABLE SPEED CAPACITY CONTROL
- **ALL COMPRESSORS;**
  - 40 BAR DESIGN (Ps)
  - BUILT-IN CAPACITY CONTROL OR VVR SOLENOID VALVES
  - NO START-UP OIL PUMP
  - HIGHER EFFICIENCY THAN 2000 SERIES

