## FINISHED PLAN

#### DE014

COSFLYING LAKE

# INSTRUCTION BOOK FOR OIL PURIFIERS (3/3)

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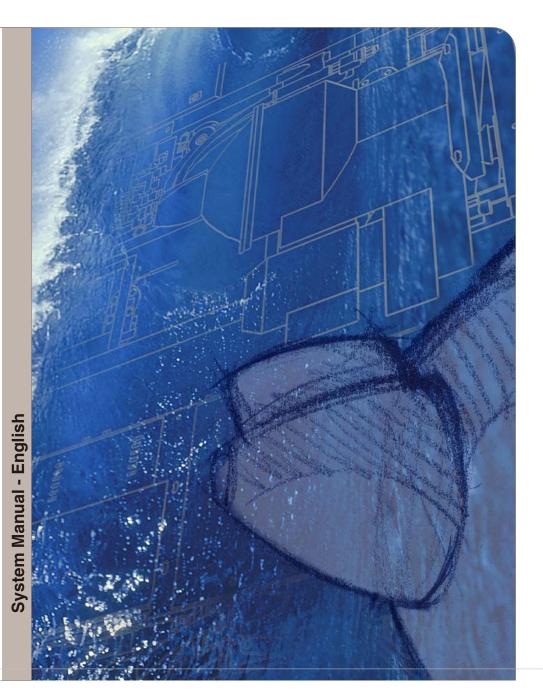
JOB NO.: ----

DESIGN DEPARTMENT DALIAN COSCO KHI SHIP ENGINEERING CO., LTD.

DALIAN

CHINA

SHEETS (INCL. COVER)



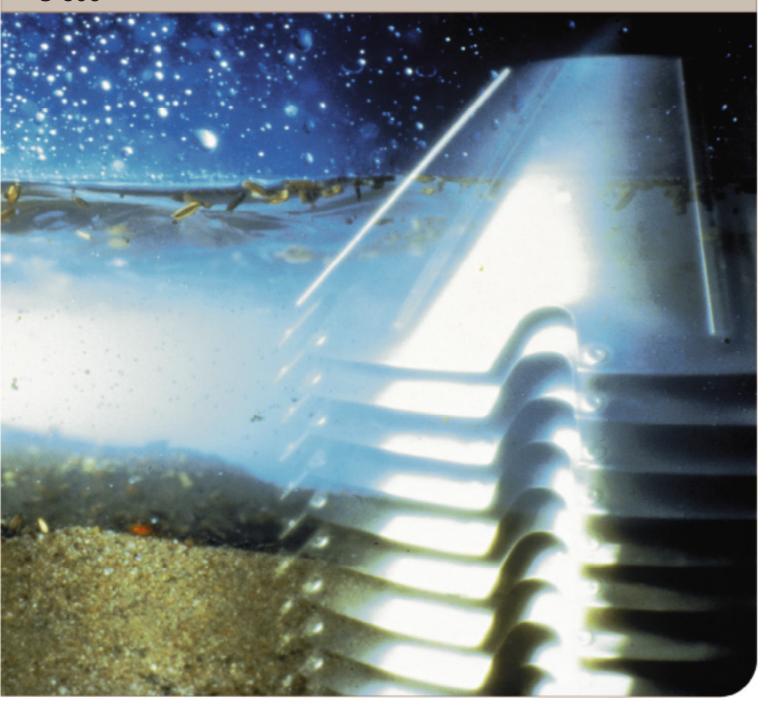






Spare parts catalogue, Reservdelskatalog, Ersatzteilkatalog, Catalogue de piéces de rechange, Varaosaluettelo, Catalogue de piezas de recambio, Каталог запасных частеи, Catalogo parti di ricambio, Reservedelskatalog, Catalogo de pecas sobressalentes, Καταλογοσ ανταλλακτικων, Reserveonderdelen-catalogus, 备件目录

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#### Published By: Alfa Laval Tumba AB SE-147 80 Tumba, Sweden

Telephone: +46 8 530 650 00 Telefax: +46 8 530 310 40

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#### 1 Read this first



- en Check the machine unit number on the name-plate before using this catalogue
- Kontrollera maskinenhetens nummer på maskinskylten innan du använder katalogen
- de Das Typenschild ein Hinweis zur korrekten Ersatzteilnummer
- fr La plaque de la machine, un guide pour trouver le numéro de piéce de rechange correct
- La placa-marca de la máquina guía del número correcto del repuesto
- **ru** Фирменная табличка машины указатель правилного номера запасной части
- it La targhetta della macchina guida al corretto numero dei ricambi
- pt La placa do fabricante da máquina um guia do número correto das partes sobressalentes
- **fi** Konekilpi opastin oikeaan varaosanumeroon
- **el** Η πινακίδα της μηχανής είναι ο οδηγός του σωστού ανταλλακτικού
- Het gegevensplaatje een wegwijzer naar het juiste onderdeelnummer
- da Typeskiltet en guide til det rette reservedelsnummer 使用目录前,检查铭牌上的机器部件号。

#### 1.1 General information

en

Safeguard your commitment to quality by always using genuine Alfa Laval spare parts.

Remember, Alfa Laval cannot accept responsibility for the failure of a separator equipped with non-original spare parts. We guarantee the quality and reliability of our products.



Följ ditt kvalitetstänkande genom att endast använda Alfa Laval originalreservdelar.

Kom ihåg att Alfa Laval inte tar något ansvar för fel på en separator, som innehåller icke-originaldelar. Vi garanterar kvaliteten och driftsäkerheten endast hos våra egna produkter.



Aus Rücksicht auf Ihr Bestreben um beste Qualität sollten Sie nur Alfa Laval Originalersatzteile benutzen.

Vergessen Sie nicht, Alfa Laval kann keine Verantwortung für das Versagen eines Separators übernehmen, der nicht mit Originalersatzteilen versehen ist. Wir garantieren Qualität und Zuverlässigkeit unserer Produkte.



Préservez la qualité de vos équipments en n'employant que des pièces de rechange Alfa Laval.

N'oubliez pas q'Alfa Laval décline toute responsabilité en cas de panne d'un séparateur non équipé de pièces de rechange d'origine. Nous garantissons la qualité et la fiabilité de nos produits.

es

Mantenga su compromiso con la calidad, al usar siempre piezas de repuesto Alfa Laval auténticas.

Recuerde que Alfa Laval no acepta responsabilidad por el fallo de una separadora equipada con piezas de repuesto no originales. Garantizamos la calidad y fiabilidad de nuestros productos.



ru

Гарантируйте надежность качества всегда используя подлинные запасные части фирмы Alfa Laval.

Запомните, что Alfa Laval не несет ответственности за повреждение сепаратора, оснащенного неподлинными запчастами. Мы гарантируем качестьо и надежность наших изделий.





Salvaguardate la vostra garanzia di qualità facendo sempre uso di parti di ricambio Alfa Laval autentiche.

Tenete presente che la Alfa Laval non può accettare responsabilità per avaria ad un separatore attrezzato con parti di ricambio non originali. Noi garantiamo la qualità l'affidabilità dei nostri prodotti.



Proteja o seu cometimento a qualidade usando sempre peças sobressalentes genuinas Alfa Laval.

Não esqueça que Alfa Laval não aceita responsabilidade por falha de uma separadora equipada com peças sobressalentes não genuinas. Nós garantimos a qualidade e a confiança dos nossos produtos.



Varmistakaa vastuunne laadusta käyttämällä aina alkuperäisiä Alfa Laval varaosia.

Muistakaa, Alfa Laval ei voi hyväksyä vastuuta ei-alkuperäsillä varaosilla varustetun separaattorin vaurioista. Me takaamme tuotteidemme laadun ja käyttövarmuuden.



Εξασφαλίοτε υψηλή ποιότητα χρησιμοποιώντας μόνο γνήσια ανταλλακτικά της Alfa Laval.

Έχετε υπόψην ότι η Alfa Laval δεν αναλαμβάνει καμμιά ευθύνη για βλάβες βουτυρομηχανής, οτην οποία έχουν εφαρμοστεί μή γνήσια ανταλλακτικά. Εγγυόμαστε ποιότητα και καλή λειτουργία μόνο για τα δικά μας προϊόντα.

nl

Streef naar een zo hoog mogelijke kwaliteit en gebruik uitsluitend originele Alfa Laval reserveonderdelen. Streef naar een zo hoog mogelijke kwaliteit en gebruik uitsluitend originele Alfa Laval reserveonderdelen.

Vergeet niet dat Alfa Laval niet verantwoordelijk is voor een defecte separator die niet-originele onderdelen bevat. Wij garanderen de kwaliteit en betrouwbaarheid van onze eigen produkten.



da

Hold Dem til den kvalitet, De har valgt at satse på, ved altid at anvende ægte Alfa Laval reservedele.

Husk, at Alfa Laval ikke kan påtage sig noget ansvar for fejl på en separator, som indeholder uoriginale dele. Vi kan kun garantere kvalitet og driftsikkerhed på vore egne produkter.

请始终使用阿法拉伐真品备件以保证您产品的质量。

请注意,阿法拉伐对使用非原装备件的分离设备的故障不承担 责任。 我们保证我们产品的质 量与可靠性。 1.2 Translation list 1 Read this first

#### 1.2 Translation list

Översättningslista Übersetzungsliste Liste de traduction Lista de traducciones

| en                            | sv                            | de                                 | fr  | es                                   |
|-------------------------------|-------------------------------|------------------------------------|---|--------------------------------------|
| Part no.                      | Reservdelsnummer              | Teil-Nr.                           | Numéro de pièce                           | Pieza No.                            |
| Qty                           | Antal                         | Anzahl                             | Quantité                                  | Cantidad                             |
| Description                   | Benämning                     | Bezeichnung                        | Dénomination                              | Descripción                          |
| Notes                         | Anmärkningar                  | Anmerkungen                        | Remarques                                 | Notas                                |
| Machine type                  | Maskintyp                     | Maschinentyp                       | Type de machine                           | Tipo de máquina                      |
| Product no.                   | Produktnr                     | Produktnummer                      | Numéro de produit                         | Número de producto                   |
| Machine unit description      | Maskinblocksbenämning         | Bezeichnung des<br>Maschinenblocks | Dénomination de partie de machine         | Descripción de sección de la máquina |
| Machine unit no.              | Maskinblocksnr                | Maschinenblock Nr.                 | Partie de machine nº                      | No. de sección de máquina            |
| Subassembly description       | Undergruppsbenämning          | Bezeichung der<br>Untergruppe      | Dénomination de sous-ensemble             | Descripción de subconjunto           |
| Subassembly no.               | Undergruppsnr                 | Untergruppe Nr.                    | Nº de sous-ensemble                       | Número de subconjunto                |
| See page                      | Se sidan                      | Siehe Seite                        | Vòir page                                 | Véase la página                      |
| Fig. ref.                     | Figurhänvisning               | Bildhinweise                       | Réf. de fig.                              | Referencia de figura                 |
| Product name                  | Produktnamn                   | Produktname                        | Nom du produit                            | Nombre del producto                  |
| Exchange necessitates         | Utbyte nödvändiggör           | Austausch erfordert                | Le remplacement                           | El racmbio requiere el               |
| rebalancing of bowl           | ombalansering av kulan        | Wiederauswuchtung der Trommel      | nécessite le rééquilibrage<br>du bol      | reequilibrado del rotor              |
| See separate spare parts list | Se separat reservdelslista    | Ersatzteilliste                    | Voir liste séparée des pièces de rechange | Véase la lista de piezas separada    |
| Not delivered as spare part   | Levereras ej som<br>reservdel | Nicht als Ersatzteil<br>geliefert  | Non livré comme piéce de rechange         | No se entrega como pieza de recambio |

#### Словарь перевда Lista traduzioni Lista para tradução Käännösluttelo

| en  | ru  | it  | pt   | fi  |
|---|---|---|--|---|
| Part no.                                  | Деталь №                                    | Nr. parte   | Numero de peca                                 | Varaosanumero   |
| Qty                                       | Кол—во                                      | Quantita  | Quantidade                                     | Lukumäärä   |
| Description                               | Наименование                                | Descrizione   | Descricao                                      | Nimitys   |
| Notes                                     | Примечания                                  | Note  | Notas  | Huomautuksia  |
| Machine type                              | Машина тнпа                                 | Tipo macchina   | Tipo de maquina                                | Konetyyppi  |
| Product no.                               | Артикул №                                   | Nr.prodotto   | No. do produto                                 | Tuotteen no   |
| Machine unit description                  | Наименование блока<br>машины                | Descrizione unita macchina                                  | Descricao da unidade da maquina                | Koneenosan nimitys                                    |
| Machine unit no.                          | Блок машины №                               | Nr. unita macchina  | Numero de unidade da maquina                   | Koneenosan no   |
| Subassembly description                   | Наименование группы                         | Descrizione sottogruppo                                     | Descriao do subconjunto                        | Alaryhmän nimitys                                     |
| Subassembly no.                           | Группа №                                    | Nr. sottogruppo   | Número de subconjunto                          | Alaryhmän no  |
| See page                                  | См. страницу                                | Vedi pagina   | Véase la página                                | Ks sivu   |
| Fig. ref.                                 | Ссылка на зскиз                             | Rif. fig.   | Referencia de figura                           | Kuvaviite   |
| Product name                              | Наименование артикула                       | Nome prodotto   | Nombre del producto                            | Tuotteen nimi   |
| Exchange necessitates rebalancing of bowl | Замена требует балансировки барабана        | La sostituzione comporta<br>la equilibratura del<br>tamburo | El racmbio requiere el reequilibrado del rotor | Vaihdettaessa kuula<br>tasapainoitettava<br>uudelleen |
| See separate spare parts list             | См. отдельный перечень запасных частей      | Vedi lista separata delle parti di ricambio                 | Véase la lista de piezas separada              | Katso erillistä<br>varaosaluetteloa                   |
| Not delivered as spare part               | Не поставлена вместе с<br>запасными частями | Non fornito come parte di ricambio                          | No se entrega como pieza<br>de recambio        | Ei toimiteta varaosana                                |

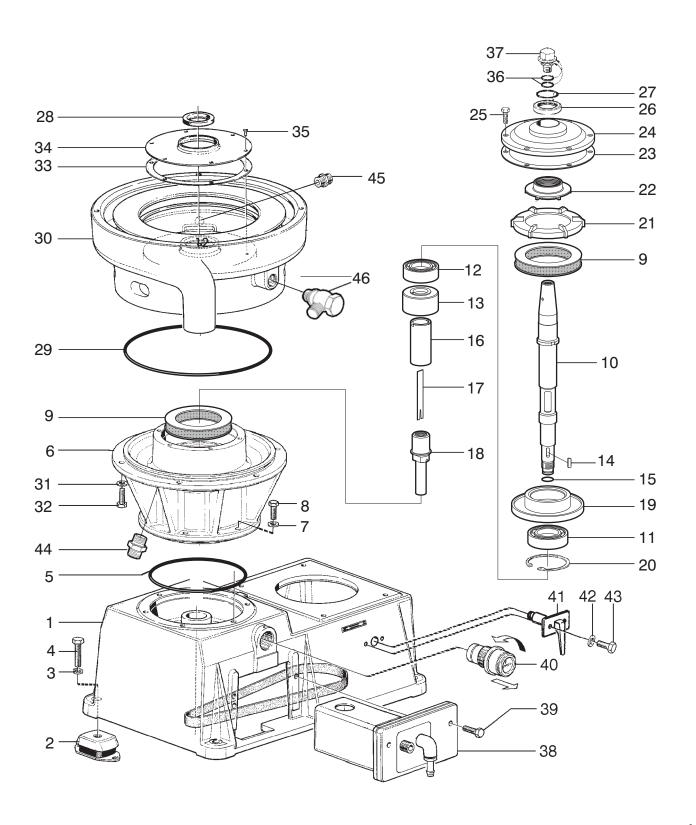
1.2 Translation list 1 Read this first

#### FΛΩΣΣΑΡΙ Vertaallijst Oversættelseliste 翻译列表、

| en  | el   | nl   | da   |            |
|---|--|--|--|------------|
| Part no.                                  | Λριθμός ανταλλακτικού  | Onderdeelnr.   | Reservedelsnummer                          | 部件号        |
| Qty                                       | Σύνολο   | Hoeveelheid  | Antal                                      | 数量         |
| Description                               | Περιγραφή  | Beschrijving   | Betegnelse                                 | 说明         |
| Notes                                     | Παρατηρήσεις   | Opmerkingen  | Bemaerkninger                              | 注释         |
| Machine type                              | Τύπος μηχανήματος  | Machinetype  | Maskintype                                 | 机器类型       |
| Product no.                               | Αριθμός προϊόντος  | Produktnr.   | Produktnr.                                 | 产品编号       |
| Machine unit description                  | Περιγραφή<br>συγκροτήματος μηχανής                             | Machineblokbenaming                                  | Maskinbetegnelse                           | 机器说明       |
| Machine unit no.                          | Αριθμός συγκροτήματος<br>μηχανής                               | Machineblokbenamning                                 | Maskinnr.                                  | 机器部件号      |
| Subassembly description                   | Περιγραφή<br>υποσυγκροτήματος                                  | Subgroepbenamning                                    | Undergruppsbetegnelse                      | 子装置说明      |
| Subassembly no.                           | Αριθμός<br>υποσυγκροτήματος                                    | Subgroepnr.  | Undergruppenr.                             | 子装置编号      |
| See page                                  | Βλέπε σελίδα   | Zie blz.   | Se side                                    | 请参阅页       |
| Fig. ref.                                 | Παραπομπή σε εικόνα  | Afb. ref.  | Figurhenvisning                            | 图片参考       |
| Product name                              | Ονομασία προϊόντος   | Produktnaam  | Produktnavn                                | 产品名        |
| Exchange necessitates rebalancing of bowl | Ανταλλαγή απαιτεί<br>επαναρρύθμιση                             | Vervangning vereist<br>herbalanceren van de<br>kogel | Udskriftning kraever afbalcering af kuglen | 更换前应校准转鼓平衡 |
| See separate spare parts list             | ισορροπίας του τύμπανου<br>Βλέπε ειδική λίστα<br>ανταλλακτικών | Vervangning vereist van<br>de kogel                  | Se spaat reservedelsliste                  | 参见备件清单     |
| Not delivered as spare part               | Δεν παραδίδεται ως ανταλλακτικό                                | Niet geleverd als reserveonderdeel                   | Levereres ikke som reservedel              | 未作为备件提供    |

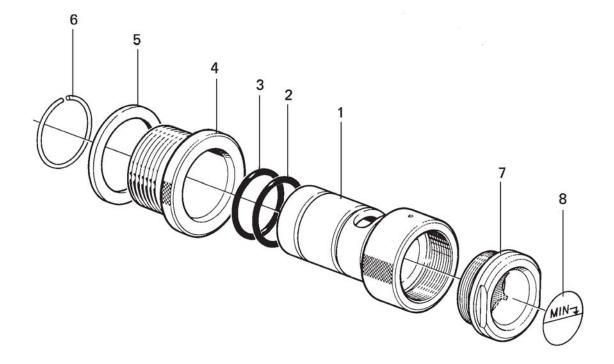
### 2 Machine bottom part

|          |                        |                         | Machin | e unit number o   |             |  |
|----------|------------------------|-------------------------|--------|-------------------|-------------|--|
|          |                        |                         |        | embly description |             |  |
|          |                        |                         |        | 565390-           | 1           |  |
| Ref      | Part No                | Description             | -01    | 00000-            | Notes       |  |
| 1101     | 1 art 140              | Description             | -01    | Quantity          | 140103      |  |
| 1        | 548010 03              | Frame bottom part       | 1      |                   |             |  |
| 2        | 545892 02              | Frame foot              | 4      |                   |             |  |
| 3        |                        | Spring washer           | 4      |                   |             |  |
| 4<br>5   | 221045 29              | Screw, M12x50           | 4      |                   |             |  |
| 6        | 223412 38              | Frame intermediate part | 1      |                   |             |  |
| 7        | 548152 03              |                         | 6      |                   |             |  |
| 8        | 221040 05              | Screw                   | 6      |                   |             |  |
| 9        | 543619 80              | Rubber buffer           | 2      |                   |             |  |
| 10       |                        | Bowl spindle            | 1      |                   |             |  |
| 11       |                        | Ball bearing            | 1      |                   |             |  |
| 12<br>13 | 37535<br>545601 80     | Ball bearing            | 1 1    |                   |             |  |
| 14       | 223610 07              |                         |        |                   |             |  |
| 15       | 223403 16              |                         | 1      |                   |             |  |
| 16       |                        | Belt pulley             | 1      |                   |             |  |
| 17       | 545597 01              |                         | 1      |                   |             |  |
| 18       | 560767 80              | Pump sleeve             | 1      |                   |             |  |
| 19       | 543609 02              | Ball bearing holder     | 1      |                   |             |  |
| 20       | 223642 36              | Snap ring               | 1      |                   |             |  |
| 21<br>22 | 545620 02<br>544203 02 | Buffer holder           | 1 1    |                   |             |  |
| 23       | 543612 01              |                         | 1      |                   |             |  |
| 24       | 543613 02              | Top bearing cover       | 1      |                   |             |  |
| 25       | 221035 02              | Screw                   | 6      |                   |             |  |
| 26       |                        | Deflector ring          | 1      |                   |             |  |
| 27<br>28 | 223406 29<br>73547     | Seal ring               | 1 1    |                   |             |  |
| 29       | 223412 49              | O-ring                  | 1      |                   |             |  |
| 30       | 566279 01              | Frame top part          |        |                   |             |  |
| 31       | 548152 03              |                         | 6      |                   |             |  |
| 32       | 221040 05              |                         | 6      |                   |             |  |
| 33       | 543662 02              |                         | 1      |                   |             |  |
| 34<br>35 | 543645 01<br>260244 01 |                         | 1 6    |                   |             |  |
| 36       | 223404 82              | O-ring                  | 2      |                   |             |  |
| 37       | 546057 02              |                         | 1      |                   |             |  |
| 38       | 560985 80              | Water container         | 1      |                   |             |  |
| 39       | 221040 41              |                         | 2      |                   |             |  |
| 40       |                        | Oil filling device      | 1      |                   | See page 14 |  |
| 41<br>42 | 548046 80<br>548152 03 |                         | 1      |                   | See page 16 |  |
| 43       | 221040 05              |                         | 2 2    |                   |             |  |
| 44       |                        | Reducing hexagon nipple | 1      |                   |             |  |
| 45       | 543953 05              | Nipple                  | 1      |                   |             |  |
| 46       | 565393 01              | Hose nipple             | 1      |                   |             |  |



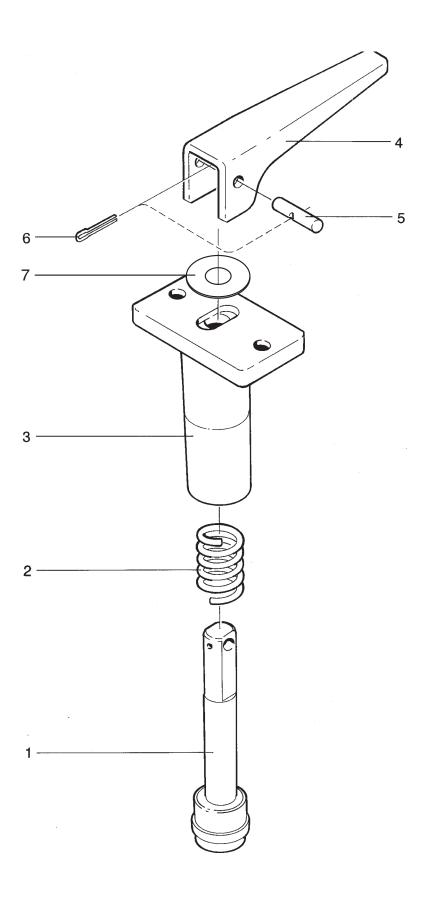
### 2.1 Oil filling device

| Ref | Part No   | Description               | Subasse | unit number of<br>mbly description<br>45831- |  |
|-----|-----------|---------------------------|---------|--|--|
|     |           | •                         | (       | Quantity                                     |  |
| 1   | 545817 01 | Sleeve                    | 1       |  |  |
| 2   | 223406 27 | O-ring                    | 1       |  |  |
| 3   | 223406 27 | O-ring                    | 1       |  |  |
| 4   | 544024 01 | Nipple                    | 1       |  |  |
| 5   | 542392 02 | Seal ring                 | 1       |  |  |
| 6   | 545818 01 | Round wire retaining ring | 1       |  |  |
| 7   | 545819 01 | Oil glass                 | 1       |  |  |
| 8   | 545832 01 | Plate                     | 1       |  |  |



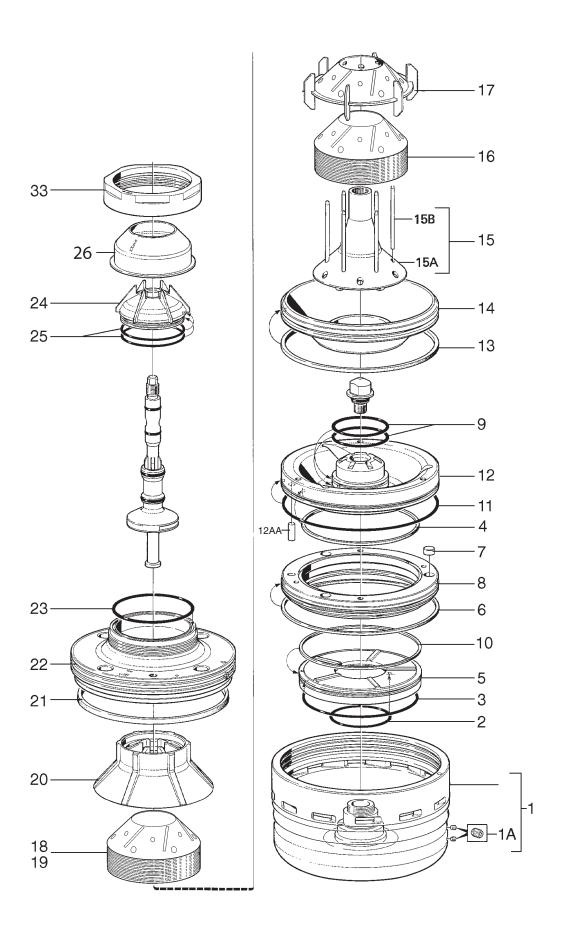
#### 2.2 Brake

|     |           |                 | Machine unit number or Subassembly description <b>548046</b> - |        |    |       |
|-----|-----------|-----------------|--|--------|----|-------|
| Ref | Part No   | Description     | -80  |        |    | Notes |
|     |           |                 |  | Quanti | ty |       |
| 1   | 548047 80 | Spindle         | 1  |        | 1  |       |
| 2   | 32652     | Spring          | 1  |        |    |       |
| 3   | 548049 02 | Adapter         | 1  |        |    |       |
| 4   | 553159 02 | Handle          | 1  |        |    |       |
| 5   | 222137 10 | Cylindrical pin | 1  |        |    |       |
| 6   | 222210 21 | Split pin       | 1  |        |    |       |
| 7   | 567616 01 | Plain washer    | 1  |        |    |       |



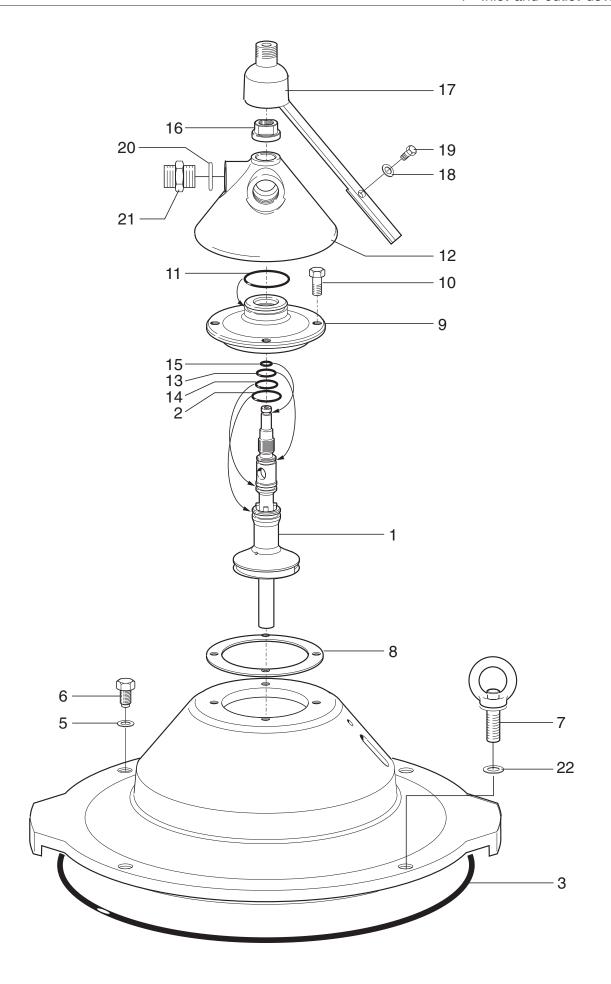
### 3 Separator bowl

|          |           |   | Machine unit number or  |                 |
|----------|-----------|---|-------------------------|-----------------|
|          |           |   | Subassembly description | 1               |
|          |           |   | 561123-                 |                 |
| Ref      | Part No   | Description                             | -03                     | Notes           |
|          |           | -                                       | Quantity                |                 |
| 1        |           | Bowl body                               | 1                       |                 |
| 1A       | 545869 01 | Nozzle Ø 1,2 mm                         | 2                       |                 |
| 2        | 223406 35 |   |                         |                 |
| 3        | 68011     | O-ring                                  | 1                       |                 |
| 4        |           | Rectangular ring                        |                         |                 |
| 5        |           | Distributing ring lower                 | 1                       |                 |
| 6<br>7   |           | Rectangular ring                        | 1                       |                 |
| 8        |           | Valve plug Operating slide              | 3                       |                 |
| 9        | 260104 91 |   |                         |                 |
| 10       |           | Rectangular ring                        | 1                       |                 |
| 11       | 73632     | O-ring                                  |                         |                 |
| 12       |           | Distributing ring upper                 | i                       | Aluminum Bronze |
| 12       |           | Distributing ring upper                 | i                       | Stainless steel |
| 12A      |           | Parallel pin                            | 1 1                     | Grammoso Groot  |
| 13       |           | Rectangular ring                        | 1   1                   |                 |
| 14       | 543567 01 | Sliding bowl bottom                     | 1                       |                 |
| 15       | 545657 80 |   | 1                       |                 |
| 15A      | 545684 01 |   |                         |                 |
| 15B      |           | Parallel pin                            | 6                       |                 |
| 16<br>17 |           | Bowl disc, caulks 0,5 mm                | 32                      |                 |
| 18       |           | Wing insert<br>Bowl disc, caulks 0,5 mm | 31                      |                 |
| 19       |           | Bowl disc, caulks 0,5 mm                | 1 1                     |                 |
| 20       | 544925 01 |   | 1 1                     |                 |
| 21       | 541691 01 |   | i                       |                 |
| 22       |           | Bowl hood                               | 1                       |                 |
| 23       | 223406 22 |   | 1   1                   |                 |
| 24       | 545797 02 | Paring chamber cover                    | 1                       |                 |
| 25       | 223406 14 |   | 2                       |                 |
| 26       | 560915 02 |   | 1                       |                 |
| 33       | 561000 02 | Lock ring                               | 1   1                   |                 |



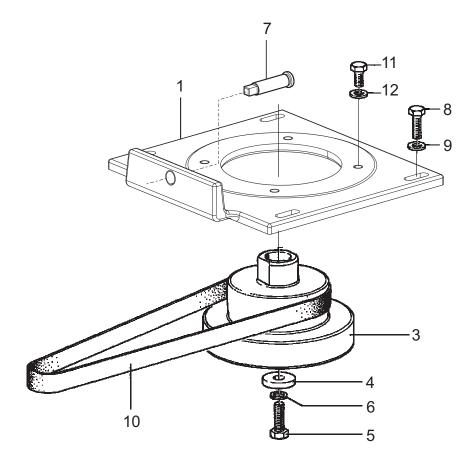
#### 4 Inlet and outlet device

|          |                        |                             | Machir                  | ne unit nur | mber or |       |
|----------|------------------------|-----------------------------|-------------------------|-------------|---------|-------|
|          |                        |                             | Subassembly description |             |         |       |
|          |                        |                             |                         | 561312      | -       |       |
| Ref      | Part No                | Description                 | -01                     |             |         | Notes |
|          |                        |                             |                         | Quantity    |         |       |
| 1        | 561272 80              | Inlet pipe with paring disc | 1                       |             |         |       |
| 2        |                        | O-ring                      | 1                       |             |         |       |
| 3        | 223412 54              | O-ring                      | 1                       |             |         |       |
| 4        |                        | Frame hood                  | 1                       |             |         |       |
| 5        | 548152 03              |                             | 2<br>2<br>2             |             |         |       |
| 6        | 221040 05              |                             | 2                       |             |         |       |
| 7        | 546157 80              |                             | 2                       |             |         |       |
| 8        |                        | Height adjusting ring       | 3                       |             |         |       |
| 9        |                        | Support ring                | 1                       |             |         |       |
| 10       | 221035 06              | Screw                       | 4                       |             |         |       |
| 11       | 223406 29              |                             | 1                       |             |         |       |
| 12       |                        | Connecting housing          | 1                       |             |         |       |
| 13       | 223404 20              |                             | 1                       |             |         |       |
| 14       | 223404 22              |                             | 1                       |             |         |       |
| 15       | 223404 10              |                             | 1                       |             |         |       |
| 16       | 559266 01              |                             | 1 1                     |             |         |       |
| 17       |                        | Safety device               | 1 1                     |             |         |       |
| 18       | 70560                  | Washer                      | 1                       |             |         |       |
| 19       | 221035 07              | Screw, M8x25                | 1                       |             |         |       |
| 20<br>21 | 552766 08<br>562596 01 |                             | 2                       |             |         |       |
| 22       | 548152 04              |                             | 2 2 2                   |             |         |       |
|          | 346132 04              | washer                      |                         |             |         |       |



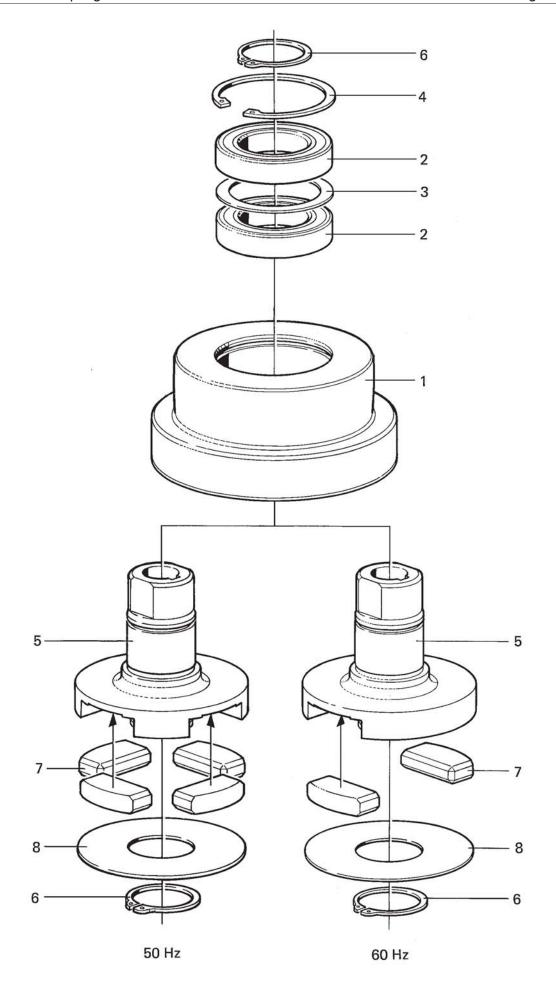
### **5 Motor mounting assembly**

|     |           |                   | Machine ι | ınit number o  | r           |
|-----|-----------|-------------------|-----------|----------------|-------------|
|     |           |                   | 900       | bly descriptio |             |
| Ref | Part No   | Description       | -05 -06   |                | Notes       |
|     |           |                   | Qı        | uantity        |             |
|     |           | 50Hz              | ↓         |                |             |
|     |           | 60Hz              |           |                |             |
| 1   | 590919 02 | Motor adapter     | 1 1       |                |             |
| 3   | 544575 80 | Friction coupling | 1         |                | See page 24 |
| 3   |           | Friction coupling | 1         |                | See page 24 |
| 4   | 543669 01 |                   | 1 1       |                |             |
| 5   | 221035 12 |                   | 1 1       |                |             |
| 6   |           | Spring washer     | 1 1       |                |             |
| 7   |           | Belt tightener    | 1 1       |                |             |
| 8   | 221040 05 |                   | 4 4       |                |             |
| 9   | 548152 03 |                   | 4 4       |                |             |
| 10  | 260169 51 |                   | 1         |                | 50Hz        |
| 10  | 260169 52 |                   | 1         |                | 60Hz        |
| 11  | 221040 04 |                   | 4 4       |                |             |
| 12  | 548152 03 | Washer            | 4 4       |                |             |



### **5.1 Friction coupling**

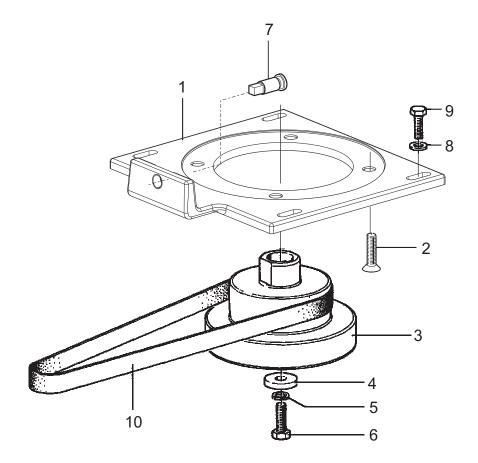
|     |           |                  |              |     |        | numbe  | -     |       |
|-----|-----------|------------------|--------------|-----|--------|--------|-------|-------|
|     |           |                  | Suba         |     |        | lescri | otion |       |
|     |           |                  |              |     | 4457   | 5-     |       |       |
| Ref | Part No   | Description      | -80          | -81 |        |        |       | Notes |
|     |           | -                |              |     | Quanti | ty     |       |       |
|     |           | 50 Hz            | $\downarrow$ |     |        |        |       |       |
|     |           | 60 Hz            |              | ↓   |        |        |       |       |
| 1   | 543858 02 | Belt pulley 60Hz |              | 1   |        |        |       |       |
| 1   | 543858 04 | Belt pulley 50Hz | 1            |     |        |        |       |       |
| 2   | 233211 66 | Ball bearing     | 2            | 2   |        |        |       |       |
| 3   | 542986 04 | Washer           | 1            | 1   |        |        |       |       |
| 4   | 223642 34 | Snap ring        | 1            | 1   |        |        |       |       |
| 5   | 544058 02 | Coupling nave    |              | 1   |        |        |       |       |
| 5   | 546915 02 | Coupling nave    | 1            |     |        |        |       |       |
| 6   | 223641 17 | Snap ring        | 2            | 2   |        |        |       |       |
| 7   | 544060 01 | Friction element | 4            | 2   |        |        |       |       |
| 8   | 543857 01 | Cover            | 1            | 1   |        |        |       |       |



### 6 Motor mounting assembly, 60 Hz Nema

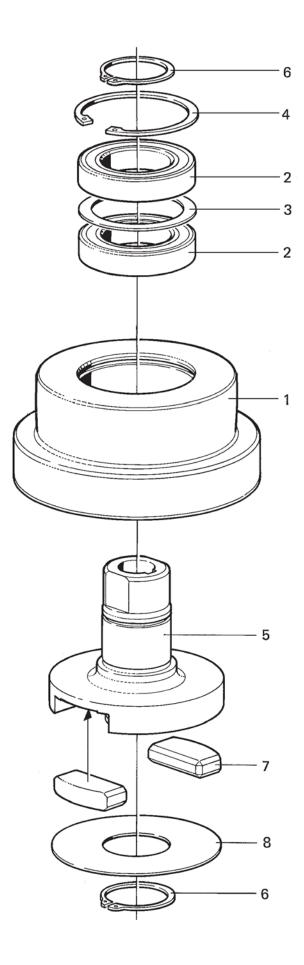
(TYPE 182TC "C - FLANGE")

|     |            |                               | Machine unit number or                  |     |      |     |       |             |
|-----|------------|-------------------------------|---|-----|------|-----|-------|-------------|
|     |            |                               | Subassembly description <b>9006363-</b> |     |      |     | ption |             |
| Ref | Part No    | Description                   | -02                                     | 900 | Ubst | 03- |       | Notes       |
|     |            | •                             | Quantity                                |     |      | ty  |       |             |
| 1   | 9005934 02 | Motor adapter                 | 1                                       |     |      |     |       |             |
| 2   | 547260 01  | Screw                         | 4                                       |     |      |     |       |             |
| 3   | 544575 84  | Friction coupling, 60 Hz NEMA | 1                                       |     |      |     |       | See page 28 |
|     |            | standard                      |   |     |      |     |       |             |
| 4   | 543669 01  |                               | 1                                       |     |      |     |       |             |
| 5   | 70915      | Spring washer                 | 1                                       |     |      |     |       |             |
| 6   | 221035 08  | Screw                         | 1                                       |     |      |     |       |             |
| 7   | 585983 03  | Belt tightener                | 1                                       |     |      |     |       |             |
| 8   | 41456      | Washer                        | 4                                       |     |      |     |       |             |
| 9   | 221040 05  | Screw                         | 4                                       |     |      |     |       |             |
| 10  | 260169 52  | Flat belt                     | 1                                       |     |      |     |       |             |



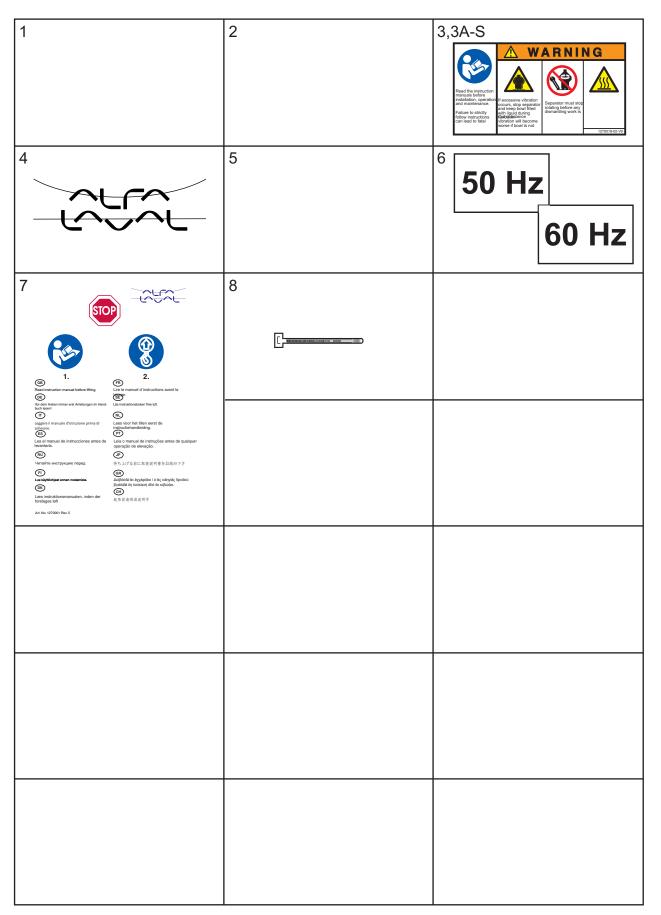
### 6.1 Friction coupling, 60 Hz NEMA standard

|     |           |                  | Machine unit number or Subassembly description <b>544575</b> - |  |  | tion |       |
|-----|-----------|------------------|--|--|--|------|-------|
| Ref | Part No   | Description      | -84  |  |  |      | Notes |
|     |           |                  | Quantity   |  |  |      |       |
| 1   | 543858 02 | Belt pulley 60Hz | 1  |  |  |      |       |
| 2   | 233211 66 | Ball bearing     | 2  |  |  |      |       |
| 3   | 542986 04 | Washer           | 1  |  |  |      |       |
| 4   | 223642 34 | Snap ring        | 1  |  |  |      |       |
| 5   | 544058 04 | Coupling hub     | 1  |  |  |      |       |
| 6   | 223641 17 | Snap ring        | 2  |  |  |      |       |
| 7   | 544060 01 | Friction element | 2  |  |  |      |       |
| 8   | 543857 01 | Cover            | 1  |  |  |      |       |



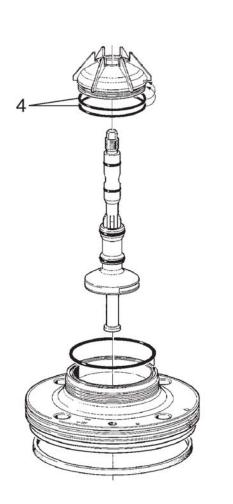
### 7 Set of plates

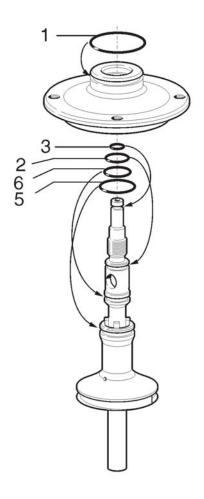
|     |           |                      | Machine unit number o  | r     |
|-----|-----------|----------------------|------------------------|-------|
|     |           |                      | Subassembly descriptio | n     |
|     |           |                      | 549572-                |       |
| Ref | Part No   | Description          | -44                    | Notes |
|     |           | -                    | Quantity               |       |
| 3   | 1270320   | Set of safety labels | 1   1                  |       |
| 4   | 523702 01 | Name sign            | 1   1                  |       |
| 6   | 553171 01 | Label 50 Hz          | 1                      |       |
| 6   | 553272 01 | Label 60 Hz          | 1   1                  |       |
| 7   | 1270001   | Lifting instruction  | 1                      |       |
| 8   | 554214 02 | Cable tie            | 1 1                    |       |



### 8 Commissioning kit

|     |           |               | Machine unit number or Subassembly description <b>576452</b> - |         |                                 |
|-----|-----------|---------------|--|---------|---------------------------------|
| Ref | Part No   | Description   | -08  |         | Notes                           |
|     |           |               | Q  | uantity |                                 |
| 1   | 223406 29 | O-ring        | 1  |         | Support / Connecting housing    |
| 2   | 223404 20 | O-ring        | 1  |         | Inlet pipe / Connecting housing |
| 3   | 223404 10 | O-ring        | 1  |         | Inlet pipe / Safety device      |
| 4   | 223406 14 | O-ring        | 2  |         | Leader cone / Top disc          |
| 5   | 74067     | O-ring        | 1  |         | Paring disc / Support           |
| 6   | 223404 22 | O-ring        | 1  |         | Inlet pipe / Connecting housing |
| 99  | 576862    | Exploded view | 1  |         |                                 |

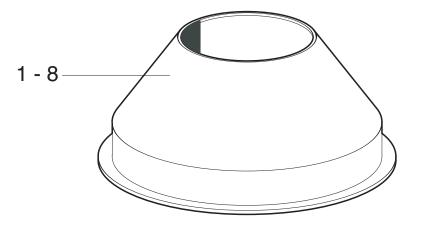




# 9 Set of gravity discs

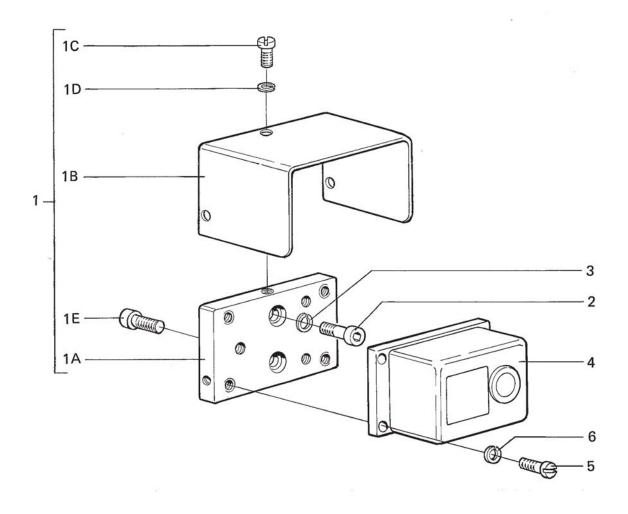
#### For purification

| Ref  | Part No   | Description            | Machine unit number or Subassembly description 560916- |      |  |       |
|------|-----------|------------------------|--|------|--|-------|
| 1101 | 1 411 140 | Description            | Quantity   |      |  | Notes |
| 1    | 560916 01 | Gravity disc Ø 50,5 mm | 1  | Quan |  |       |
| 2    |           | Gravity disc Ø 52 mm   | 1  |      |  |       |
| 3    |           | Gravity disc Ø 54 mm   | 1  |      |  |       |
| 4    | 560916 04 | Gravity disc Ø 57 mm   | 1  |      |  |       |
| 5    | 560916 05 | Gravity disc Ø 61 mm   | 1  |      |  |       |
| 6    | 560916 06 | Gravity disc Ø 66 mm   | 1  |      |  |       |
| 7    | 560916 07 | Gravity disc Ø 73 mm   | 1  |      |  |       |
| 8    | 560916 08 | Gravity disc Ø 49,3 mm | 1  |      |  |       |



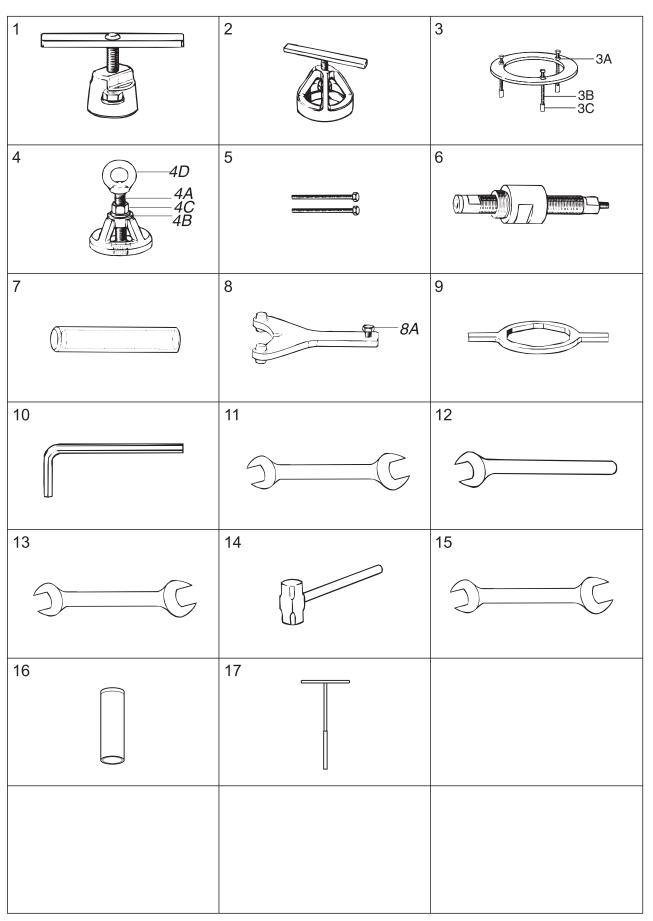
# 10 Vibration monitoring unit

| Ref | Part No   | Description      | Machine unit number or Subassembly description 536498- |    |        | escri | Notes |   |
|-----|-----------|------------------|--|----|--------|-------|-------|---|
|     |           | -                |  | Qı | uantit | ty    |       |   |
| 1   | 536469 80 | Support          | 1  |    |        | •     |       | Ì |
| 1A  | 536470 01 | Plate            | 1  |    |        |       |       |   |
| 1B  | 536471 01 | Cap              | 1  |    |        |       |       |   |
| 1C  | 221135 11 | Screw            | 3  |    |        |       |       |   |
| 1D  | 70915     | Spring washer    | 3  |    |        |       |       |   |
| 1E  | 221716 01 |                  | 3  |    |        |       |       |   |
| 2   | 221726 01 |                  | 2  |    |        |       |       |   |
| 3   |           | Spring washer    | 2  |    |        |       |       |   |
| 4   |           | Vibration switch | 1  |    |        |       |       |   |
| 5   | 221711 13 |                  | 4  |    |        |       |       |   |
| 6   | 223107 34 | Spring washer    | 4  |    |        |       |       |   |



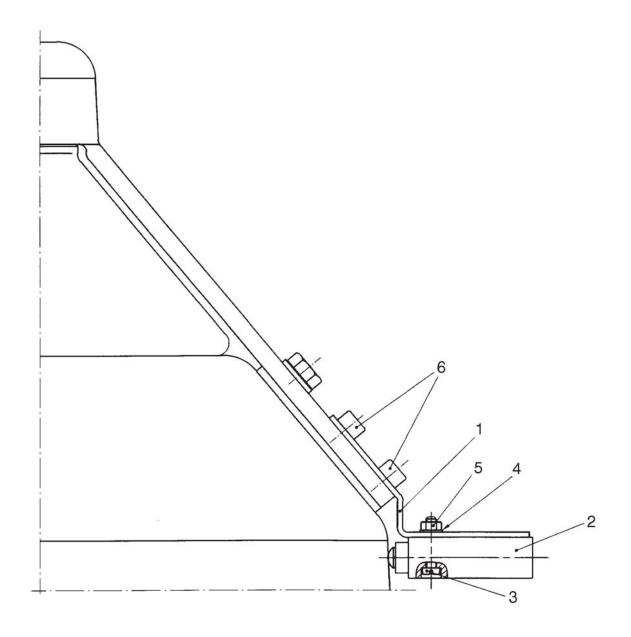
## 11 Set of tools

|          |                        |                               | Machine un | nit number or  |                                    |
|----------|------------------------|-------------------------------|------------|----------------|------------------------------------|
|          |                        |                               | Subassemb  | ly description |                                    |
|          |                        |                               |            | 166-           |                                    |
| Ref      | Part No                | Description                   | -08        |                | Notes                              |
|          |                        |                               | Qua        | antity         |                                    |
| 1        | 545840 80              | Puller and lifting tool       | 1 1        |                | Bowl body                          |
| 2        |                        | Puller and lifting tool       | 1          |                | Sliding bowl bottom                |
| 3        | 546293 80              |                               | 1          |                | Distributing ring upper            |
| 3A       |                        | Nut, M8                       | 3          |                |                                    |
| 3B       | 221035 60              |                               | 3          |                |                                    |
| 3C       | 546222 01              |                               | 3          |                |                                    |
| 4        |                        | Compression tool              | 1          |                | Disc stack                         |
| 4A       | 548807 01              |                               |            |                |                                    |
| 4B       | 70490                  | Washer                        | 1 1        |                |                                    |
| 4C<br>4D | 221803 34<br>260220 03 |                               | 1          |                |                                    |
| 4D<br>5  | 221035 60              |                               | 2          |                | Operating slide/ Distributing ring |
| 6        |                        | Mounting and dismounting tool | 1          |                | Friction coupling                  |
| 7        | 544555 O1              | Mounting tool                 |            |                | Ball bearing                       |
| 8        |                        | Spanner for bowl hood         | 1          |                | Bowl hood                          |
| 8A       | 221040 04              |                               |            |                | Bowi nood                          |
| 9        |                        | Spanner for lock ring         | i          |                | Lock ring                          |
| 10       |                        | Hexagon socket head key       | 1 1        |                | Nozzle                             |
| 11       |                        | Spanners double               | 1          |                |                                    |
| 12       | 526378 19              | Open-ended spanner            | 1          |                |                                    |
| 13       | 527380 08              | Open-ended spanner            | 1          |                |                                    |
| 14       |                        | Brass hammer                  | 1          |                |                                    |
| 15       |                        | Open-ended spanner            | 1          |                |                                    |
| 16       | 561624 80              | Driving off tool              | 1          |                | Ball bearing                       |
| 17       | 561628 80              | Cleaning cutter               | 1          |                | Bowl spindle                       |
| 99       | 588070                 | Exploded view                 | 1          |                |                                    |



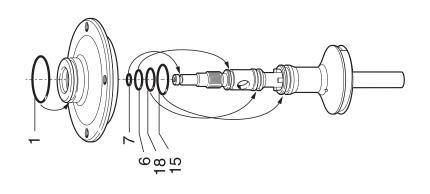
## 12 Interlocking switch

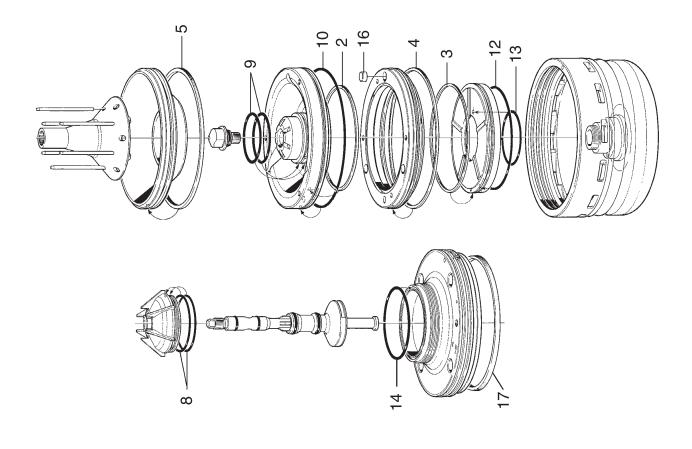
| Ref | Part No   | Description       | Machine unit number or Subassembly description 559889- |   |       | lescrip | otion | Notes |   |
|-----|-----------|-------------------|--|---|-------|---------|-------|-------|---|
|     |           |                   |  | Q | uanti | ty      |       |       |   |
| 1   | 559882 01 | Support plate     | 1  |   |       |         |       |       | Ì |
| 2   | 551337 01 | Limit switch      | 1  |   |       |         |       |       |   |
| 3   | 221121 15 | Screw             | 2  |   |       |         |       |       |   |
| 4   | 223101 41 | Washer, 4,3x9x0,8 | 2  |   |       |         |       |       |   |
| 5   | 221803 20 | Nut               | 2  |   |       |         |       |       |   |
| 6   | 221711 17 | Screw             | 2  |   |       |         |       |       |   |

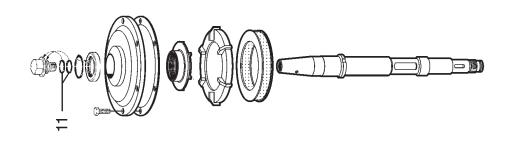


## 13 Intermediate service kit

|     |           |                            | Machine II                             | nit number or |                                |
|-----|-----------|----------------------------|--|---------------|--------------------------------|
|     |           |                            | Subassembly description <b>589881-</b> |               |                                |
| Ref | Part No   | Description                | -01                                    |               | Notes                          |
|     |           | -                          | Qu                                     | antity        |                                |
| 1   | 223406 29 |                            | 1                                      |               | Support/ Connecting housing    |
| 2   |           | Rectangular ring           | 1                                      |               | Distributing ring upper        |
| 3   |           | Rectangular ring           | 1                                      |               | Distributing ring lower        |
| 4   |           | Rectangular ring           | 1                                      |               | Operating slide                |
| 5   |           | Rectangular ring           | 1                                      |               | Sliding bowl bottom/ Bowl body |
| 6   | 223404 20 |                            | 1                                      |               | Inlet pipe/ Connecting housing |
| 7   | 223404 10 |                            | 1                                      |               | Inlet pipe/ Safety device      |
| 8   | 223406 14 |                            | 2                                      |               | Leader cone/ Top disc          |
| 9   | 260104 91 |                            | 2                                      |               | Distributing ring upper        |
| 10  |           | O-ring                     | 1                                      |               | Distributing ring upper        |
| 11  | 223404 82 |                            | 2                                      |               | Cap nut                        |
| 12  | 68011     | O-ring                     | 1                                      |               | Distributing ring lower        |
| 13  | 223406 35 |                            | 1 1                                    |               | Distributing ring lower        |
| 14  | 223406 22 |                            | 1                                      |               | Bowl hood/ Paring disc chamber |
| 15  |           | O-ring                     | 1 1                                    |               | Paring disc/ Support           |
| 16  | 545871 01 |                            | 3                                      |               | Operating slide                |
| 17  | 541691 01 |                            | 1                                      |               | Bowl hood                      |
| 18  | 223404 22 |                            | 1                                      |               | Inlet pipe/ Connecting housing |
| 19  |           | Molybdenum disulfide paste | 1                                      |               |                                |
| 20  |           | Lube grease Food H1        | 1                                      |               |                                |
| 21  |           | Anti-friction coating      | 1                                      |               |                                |
| 99  | 589961    | Exploded view              | 1                                      |               |                                |

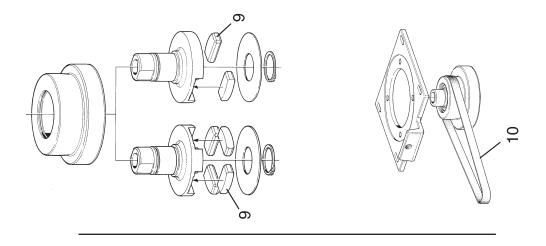




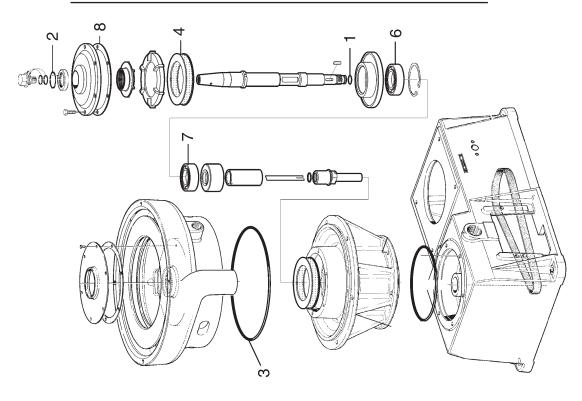


# 14 Major service kit

|     |           |                  | Machine unit number or  |              |        | umber o |  |
|-----|-----------|------------------|-------------------------|--------------|--------|---------|--|
|     |           |                  | Subassembly description |              |        |         | n                                      |
|     |           |                  |                         | _            | 667    | 0-      |  |
| Ref | Part No   | Description      | -21                     | -22          |        |         | Notes                                  |
|     |           | -                |                         | Q            | uantit | ty      |  |
|     |           | 50 Hz            | $\downarrow$            |              |        |         |  |
|     |           | 60 Hz            |                         | $\downarrow$ |        |         |  |
| 1   | 223403 16 | O-ring           | 1                       | 1            |        |         | Pump sleeve/ Belt pulley               |
| 2   | 223406 29 |                  | 1                       | 1            |        |         | Deflector ring/ Bowl spindle           |
| 3   | 223412 49 | O-ring           | 1                       | 1            |        |         | Frame intermediate part                |
| 4   | 543619 80 | Rubber buffer    | 2                       | 2            |        |         | Frame intermediate part/ Buffer holder |
| 5   | 223412 54 | O-ring           | 1                       | 1            |        |         | Frame top part/ Frame hood             |
| 6   | 548051 05 | Ball bearing     | 1                       | 1            |        |         | Bowl spindle/ Ball bearing holder      |
| 7   | 37535     | Ball bearing     | 1                       | 1            |        |         | Frame intermediate part/ Bowl spindle  |
| 8   | 543612 01 | Gasket           | 1                       | 1            |        |         | Top bearing cover                      |
| 9   | 544060 01 | Friction element | 4                       | 2            |        |         | Friction coupling                      |
| 10  | 260169 51 |                  | 1                       |              |        |         |  |
| 10  | 260169 52 |                  |                         | 1            |        |         |  |
| 11  |           | Locking liquid   | 1                       | 1            |        |         |  |
| 99  | 573400    | Exploded view    | 1                       | 1            |        |         |  |

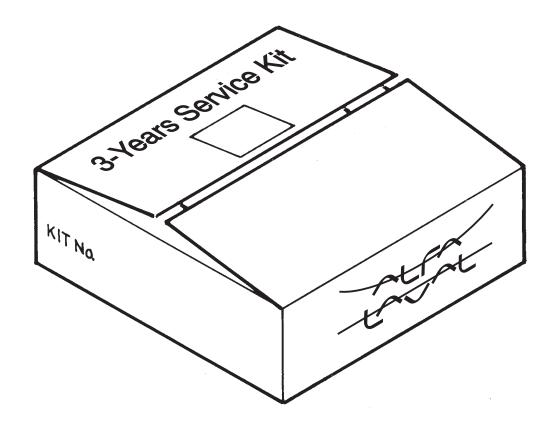






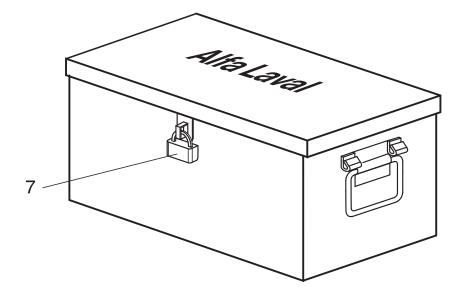
## 15 3-years service kit

|     |           |                           | Subass | e unit number or embly description <b>555613-</b> |                                 |
|-----|-----------|---------------------------|--------|---|---------------------------------|
| Ref | Part No   | Description               | -02    |   | Notes                           |
|     |           |                           |        | Quantity  |                                 |
| 1   | 233211 66 | Ball bearing              | 2      |   | Friction coupling               |
| 2   | 545892 02 | Frame foot                | 4      |   | Frame bottom part               |
| 3   | 223107 35 | Spring washer             | 4      |   | Frame foot                      |
| 4   | 73547     | Seal ring                 | 1      |   | Frame intermediate part         |
| 5   | 223412 38 | O-ring                    | 1      |   | Frame intermediate part         |
| 6   | 70915     | Spring washer             | 1      |   | Friction coupling               |
| 7   | 543662 02 | Gasket                    | 1      |   | Screen/ Frame intermediate part |
| 8   | 260244 01 | Screw                     | 6      |   | Screen/ Frame intermediate part |
| 9   | 545818 01 | Round wire retaining ring | 1      |   | Oil filling device              |
| 10  | 223406 27 | O-ring                    | 2      |   | Oil filling device              |
| 11  | 542392 02 | Seal ring                 | 1      |   | Oil filling device              |



## 16 Tool box

|     |         |             | Machine unit number or                 |       |
|-----|---------|-------------|--|-------|
|     |         |             | Subassembly description <b>558533-</b> |       |
| Ref | Part No | Description | -81                                    | Notes |
|     |         |             |  |       |
|     |         | •           | Quantity                               |       |



## 17 Cross reference list

| Part No.  | Page | Ref. | Part No.  | Page | Ref. | Part No.  | Page | Ref. |
|-----------|------|------|-----------|------|------|-----------|------|------|
| 1270001   | 30   | 7    | 223406 22 | 42   | 14   | 535586 80 | 42   | 21   |
| 1270320   | 30   | 3    | 223406 22 | 18   | 23   | 536469 80 | 36   | 1    |
| 221035 02 | 12   | 25   | 223406 27 | 46   | 10   | 536470 01 | 36   | 1A   |
| 221035 06 | 20   | 10   | 223406 27 | 14   | 2    | 536471 01 | 36   | 1B   |
| 221035 07 | 20   | 19   | 223406 27 | 14   | 3    | 537086 03 | 42   | 19   |
| 221035 08 | 26   | 6    | 223406 29 | 20   | 11   | 541691 01 | 42   | 17   |
| 221035 12 | 22   | 5    | 223406 29 | 32   | 1    | 541691 01 | 18   | 21   |
| 221035 60 | 38   | 3B   | 223406 29 | 42   | 1    | 542392 02 | 46   | 11   |
| 221035 60 | 38   | 5    | 223406 29 | 44   | 2    | 542392 02 | 14   | 5    |
| 221040 04 | 22   | 11   | 223406 29 | 12   | 27   | 542986 04 | 24   | 3    |
| 221040 04 | 38   | A8   | 223406 35 | 42   | 13   | 542986 04 | 28   | 3    |
| 221040 05 | 22   | 8    | 223406 35 | 18   | 2    | 543446 02 | 42   | 5    |
| 221040 05 | 26   | 9    | 223412 38 | 46   | 5    | 543446 02 | 18   | 13   |
| 221040 05 | 12   | 32   | 223412 38 | 12   | 5    | 543566 01 | 18   | 22   |
| 221040 05 | 12   | 43   | 223412 49 | 44   | 3    | 543567 01 | 18   | 14   |
| 221040 05 | 12   | 8    | 223412 49 | 12   | 29   | 543590 06 | 18   | 15B  |
| 221040 05 | 20   | 6    | 223412 54 | 44   | 5    | 543609 02 | 12   | 19   |
| 221040 41 | 12   | 39   | 223412 54 | 20   | 3    | 543612 01 | 12   | 23   |
| 221045 29 | 12   | 4    | 223610 07 | 12   | 14   | 543612 01 | 44   | 8    |
| 221121 15 | 40   | 3    | 223641 17 | 24   | 6    | 543613 02 | 12   | 24   |
| 221135 11 | 36   | 1C   | 223641 17 | 28   | 6    | 543619 80 | 44   | 4    |
| 221711 13 | 36   | 5    | 223642 34 | 24   | 4    | 543619 80 | 12   | 9    |
| 221711 17 | 40   | 6    | 223642 34 | 28   | 4    | 543645 01 | 12   | 34   |
| 221716 01 | 36   | 1E   | 223642 36 | 12   | 20   | 543662 02 | 46   | 7    |
| 221726 01 | 36   | 2    | 233211 66 | 24   | 2    | 543662 02 | 12   | 33   |
| 221803 20 | 40   | 5    | 233211 66 | 28   | 2    | 543669 01 | 22   | 4    |
| 221803 34 | 38   | 4C   | 233211 66 | 46   | 1    | 543669 01 | 26   | 4    |
| 222137 10 | 16   | 5    | 260104 91 | 42   | 9    | 543857 01 | 24   | 8    |
| 222210 21 | 16   | 6    | 260104 91 | 18   | 9    | 543857 01 | 28   | 8    |
| 223101 41 | 40   | 4    | 260169 51 | 22   | 10   | 543858 02 | 24   | 1    |
| 223107 34 | 36   | 6    | 260169 51 | 44   | 10   | 543858 02 | 28   | 1    |
| 223107 35 | 36   | 3    | 260169 52 | 22   | 10   | 543858 04 | 24   | 1    |
| 223107 35 | 46   | 3    | 260169 52 | 26   | 10   | 543953 05 | 12   | 45   |
| 223107 35 | 12   | 3    | 260169 52 | 44   | 10   | 544024 01 | 14   | 4    |
| 223403 16 | 12   | 15   | 260220 03 | 38   | 4D   | 544058 02 | 24   | 5    |
| 223403 16 | 44   | 1    | 260244 01 | 46   | 8    | 544058 04 | 28   | 5    |
| 223404 10 | 20   | 15   | 260244 01 | 12   | 35   | 544060 01 | 24   | 7    |
| 223404 10 | 32   | 3    | 27345     | 38   | 3A   | 544060 01 | 28   | 7    |
| 223404 10 | 42   | 7    | 32652     | 16   | 2    | 544060 01 | 44   | 9    |
| 223404 20 | 20   | 13   | 37535     | 12   | 12   | 544203 02 | 12   | 22   |
| 223404 20 | 32   | 2    | 37535     | 44   | 7    | 544337 02 | 12   | 26   |
| 223404 20 | 42   | 6    | 41456     | 26   | 8    | 544465 02 | 44   | 11   |
| 223404 22 | 20   | 14   | 523702 01 | 30   | 4    | 544555 01 | 38   | 7    |
| 223404 22 | 32   | 6    | 526337 06 | 12   | 44   | 544575 80 | 22   | 3    |
| 223404 22 | 42   | 18   | 526378 19 | 38   | 12   | 544575 81 | 22   | 3    |
| 223404 82 | 42   | 11   | 527355 03 | 38   | 10   | 544575 84 | 26   | 3    |
| 223404 82 | 12   | 36   | 527380 06 | 38   | 15   | 544925 01 | 18   | 20   |
| 223406 14 | 32   | 4    | 527380 07 | 38   | 11   | 545597 01 | 12   | 17   |
| 223406 14 | 42   | 8    | 527380 08 | 38   | 13   | 545601 80 | 12   | 13   |
| 223406 14 | 18   | 25   | 530307 01 | 36   | 4    | 545620 02 | 12   | 21   |

| Part No.  | Page | Ref. | Part No.  | Page | Ref. | Part No.   | Page | Ref. |
|-----------|------|------|-----------|------|------|------------|------|------|
| 545654 02 | 18   | 8    | 553159 02 | 16   | 4    | 68011      | 42   | 12   |
| 545657 80 | 18   | 15   | 553171 01 | 30   | 6    | 68011      | 18   | 3    |
| 545684 01 | 18   | 15A  | 553272 01 | 30   | 6    | 70490      | 38   | 4B   |
| 545797 02 | 18   | 24   | 554214 02 | 30   | 8    | 70560      | 20   | 18   |
| 545800 03 | 42   | 4    | 558533 10 | 48   | 7    | 70915      | 22   | 6    |
| 545800 03 | 18   | 6    | 559266 01 | 20   | 16   | 70915      | 26   | 5    |
| 545800 04 | 42   | 3    | 559882 01 | 40   | 1    | 70915      | 36   | 1D   |
| 545800 04 | 18   | 10   | 560757 01 | 12   | 10   | 70915      | 46   | 6    |
| 545800 08 | 42   | 2    | 560763 01 | 12   | 16   | 73547      | 46   | 4    |
| 545800 08 | 18   | 4    | 560767 80 | 12   | 18   | 73547      | 12   | 28   |
| 545817 01 | 14   | 1    | 560915 02 | 18   | 26   | 73632      | 42   | 10   |
| 545818 01 | 46   | 9    | 560916 01 | 34   | 1    | 73632      | 18   | 11   |
| 545818 01 | 14   | 6    | 560916 02 | 34   | 2    | 74067      | 32   | 5    |
| 545819 01 | 14   | 7    | 560916 03 | 34   | 3    | 74067      | 42   | 15   |
| 545831 80 | 12   | 40   | 560916 04 | 34   | 4    | 74067      | 20   | 2    |
| 545832 01 | 14   | 8    | 560916 05 | 34   | 5    | 9001142 80 | 20   | 4    |
| 545837 02 | 38   | 9    | 560916 06 | 34   | 6    | 9005934 02 | 26   | 1    |
| 545840 80 | 38   | 1    | 560916 07 | 34   | 7    |            |      |      |
| 545841 80 | 38   | 2    | 560916 08 | 34   | 8    |            |      |      |
| 545844 80 | 38   | 6    | 560985 80 | 12   | 38   |            |      |      |
| 545867 80 | 38   | 8    | 561000 02 | 18   | 33   |            |      |      |
| 545869 01 | 18   | 1A   | 561013 02 | 20   | 9    |            |      |      |
| 545871 01 | 42   | 16   | 561072 80 | 18   | 1    |            |      |      |
| 545871 01 | 18   | 7    | 561271 80 | 20   | 17   |            |      |      |
| 545892 02 | 12   | 2    | 561272 80 | 20   | 1    |            |      |      |
| 545892 02 | 46   | 2    | 561297 02 | 20   | 12   |            |      |      |
| 546057 02 | 12   | 37   | 561307 01 | 20   | 8    |            |      |      |
| 546157 80 | 20   | 7    | 561624 80 | 38   | 16   |            |      |      |
| 546222 01 | 38   | 3C   | 561628 80 | 38   | 17   |            |      |      |
| 546293 80 | 38   | 3    | 562596 01 | 20   | 21   |            |      |      |
| 546915 02 | 24   | 5    | 565393 01 | 12   | 46   |            |      |      |
| 547260 01 | 26   | 2    | 566279 01 | 12   | 30   |            |      |      |
| 548010 03 | 12   | 1    | 567616 01 | 16   | 7    |            |      |      |
| 548012 02 | 12   | 6    | 569415 03 | 42   | 20   |            |      |      |
| 548046 80 | 12   | 41   | 573400    | 44   | 99   |            |      |      |
| 548047 80 | 16   | 1    | 575192 80 | 18   | 16   |            |      |      |
| 548049 02 | 16   | 3    | 575192 80 | 18   | 18   |            |      |      |
| 548051 05 | 12   | 11   | 575192 80 | 18   | 19   |            |      |      |
| 548051 05 | 44   | 6    | 575364 80 | 18   | 17   |            |      |      |
| 548152 03 | 22   | 9    | 576862    | 32   | 99   |            |      |      |
| 548152 03 | 22   | 12   | 585983 02 | 22   | 7    |            |      |      |
| 548152 03 | 12   | 31   | 585983 03 | 26   | 7    |            |      |      |
| 548152 03 | 12   | 42   | 586259 02 | 18   | 5    |            |      |      |
| 548152 03 | 12   | 7    | 588070    | 38   | 99   |            |      |      |
| 548152 03 | 20   | 5    | 589035 01 | 38   | 14   |            |      |      |
| 548152 04 | 20   | 22   | 589393 01 | 18   | 12A  |            |      |      |
| 548806 80 | 38   | 4    | 589399 80 | 18   | 12   |            |      |      |
| 548807 01 | 38   | 4A   | 589399 82 | 18   | 12   |            |      |      |
| 551337 01 | 40   | 2    | 589961    | 42   | 99   |            |      |      |
| 552766 08 | 20   | 20   | 590919 02 | 22   | 1    |            |      |      |

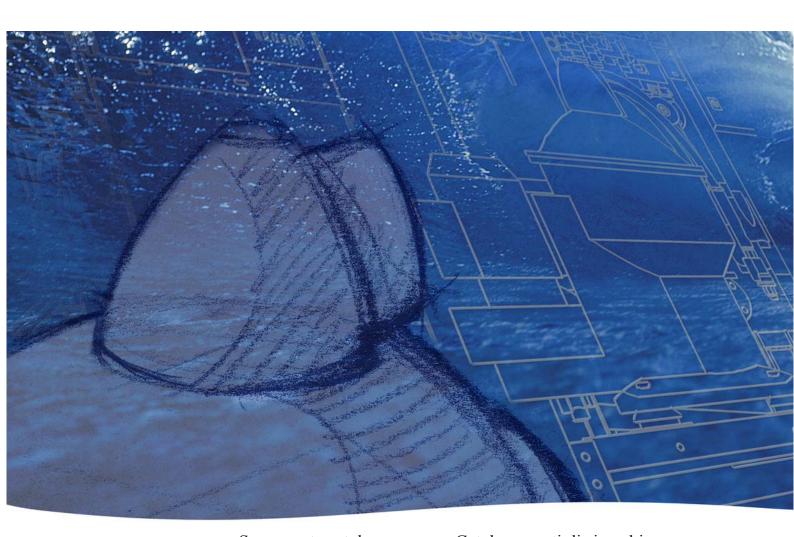
Config No. Product No.

### S 805 Flex system

## **Spare Parts Catalogue**



Specification No. 881501-01-02/5 Config No. 108277 Book No. 9014504 02 Rev. 1 Product No. 881501 02 02



Spare parts catalogue

Reservdelskatalog

Ersatzteilkatalog

Catalogue de piéces de rechange

Catalogue de piezas de recambio

Каталог запасных

частеи

Catalogo parti di ricambio

Catalogo de pecas sobressalentes

Varaosaluettelo

Καταλογοσ ανταλλακτικων

Reserveonderdelen-catalogus

Reservedelskatalog

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Telephone: +46 8 530 650 00 Telefax: +46 8 530 310 40

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#### 1 Read this first



- en Check the machine unit number on the name-plate before using this catalogue
- Kontrollera maskinenhetens nummer på maskinskylten innan du använder katalogen
- de Das Typenschild ein Hinweis zur korrekten Ersatzteilnummer
- fr La plaque de la machine, un guide pour trouver le numéro de piéce de rechange correct
- La placa-marca de la máquina guía del número correcto del repuesto
- **ru** Фирменная табличка машины указатель правилного номера запасной части
- it La targhetta della macchina guida al corretto numero dei ricambi
- pt La placa do fabricante da máquina um guia do número correto das partes sobressalentes
- **fi** Konekilpi opastin oikeaan varaosanumeroon
- **el** Η πινακίδα της μηχανής είναι ο οδηγός του σωστού ανταλλακτικού
- Het gegevensplaatje een wegwijzer naar het juiste onderdeelnummer
- da Typeskiltet en guide til det rette reservedelsnummer 使用目录前,检查铭牌上的机器部件号。

#### 1.1 General information

en

Safeguard your commitment to quality by always using genuine Alfa Laval spare parts.

Remember, Alfa Laval cannot accept responsibility for the failure of a separator equipped with non-original spare parts. We guarantee the quality and reliability of our products.



Följ ditt kvalitetstänkande genom att endast använda Alfa Laval originalreservdelar.

Kom ihåg att Alfa Laval inte tar något ansvar för fel på en separator, som innehåller icke-originaldelar. Vi garanterar kvaliteten och driftsäkerheten endast hos våra egna produkter.



Aus Rücksicht auf Ihr Bestreben um beste Qualität sollten Sie nur Alfa Laval Originalersatzteile benutzen.

Vergessen Sie nicht, Alfa Laval kann keine Verantwortung für das Versagen eines Separators übernehmen, der nicht mit Originalersatzteilen versehen ist. Wir garantieren Qualität und Zuverlässigkeit unserer Produkte.



Préservez la qualité de vos équipments en n'employant que des pièces de rechange Alfa Laval.

N'oubliez pas q'Alfa Laval décline toute responsabilité en cas de panne d'un séparateur non équipé de pièces de rechange d'origine. Nous garantissons la qualité et la fiabilité de nos produits.

es

Mantenga su compromiso con la calidad, al usar siempre piezas de repuesto Alfa Laval auténticas.

Recuerde que Alfa Laval no acepta responsabilidad por el fallo de una separadora equipada con piezas de repuesto no originales. Garantizamos la calidad y fiabilidad de nuestros productos.



ru

Гарантируйте надежность качества всегда используя подлинные запасные части фирмы Alfa Laval.

Запомните, что Alfa Laval не несет ответственности за повреждение сепаратора, оснащенного неподлинными запчастами. Мы гарантируем качестьо и надежность наших изделий.





Salvaguardate la vostra garanzia di qualità facendo sempre uso di parti di ricambio Alfa Laval autentiche.

Tenete presente che la Alfa Laval non può accettare responsabilità per avaria ad un separatore attrezzato con parti di ricambio non originali. Noi garantiamo la qualità l'affidabilità dei nostri prodotti.



Proteja o seu cometimento a qualidade usando sempre peças sobressalentes genuinas Alfa Laval.

Não esqueça que Alfa Laval não aceita responsabilidade por falha de uma separadora equipada com peças sobressalentes não genuinas. Nós garantimos a qualidade e a confiança dos nossos produtos.



Varmistakaa vastuunne laadusta käyttämällä aina alkuperäisiä Alfa Laval varaosia.

Muistakaa, Alfa Laval ei voi hyväksyä vastuuta ei-alkuperäsillä varaosilla varustetun separaattorin vaurioista. Me takaamme tuotteidemme laadun ja käyttövarmuuden.



Εξασφαλίοτε υψηλή ποιότητα χρησιμοποιώντας μόνο γνήσια ανταλλακτικά της Alfa Laval.

Έχετε υπόψην ότι η Alfa Laval δεν αναλαμβάνει καμμιά ευθύνη για βλάβες βουτυρομηχανής, οτην οποία έχουν εφαρμοστεί μή γνήσια ανταλλακτικά. Εγγυόμαστε ποιότητα και καλή λειτουργία μόνο για τα δικά μας προϊόντα.

nl

Streef naar een zo hoog mogelijke kwaliteit en gebruik uitsluitend originele Alfa Laval reserveonderdelen. Streef naar een zo hoog mogelijke kwaliteit en gebruik uitsluitend originele Alfa Laval reserveonderdelen.

Vergeet niet dat Alfa Laval niet verantwoordelijk is voor een defecte separator die niet-originele onderdelen bevat. Wij garanderen de kwaliteit en betrouwbaarheid van onze eigen produkten.



da

Hold Dem til den kvalitet, De har valgt at satse på, ved altid at anvende ægte Alfa Laval reservedele.

Husk, at Alfa Laval ikke kan påtage sig noget ansvar for fejl på en separator, som indeholder uoriginale dele. Vi kan kun garantere kvalitet og driftsikkerhed på vore egne produkter.

请始终使用阿法拉伐真品备件以保证您产品的质量。

请注意,阿法拉伐对使用非原装备件的分离设备的故障不承担 责任。 我们保证我们产品的质 量与可靠性。 1.2 Translation list 1 Read this first

## 1.2 Translation list

Översättningslista Übersetzungsliste Liste de traduction Lista de traducciones

| en                            | sv                            | de                                 | fr  | es                                   |
|-------------------------------|-------------------------------|------------------------------------|---|--------------------------------------|
| Part no.                      | Reservdelsnummer              | Teil-Nr.                           | Numéro de pièce                           | Pieza No.                            |
| Qty                           | Antal                         | Anzahl                             | Quantité                                  | Cantidad                             |
| Description                   | Benämning                     | Bezeichnung                        | Dénomination                              | Descripción                          |
| Notes                         | Anmärkningar                  | Anmerkungen                        | Remarques                                 | Notas                                |
| Machine type                  | Maskintyp                     | Maschinentyp                       | Type de machine                           | Tipo de máquina                      |
| Product no.                   | Produktnr                     | Produktnummer                      | Numéro de produit                         | Número de producto                   |
| Machine unit description      | Maskinblocksbenämning         | Bezeichnung des<br>Maschinenblocks | Dénomination de partie de machine         | Descripción de sección de la máquina |
| Machine unit no.              | Maskinblocksnr                | Maschinenblock Nr.                 | Partie de machine nº                      | No. de sección de máquina            |
| Subassembly description       | Undergruppsbenämning          | Bezeichung der<br>Untergruppe      | Dénomination de sous-ensemble             | Descripción de subconjunto           |
| Subassembly no.               | Undergruppsnr                 | Untergruppe Nr.                    | Nº de sous-ensemble                       | Número de subconjunto                |
| See page                      | Se sidan                      | Siehe Seite                        | Vòir page                                 | Véase la página                      |
| Fig. ref.                     | Figurhänvisning               | Bildhinweise                       | Réf. de fig.                              | Referencia de figura                 |
| Product name                  | Produktnamn                   | Produktname                        | Nom du produit                            | Nombre del producto                  |
| Exchange necessitates         | Utbyte nödvändiggör           | Austausch erfordert                | Le remplacement                           | El racmbio requiere el               |
| rebalancing of bowl           | ombalansering av kulan        | Wiederauswuchtung der Trommel      | nécessite le rééquilibrage<br>du bol      | reequilibrado del rotor              |
| See separate spare parts list | Se separat reservdelslista    | Ersatzteilliste                    | Voir liste séparée des pièces de rechange | Véase la lista de piezas separada    |
| Not delivered as spare part   | Levereras ej som<br>reservdel | Nicht als Ersatzteil<br>geliefert  | Non livré comme piéce de rechange         | No se entrega como pieza de recambio |

#### Словарь перевда Lista traduzioni Lista para tradução Käännösluttelo

| en  | ru  | it  | pt   | fi  |
|---|---|---|--|---|
| Part no.                                  | Деталь №                                    | Nr. parte   | Numero de peca                                 | Varaosanumero   |
| Qty                                       | Кол—во                                      | Quantita  | Quantidade                                     | Lukumäärä   |
| Description                               | Наименование                                | Descrizione   | Descricao                                      | Nimitys   |
| Notes                                     | Примечания                                  | Note  | Notas  | Huomautuksia  |
| Machine type                              | Машина тнпа                                 | Tipo macchina   | Tipo de maquina                                | Konetyyppi  |
| Product no.                               | Артикул №                                   | Nr.prodotto   | No. do produto                                 | Tuotteen no   |
| Machine unit description                  | Наименование блока<br>машины                | Descrizione unita macchina                                  | Descricao da unidade da maquina                | Koneenosan nimitys                                    |
| Machine unit no.                          | Блок машины №                               | Nr. unita macchina  | Numero de unidade da maquina                   | Koneenosan no   |
| Subassembly description                   | Наименование группы                         | Descrizione sottogruppo                                     | Descriao do subconjunto                        | Alaryhmän nimitys                                     |
| Subassembly no.                           | Группа №                                    | Nr. sottogruppo   | Número de subconjunto                          | Alaryhmän no  |
| See page                                  | См. страницу                                | Vedi pagina   | Véase la página                                | Ks sivu   |
| Fig. ref.                                 | Ссылка на зскиз                             | Rif. fig.   | Referencia de figura                           | Kuvaviite   |
| Product name                              | Наименование артикула                       | Nome prodotto   | Nombre del producto                            | Tuotteen nimi   |
| Exchange necessitates rebalancing of bowl | Замена требует балансировки барабана        | La sostituzione comporta<br>la equilibratura del<br>tamburo | El racmbio requiere el reequilibrado del rotor | Vaihdettaessa kuula<br>tasapainoitettava<br>uudelleen |
| See separate spare parts list             | См. отдельный перечень<br>запасных частей   | Vedi lista separata delle parti di ricambio                 | Véase la lista de piezas<br>separada           | Katso erillistä<br>varaosaluetteloa                   |
| Not delivered as spare part               | Не поставлена вместе с<br>запасными частями | Non fornito come parte di ricambio                          | No se entrega como pieza<br>de recambio        | Ei toimiteta varaosana                                |

1.2 Translation list 1 Read this first

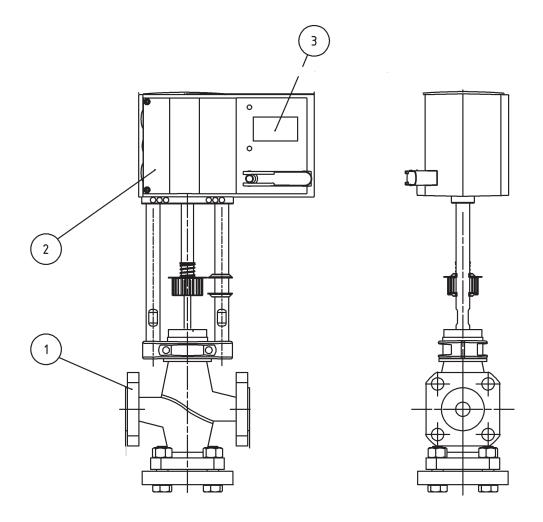
#### FΛΩΣΣΑΡΙ Vertaallijst Oversættelseliste 翻译列表、

| en  | el   | nl   | da   |            |
|---|--|--|--|------------|
| Part no.                                  | Λριθμός ανταλλακτικού  | Onderdeelnr.   | Reservedelsnummer                          | 部件号        |
| Qty                                       | Σύνολο   | Hoeveelheid  | Antal                                      | 数量         |
| Description                               | Περιγραφή  | Beschrijving   | Betegnelse                                 | 说明         |
| Notes                                     | Παρατηρήσεις   | Opmerkingen  | Bemaerkninger                              | 注释         |
| Machine type                              | Τύπος μηχανήματος  | Machinetype  | Maskintype                                 | 机器类型       |
| Product no.                               | Αριθμός προϊόντος  | Produktnr.   | Produktnr.                                 | 产品编号       |
| Machine unit description                  | Περιγραφή<br>συγκροτήματος μηχανής                             | Machineblokbenaming                                  | Maskinbetegnelse                           | 机器说明       |
| Machine unit no.                          | Αριθμός συγκροτήματος<br>μηχανής                               | Machineblokbenamning                                 | Maskinnr.                                  | 机器部件号      |
| Subassembly description                   | Περιγραφή<br>υποσυγκροτήματος                                  | Subgroepbenamning                                    | Undergruppsbetegnelse                      | 子装置说明      |
| Subassembly no.                           | Αριθμός<br>υποσυγκροτήματος                                    | Subgroepnr.  | Undergruppenr.                             | 子装置编号      |
| See page                                  | Βλέπε σελίδα   | Zie blz.   | Se side                                    | 请参阅页       |
| Fig. ref.                                 | Παραπομπή σε εικόνα  | Afb. ref.  | Figurhenvisning                            | 图片参考       |
| Product name                              | Ονομασία προϊόντος   | Produktnaam  | Produktnavn                                | 产品名        |
| Exchange necessitates rebalancing of bowl | Ανταλλαγή απαιτεί<br>επαναρρύθμιση                             | Vervangning vereist<br>herbalanceren van de<br>kogel | Udskriftning kraever afbalcering af kuglen | 更换前应校准转鼓平衡 |
| See separate spare parts list             | ισορροπίας του τύμπανου<br>Βλέπε ειδική λίστὰ<br>ανταλλακτικών | Vervangning vereist van<br>de kogel                  | Se spaat reservedelsliste                  | 参见备件清单     |
| Not delivered as spare part               | Δεν παραδίδεται ως ανταλλακτικό                                | Niet geleverd als reserveonderdeel                   | Levereres ikke som reservedel              | 未作为备件提供    |

# 2 Regulating valve with drive

#### DN 15

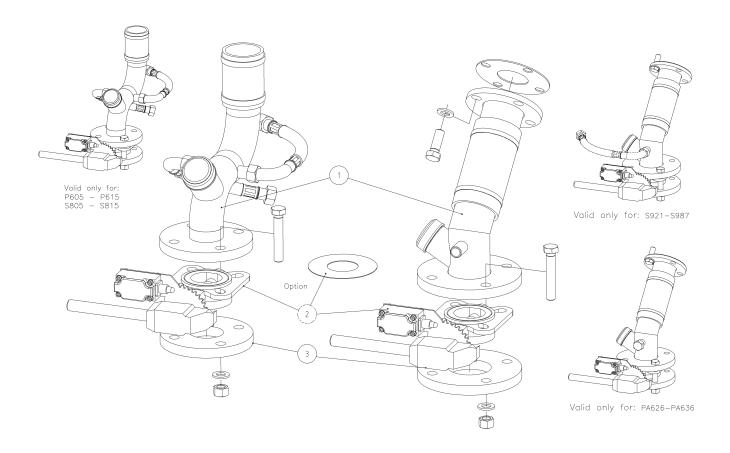
|     |           |                     | Machine unit number o           | r   |
|-----|-----------|---------------------|---------------------------------|---|
|     |           |                     | Subassembly description 578787- | on  |
| Ref | Part No   | Description         | -05                             | Notes                                       |
|     |           |                     | Quantity                        |   |
| 1   | 578784 05 | Regulating valve    | 1   1   1                       |   |
| 2   | 578785 01 | Valve drive         | 1   1                           |   |
| 3   | 539436 01 | Article number sign | 1                               | Marked with article No for valve with drive |



# 3 Sludge outlet block

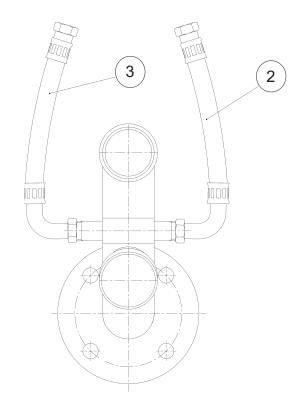
\* This is an internal number and cannot be ordered. Use numbers from the item list below when ordering.

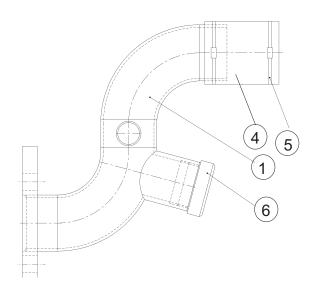
|     |           |                     | Machine unit number or           |  |             |
|-----|-----------|---------------------|----------------------------------|--|-------------|
|     |           |                     | Subassembly description 9000351- |  |             |
| Ref | Part No   | Description         | -AA*                             |  | Notes       |
|     |           | -                   | Quantity                         |  |             |
| 1   | 595084 80 | Sludge outlet, DIN  | 1                                |  | See page 16 |
| 0   | E00E46.00 | Butterfly valve kit |                                  |  | See page 18 |



# 3.1 Sludge outlet, DIN

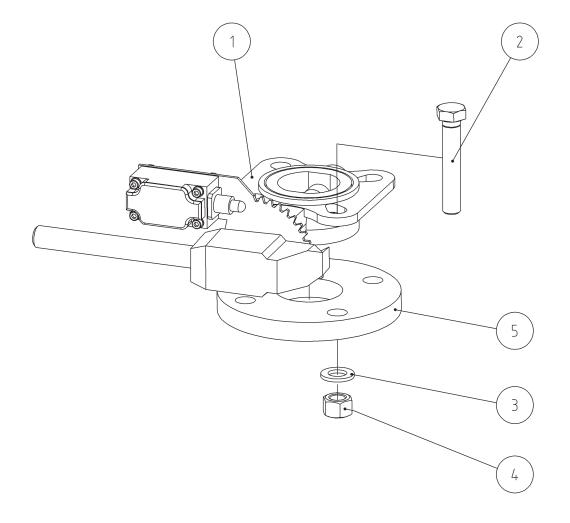
|     |            |                       | Machine unit number or                 |        |   |
|-----|------------|-----------------------|--|--------|---|
|     |            |                       | Subassembly description <b>595084-</b> |        |   |
| Ref | Part No    | Description           | -80                                    | Notes  | 6 |
|     |            |                       | Quan                                   | tity   |   |
| 1   | 595085 80  | Discharge outlet      | 1                                      |        |   |
| 2   | 1765934 07 | Flexible connection   | 1                                      | L= 600 |   |
| 3   | 1765934 06 | Flexible connection   | 1                                      | L= 450 |   |
| 4   | 1762017 01 | Hose                  | 1 1                                    |        |   |
| 5   | 1762020 03 | Hose clip Ø 58 x Ø 75 | 2                                      |        |   |
| 6   | 1766096 01 | Plug                  | 1                                      |        |   |





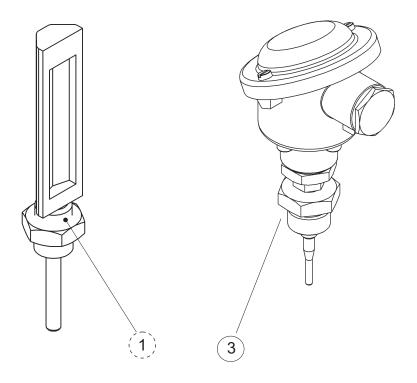
# 3.2 Butterfly valve kit

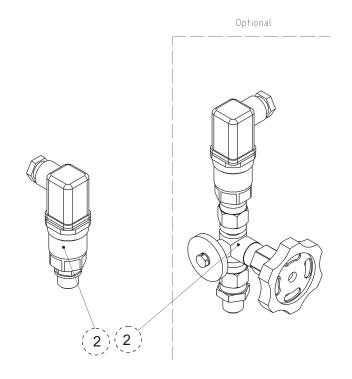
|     |            |                 | Machine unit numl           | ber or  |  |
|-----|------------|-----------------|-----------------------------|---------|--|
|     |            |                 | Subassembly desc<br>598546- | ription |  |
| Ref | Part No    | Description     | -80                         | Notes   |  |
|     |            |                 | Quantity                    |         |  |
| 1   | 1766007 01 | Butterfly valve | 1   1                       |         |  |
| 2   | 2210463 15 | Screw           | 4                           |         |  |
| 3   | 70528      | Washer          | 4                           |         |  |
| 4   | 221803 34  |                 | 4                           |         |  |
| 5   | 1762751 26 | Flange          | 1                           |         |  |



# 4 Feed supervision block

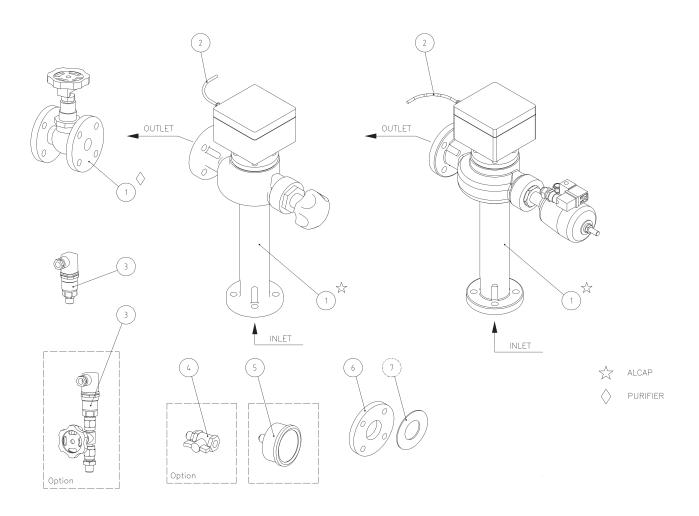
|     |          |             | Machine unit number or                  |       |
|-----|----------|-------------|---|-------|
|     |          |             | Subassembly description <b>9000152-</b> |       |
| Def | Dowt No. | Description | -AA*                                    | Notes |
| Ref | Part No  | Description | -AA                                     | MOLES |
| Ret | Part NO  | Description | Quantity                                | Notes |





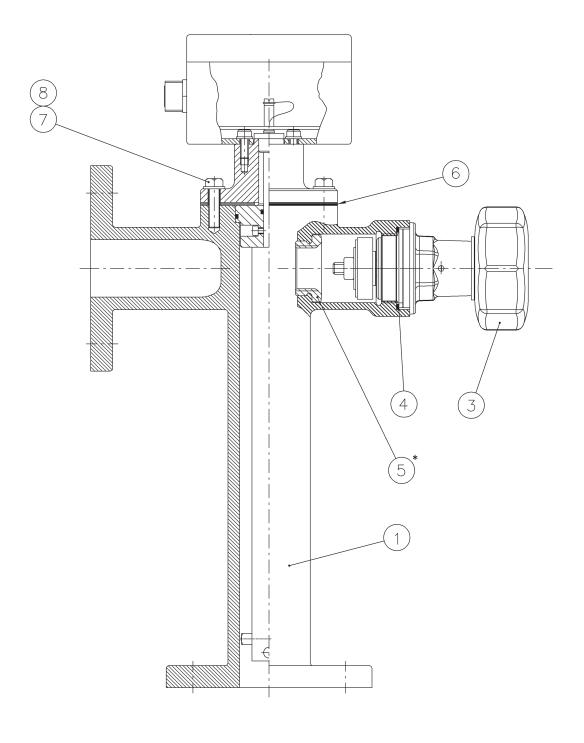
# 5 Light phase regulating BI

|      |         |             | Machine unit number or           |       |
|------|---------|-------------|----------------------------------|-------|
|      |         |             | Subassembly description 9000158- |       |
| Ref  | Part No | Description | -AA*                             | Notes |
| 1701 | Fait NO | Description | -AA                              | MOIG2 |
| 1.01 | Fait NO | Description | Quantity                         | Notes |



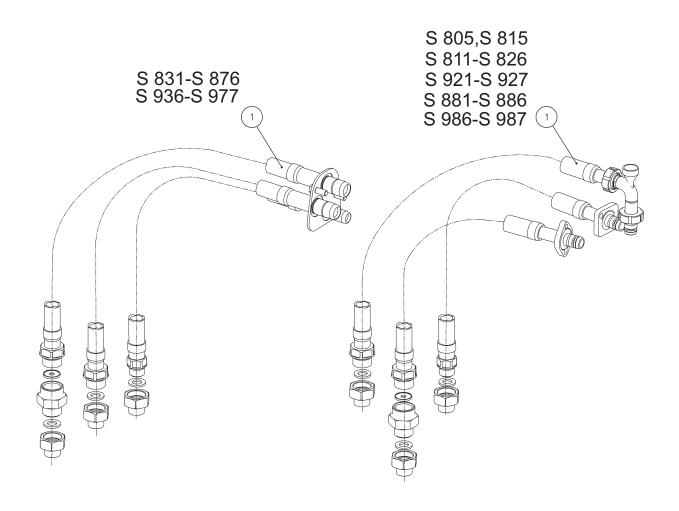
#### 5.1 Water transducer MT60

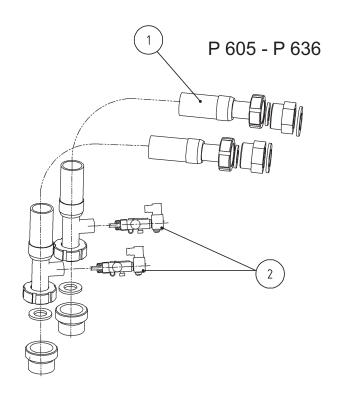
|     |            |                    | Machine unit number or |                            |       |   |
|-----|------------|--------------------|------------------------|----------------------------|-------|---|
|     |            |                    |                        | ly description <b>700-</b> |       |   |
| Ref | Part No    | Description        | -80                    | 700-                       | Notes |   |
|     |            |                    | Qua                    | antity                     |       |   |
| 1   | 581384 01  | Valve Body         | 1                      |                            | DN25  | Ì |
| 3   | 582585 01  | Manual insert DN25 | 1                      |                            | DN25  |   |
| 4   | 586248 03  | Gasket             | 1                      |                            | DN25  |   |
| 5   | 582554 01  | Valve seat         | 1                      |                            | DN25  |   |
| 6   | 1765130 01 |                    | 1                      |                            |       |   |
| 7   | 221040 08  | Screw              | 4                      |                            |       |   |
| 8   | 223107 06  | Spring washer      | 4                      |                            |       |   |



## 6 Flexible hose block

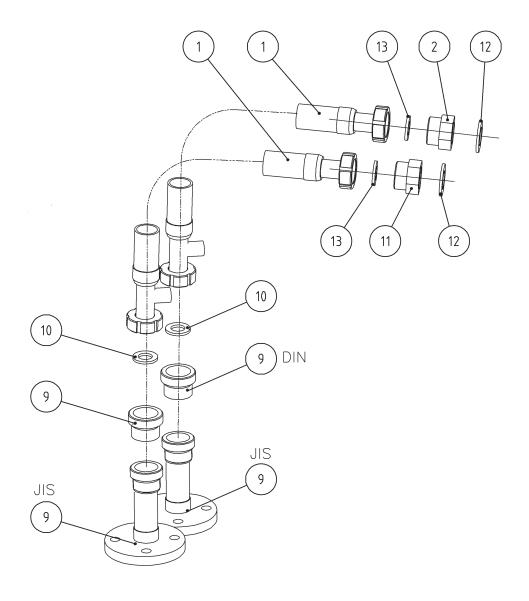
|     |            |                     | Machine u     | nit number or   |             |
|-----|------------|---------------------|---------------|-----------------|-------------|
|     |            |                     |               | oly description |             |
|     |            |                     | 900           | 0428-           |             |
| Ref | Part No    | Description         | - <b>AA</b> * |                 | Notes       |
|     |            |                     | Qu            | antity          |             |
| 1   | 9000188 03 | Flexible hose kit   | 1             |                 | See page 28 |
|     |            | Pressure tansmitter |               |                 | See page 32 |





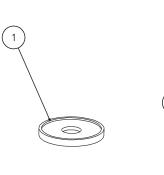
#### 6.1 Flexible hose kit

|     |            |                           | Subass |         | umber or<br>lescription<br><b>38-</b> |             |
|-----|------------|---------------------------|--------|---------|---------------------------------------|-------------|
| Ref | Part No    | Description               | -03    |         |                                       | Notes       |
|     |            |                           |        | Quantit | ty                                    |             |
| 1   | 573695 80  | Flexible hose             | 2      |         | ľ [                                   |             |
| 2   | 582476 03  | Throttle washer block kit | 1      |         |                                       | See page 30 |
| 9   | 1760926 01 | Nipple                    | 2      |         |                                       |             |
| 10  | 546229 35  | Rectangular ring          | 2      |         |                                       |             |
| 11  | 576792 02  | Nipple                    | 1      |         |                                       |             |
| 12  | 1760191 05 | Cu-Washer 3/4"            | 2      |         |                                       |             |
| 13  | 546229 35  | Rectangular ring          | 2      |         |                                       |             |



## 6.1.1 Throttle washer block kit

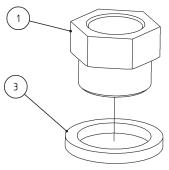
|     |           |             | Machine unit number or          |       |
|-----|-----------|-------------|---------------------------------|-------|
|     |           |             | Subassembly description 582476- |       |
| Ref | Part No   | Description | -03                             | Notes |
|     |           |             | Quantity                        |       |
|     |           |             |                                 |       |
| 1   | 576792 03 | Nipple      | 1                               |       |



Alt. 1

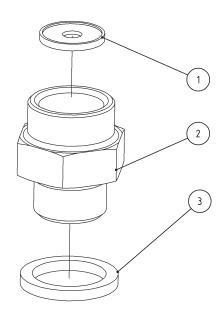
PA— Separators with or without oil block

S- Separators with oil block



Alt. 2

P605 and P615 Separators with or without oil block

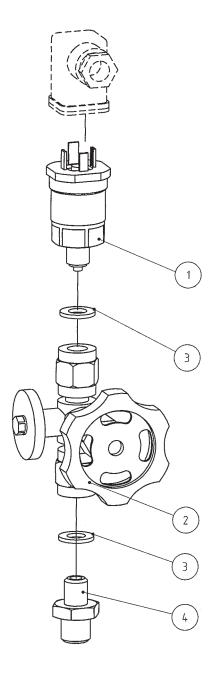


Alt. 3

S— Separators without oil block

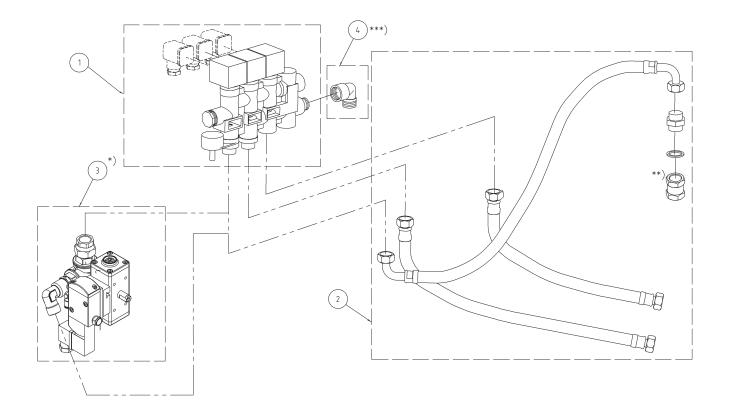
#### 6.2 Pressure tansmitter

| Ref | Part No     | Description          | Machine unit number of Subassembly description 582752- |       |
|-----|-------------|----------------------|--|-------|
| Rei | Part No     | Description          | -02  | Notes |
|     |             |                      | Quantity   |       |
| 1   | 597255 02   | Pressure transmitter | 1  |       |
| 2   | 1763903 03  | Needle valve         | 1  |       |
| 3   | 53551716 02 | Washer               | 2  |       |
| 4   | 1765082 09  | Nipple               | 1  |       |



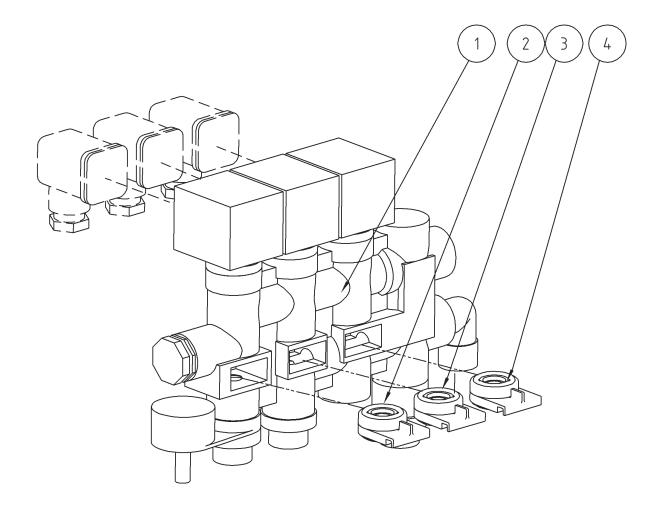
# 7 Operating water valve BI

|     |            |                         | Machine       | unit number or                 |             |  |
|-----|------------|-------------------------|---------------|--------------------------------|-------------|--|
|     |            |                         | 90            | nbly description <b>00340-</b> |             |  |
| Ref | Part No    | Description             | - <b>AA</b> * |                                | Notes       |  |
|     |            | -                       | C             | (uantity                       |             |  |
| 1   | 598371 08  | Valve block water       | 1             |                                | See page 36 |  |
| 2   | 598372 01  | Flexible connection kit | 1             |                                | See page 38 |  |
| 4   | 571395 03  | Elbow coupling G1/2     | 1             |                                |             |  |
| Z   | 1765993 87 | Water block spare parts |               |                                | See page 48 |  |



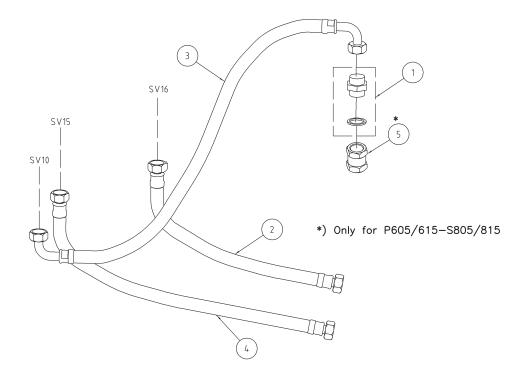
#### 7.1 Valve block water

| Ref  | Part No    | Description            | Machine unit number or Subassembly description 598371- |       |
|------|------------|------------------------|--|-------|
| 1/61 | I alt NO   | Description            |  | Notes |
|      |            |                        | Quantity   |       |
| 1    | 582495 80  | Valve block water      | 1 1   1  |       |
| 2    | 1766037 01 | Flow valve, 1.3 l/min  | 1  |       |
| 3    | 1766037 05 | Flow valve, 18.0 l/min | 1  |       |
| 4    | 1766037 04 | Flow valve, 0.9 l/min  | 1  |       |



## 7.2 Flexible connection kit

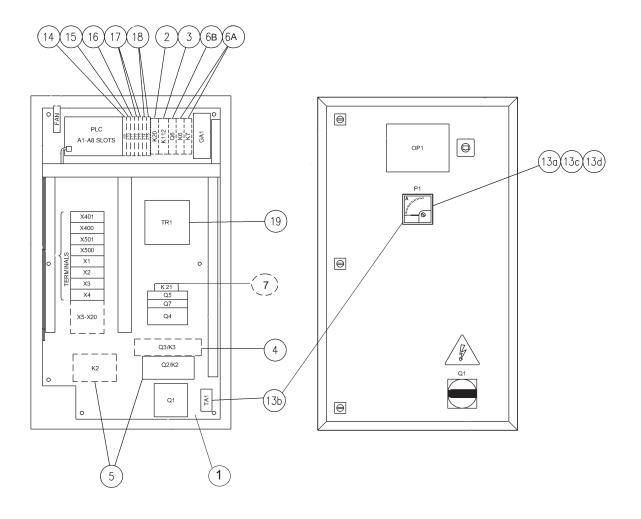
|     |             |                           | Mach                                   | nine ı | unit n | umbe | er or |       |
|-----|-------------|---------------------------|--|--------|--------|------|-------|-------|
|     |             |                           | Subassembly description <b>598372-</b> |        | otion  |      |       |       |
| Ref | Part No     | Description               | -01                                    |        |        |      |       | Notes |
|     |             |                           |  | Q      | uanti  | ty   |       |       |
| 1   | 1767071 80  | Non return valve kit      | 1                                      |        |        | _    |       |       |
| 2   | 53550655 01 | Flexible connection       | 1                                      |        |        |      |       |       |
| 3   | 1765936 03  | Flexible connection water | 1                                      |        |        |      |       |       |
| 4   | 53550654 01 | Flexible connection water | 1                                      |        |        |      |       |       |
| 5   | 583259 04   | Exagon socket             | 1                                      |        |        |      |       |       |

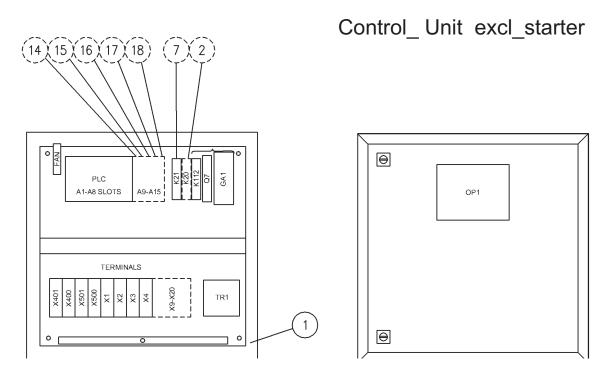


# 8 Control\_Unit excl.Starter

|           |                         |                 | Machine unit number or  |             |
|-----------|-------------------------|-----------------|-------------------------|-------------|
|           |                         |                 | Subassembly description |             |
|           |                         |                 | 9000238-                |             |
| Ref       | Part No                 | Description     | - <b>AA</b> *           | Notes       |
|           |                         | -<br>-          | Quantity                |             |
|           |                         |                 |                         |             |
| 1         | 581043 81               | Control cabinet | 1                       | See page 42 |
| 1<br>15.1 | 581043 81<br>NO NODE 01 |                 | 1                       | See page 42 |

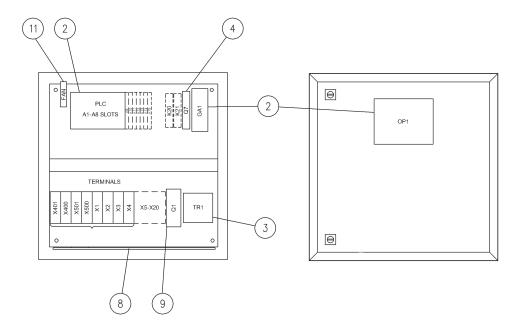
# Control\_ Unit incl\_starter

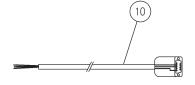




## 8.1 Control cabinet

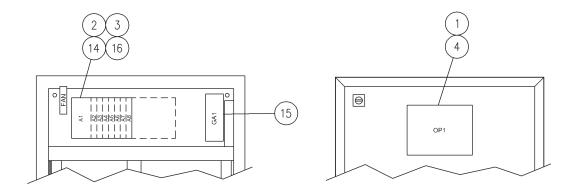
|     |           |                  | Machine unit number or Subassembly description |                          |    |             |   |
|-----|-----------|------------------|--|--------------------------|----|-------------|---|
|     |           |                  | Subas  | sembly 0<br><b>58104</b> |    | ו           |   |
| Ref | Part No   | Description      | -81  | 00104                    |    | Notes       | l |
|     |           |                  |  | Quanti                   | ty |             |   |
| 2   | 580999 80 | PLC standard kit | 1  |                          |    | See page 44 |   |
| 3   | 580993 03 | Transformer      | 1  |                          |    | , ,         |   |
| 4   | 580992 26 | Circuit Breaker  | 1  |                          |    |             |   |
| 8   | 580994 01 | Copper plait     | 1  |                          |    |             |   |
| 9   | 580992 25 | Circuit Breaker  | 1  |                          |    |             |   |
| 10  | 580936 01 | Cable            | 1  |                          |    |             |   |
| 11  | 581016 01 | Fan              | 1  |                          |    |             |   |

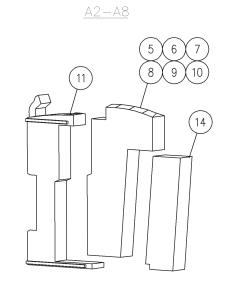




## 8.1.1 PLC standard kit

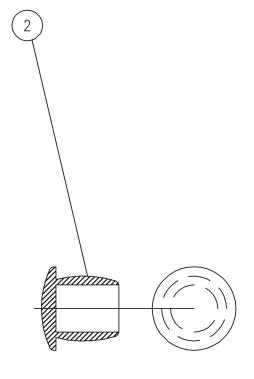
|     |           |                       | Machine unit nu         | ımber or |               |
|-----|-----------|-----------------------|-------------------------|----------|---------------|
|     |           |                       | Subassembly description |          |               |
|     | D ( N     | <b>5</b>              | 580999                  |          |               |
| Ref | Part No   | Description           | -80                     |          | Notes         |
|     |           |                       | Quantity                | /        |               |
| 1   | 580986 01 | Operator panel        | 1                       |          | 4B1260.00-K07 |
| 2   | 580986 02 | CPU                   | 1                       |          | X20CP0292     |
| 3   | 580986 14 | Supply module         | 1                       |          | X20PS9500     |
| 4   |           | Terminal block        | 1                       |          | 0TB103.91     |
| 5   | 580986 04 | 6 Digital input       | 1                       |          | X20DI6371     |
| 6   | 580986 05 | 2 Relay output        | 1                       |          | X20DO2649     |
| 7   | 580986 06 | 6 Relay output        | 1                       |          | X20DO6529     |
| 8   | 580986 07 | 4 Relay output        | 1                       |          | X20DO4529     |
| 9   | 580986 08 | 4 Analogue input      | 1                       |          | X20AI4622     |
| 10  | 580986 09 | 2 Analogue input      | 1                       |          | X20AT2222     |
| 11  | 580986 17 | Bus module            | 6                       |          | X20BM11       |
| 140 | 580986 16 | Terminal block 12-pin | 7                       |          | X20TB12       |
| 150 | 580986 03 | Power supply          | 1                       |          | 0AC524.9      |
| 160 | 580986 18 | Bus module for CPU    | 1                       |          | X20BB22       |

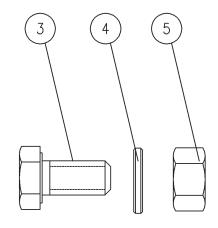




# 8.2 Wall Mounting Kit

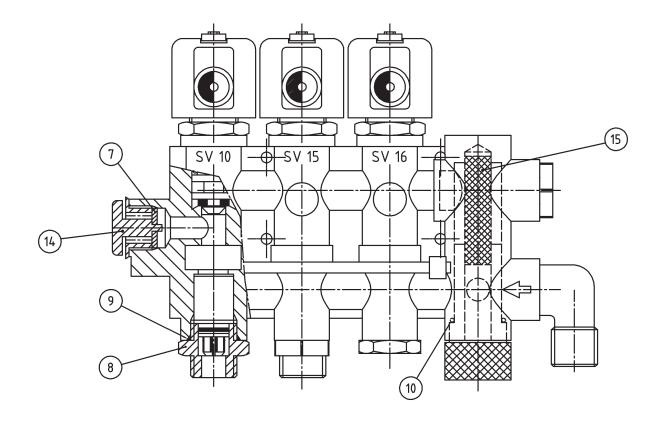
|     |           |             | Machine uni                             | t number or |             |
|-----|-----------|-------------|---|-------------|-------------|
|     |           |             | Subassembly description <b>9004096-</b> |             |             |
| Ref | Part No   | Description | -80                                     |             | Notes       |
|     |           |             | Quantity                                |             |             |
| 3   | 221031 21 | Screw       | 8                                       |             | Screw M6x16 |
| 4   | 223101 32 | Washer      | 8                                       |             | Washer M6   |
| 5   | 221803 28 | Nut         | 8                                       |             | Nut M6      |

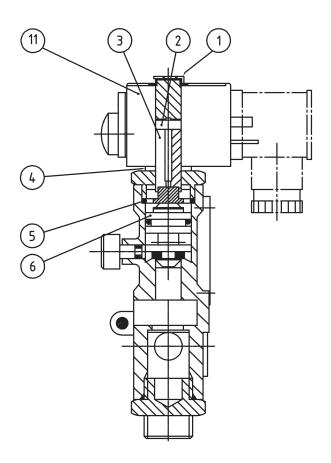




# 9 Water block spare parts

|     |            |                  | Machine unit number or           |        | r or |       |
|-----|------------|------------------|----------------------------------|--------|------|-------|
|     |            |                  | Subassembly description 1765993- |        | tion |       |
| Ref | Part No    | Description      | -87                              | 00330- |      | Notes |
|     |            | •                | Quantity                         |        |      |       |
| 1   | 1765993 01 | Retaining clip   | 1                                |        |      |       |
| 2   | 1765993 02 | Spring           | 1                                |        |      |       |
| 3   | 1765993 03 |                  | 1                                |        |      |       |
| 4   |            | Spring washer    | 1                                |        |      |       |
| 5   | 1765993 05 | O-ring           | 1                                |        |      |       |
| 6   | 1765993 06 |                  | 1                                |        |      |       |
| 7   | 1765993 07 |                  | 1                                |        |      |       |
| 8   |            | Non-return valve | 1                                |        |      |       |
| 9   | 1765993 09 |                  | 1                                |        |      |       |
| 10  | 1765993 10 |                  | 1                                |        |      |       |
| 11  | 1765993 11 |                  | 1                                |        |      |       |
| 14  | 1765993 13 |                  | 1                                |        |      |       |
| 15  | 1765993 16 | Strainer         | 1                                |        |      |       |



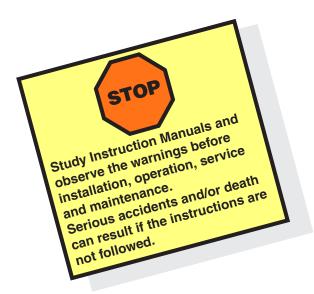


# 10 Cross reference list

| Part No.                 | Page     | Ref.   | Part No.               | Page     | Ref.   |
|--------------------------|----------|--------|------------------------|----------|--------|
|                          |          |        | raitivo.               | ı aye    | IXGI.  |
| 1760191 05               | 28       | 12     | 578785 01              | 12       | 2      |
| 1760926 01               | 28       | 9      | 580936 01              | 42       | 10     |
| 1762017 01<br>1762020 03 | 16       | 4<br>5 | 580986 01              | 44       | 1      |
| 1762020 03               | 16<br>18 | 5      | 580986 02              | 44       | 2      |
|                          | 32       | 2      | 580986 03              | 44       | 150    |
| 1763903 03<br>1765082 09 | 32       | 4      | 580986 04              | 44       | 5      |
| 1765130 01               | 24       | 6      | 580986 05              | 44       | 6      |
| 1765934 06               | 16       | 3      | 580986 06              | 44       | 7      |
| 1765934 07               | 16       | 2      | 580986 07              | 44       | 8      |
| 1765936 03               | 38       | 3      | 580986 08              | 44       | 9      |
| 1765993 01               | 48       | 1      | 580986 09              | 44       | 10     |
| 1765993 02               | 48       | 2      | 580986 14              | 44       | 3      |
| 1765993 03               | 48       | 3      | 580986 16              | 44       | 140    |
| 1765993 04               | 48       | 4      | 580986 17              | 44       | 11     |
| 1765993 05               | 48       | 5      | 580986 18              | 44       | 160    |
| 1765993 06               | 48       | 6      | 580986 26              | 44       | 4      |
| 1765993 07               | 48       | 7      | 580992 25              | 42       | 9      |
| 1765993 08               | 48       | 8      | 580992 26              | 42       | 4      |
| 1765993 09               | 48       | 9      | 580993 03              | 42       | 3      |
| 1765993 10               | 48       | 10     | 580994 01              | 42       | 8      |
| 1765993 11               | 48       | 11     | 580999 80              | 42       | 2      |
| 1765993 13               | 48       | 14     | 581016 01              | 42       | 11     |
| 1765993 16               | 48       | 15     | 581043 81              | 40       | 1      |
| 1765993 87               | 34       | Z      | 581384 01              | 24       | 1      |
| 1766007 01               | 18       | 1      | 582476 03              | 28       | 2      |
| 1766037 01               | 36       | 2      | 582495 80              | 36       | 1      |
| 1766037 04               | 36       | 4      | 582554 01              | 24       | 5      |
| 1766037 05               | 36       | 3      | 582585 01              | 24       | 3      |
| 1766096 01               | 16       | 6      | 582752 82              | 26       | 2<br>5 |
| 1767071 80               | 38       | 1      | 583259 04<br>586248 03 | 38<br>24 | 4      |
| 221031 21                | 46       | 3      | 589700 80              | 22       | 1      |
| 221040 08                | 24       | 7      | 595084 80              | 14       | 1      |
| 2210463 15               | 18       | 2      | 595085 80              | 16       | 1      |
| 221803 28                | 46       | 5      | 597255 02              | 32       | 1      |
| 221803 34                | 18       | 4      | 597256 01              | 20       | 3      |
| 223101 32                | 46       | 4      | 598371 08              | 34       | 1      |
| 223107 06                | 24       | 8      | 598372 01              | 34       | 2      |
| 53550654 01              | 38       | 4      | 598546 80              | 14       | 2      |
| 53550655 01              | 38       | 2      | 70528                  | 18       | 3      |
| 53551716 02              | 32       | 3      | 9000188 03             | 26       | 1      |
| 539436 01                | 12       | 3      | 9004096 80             | 40       | 22     |
| 546229 11                | 30       | 3      | NO NODE 01             | 40       | 15.1   |
| 546229 35                | 28       | 10     |                        |          |        |
| 546229 35                | 28       | 13     |                        |          |        |
| 571395 03                | 34       | 4      |                        |          |        |
| 573695 80                | 28       | 1      |                        |          |        |
| 576792 02                | 28       | 11     |                        |          |        |
| 576792 03                | 30       | 1      |                        |          |        |
| 578784 05                | 12       | 1      |                        |          |        |



#### **S and P Flex Separation**



Only foreseeable conditions have been taken into consideration. No warnings are given for situations arising from unintended usage of the system components and tools.

#### **Marine & Diesel Equipment**

Printed Jun 2008

Document No. 587876-02

Configuration no.

| Safety                             | 1   |
|------------------------------------|-----|
| System Description                 | 2   |
| Operating Instructions             | 3   |
| Parameter List                     | 4   |
| Alarms and Fault Finding           | 5   |
| Installation System<br>Reference   | 6   |
| Separator Manual                   | 7   |
| Separator Spare Parts<br>Catalogue | 8   |
| Ancillary Spare Parts<br>Catalogue | 9   |
| Optional Equipment                 | 1.0 |

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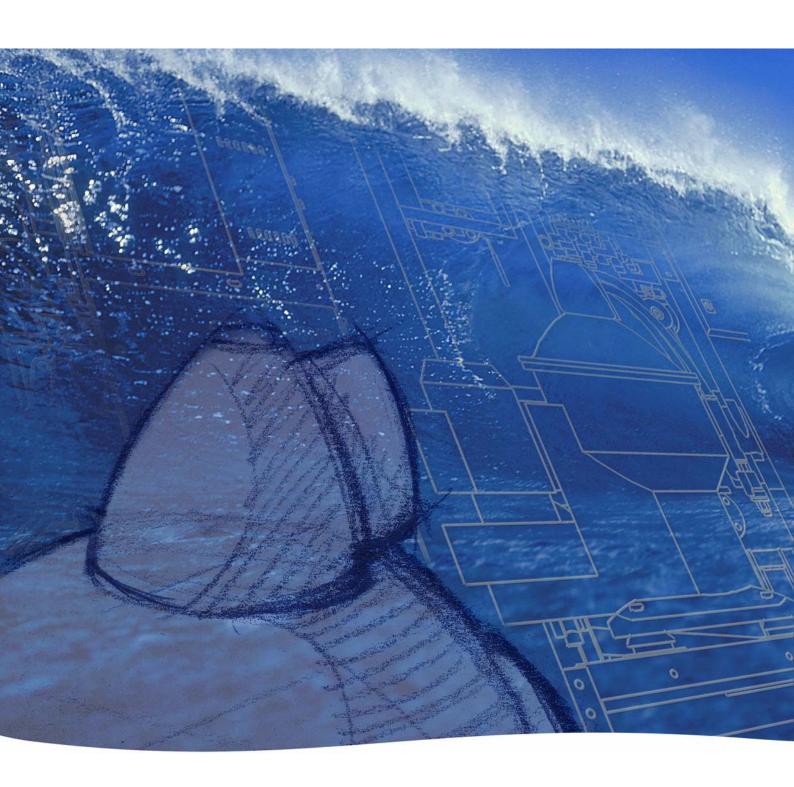
# **S and P Flex Separation**

# Safety

Printed Feb 2008

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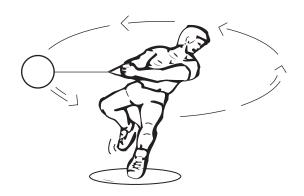
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# 1 Safety Instructions

Important - read this!

The centrifugal separator includes parts that rotate at very high speeds, generating huge forces. It is therefore essential for the safe operation of this separator system that you read and understand this manual, including the warning signs and safety precautions presented in this manual. Failure to do so may cause a fatal accident.



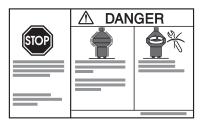
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### 1.1 Key Factors for Safe Operation

The separation system is designed and supplied for a specific function (type of liquid, rotational speed, temperature, density, etc.). The system must be used for this function only, and strictly within Alfa Laval's specifications.

Incorrect operation or maintenance may result in a heavy unbalance, reduction of material strength, etc. that could lead to serious breakdown with fatal injury or damage to property.

For safe operation, strictly follow the instructions for installation, operation and maintenance in this manual.



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# The following is compulsory for safe operation:

- 1 Never start up a separator before the bowl is completely assembled, and all fastenings securely tightened.
- 2 Never discharge a vibrating separator. Always stop with the emergency stop button.
- 3 Never begin to disassemble a separator before it has come to a complete standstill.
- **4** Always set the discharge intervals according to instructions in the instruction book.
- **5** Never ignore alarms. Always eliminate the cause before resuming operation.
- 6 Never use the separator for other liquids than those specified by Alfa Laval.
- 7 Never operate a separator with a different power supply frequency than stated on the machine plate.
- **8** Clean the operating system regularly to avoid sludge discharge malfunction.
- **9** Ensure that personnel are fully trained and competent in installation, operation, maintenance, and emergency procedures.
- **10** Use only Alfa Laval genuine spare parts and the special tools supplied.

# 1.2 Warning Sign Definitions

Below are definitions of the warning signs used.

#### Danger - serious injury or death

This type of safety sign or instruction indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

#### Example:



#### **Entrapment hazard**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work.

#### Warning - serious injury or death

This type of safety sign or instruction indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

#### **Example:**



#### **Disintegration hazard**

If unusually strong vibration occurs, press the Emergency Stop button and leave the room. Do not enter the room after an emergency stop while the separator is still rotating.

#### **Caution - minor or moderate injury**

This type of safety sign or instruction indicates a situation which, if not avoided, could result in minor or moderate injury.

'CAUTION' used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, could result in equipment damage.

#### **Example:**



#### **Burn hazard**

Various machine surfaces can be hot and cause burns.

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# 1.3 Summary of Safety Hazards

Below follows a selection of the warnings which have been used in the text of this instruction manual to ensure safe installation, start-up, operation, stop, and maintenance. Further warnings are to be found in the appropriate places throughout the manual.

#### Start-up

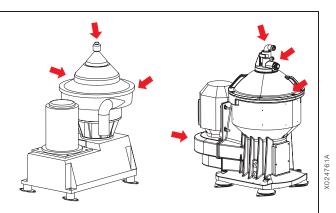
Check that the separator is correctly assembled and connected to power supply of correct voltage and frequency. The control panel must be ON.

Be specially observant during start-up. If there is any abnormal vibration, immediately stop the separator and investigate the cause. Clean the bowl if it contains sediment.



#### **Breakdown hazard**

Assemble the separator completely before start. All couplings, covers, and guards must be in place and properly tightened. Failure to do so may lead to breakdown.





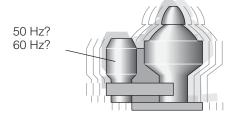
#### **Electrical hazard**

Follow local regulations for electrical installation and earthing (grounding).



#### **Breakdown hazard**

Check that the power frequency is in agreement with the machine plate. If incorrect, resulting overspeed may cause breakdown.



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Use the separation system for the purpose, and within the limits, specified by Alfa Laval. Failure to do so could cause a violent breakdown.



If power cable polarity has been reversed, the separator will rotate in reverse, and vital rotating parts can loosen.



Check the oil level before start. Top up when necessary. Do not overfill.

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#### **Operation**



#### **Excessive vibration**

If vibration increases, or continues at full speed, keep bowl filled and stop the separator.

The cause of the vibration must be determined and corrected before starting again!

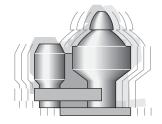
Excessive vibration may be due to incorrect assembly or insufficient cleaning of the bowl.



#### **Breakdown hazard**

If strong vibration occurs, press the emergency stop button and evacuate the room.

Never discharge a vibrating separator. Vibration may then become violent and result in breakdown.





#### **Disintegration hazard**

After an emergency stop, the cause of the fault must be identified.

If all parts have been checked and the cause not found, contact Alfa Laval for advice before restarting the separator.



#### **Burning hazard**

Lubricating oil and various machine surfaces can be hot and cause burns.



#### **Noise hazard**

Use ear protection if noise levels are high.

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#### **Breakdown hazard**

Never reset an alarm without first finding and remedying the cause.



#### **Disintegration hazard**

Do not discharge a vibrating separator. Vibration can increase if solidified sludge is only partially discharged.



#### **Burn hazard**

Avoid contact with hot surfaces. Process pipes, various machine surfaces, and processed liquid can be hot and cause burns.



#### Slip hazard

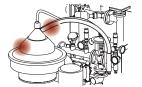
Check all connections for leakage.

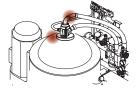
Oil leakage may make the floor slippery.

If speed or starting power is not correct:



Stop and change the belt transmission to suit the power supply frequency.





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#### **Stop**



#### **Breakdown hazard**

Stop the separator by means of the control unit, and not by turning off the motor.

Never attempt to clean the bowl by manual discharge in connection with stop.

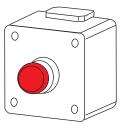
#### **Emergency stop**



#### **Disintegration hazard**

If unusually strong vibration occurs, press the Emergency Stop button and leave the room

Do not enter the room after an emergency stop while the separator is still rotating.





#### **Disintegration hazard**

Do not start the separator after an emergency stop without first remedying the cause of the emergency.

Make sure that the bowl is clean before restart.

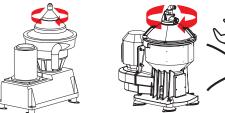
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#### **After emergency stop**



#### **Entrapment hazard**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work. The rotation indicator lamp, where applicable, must be off.







#### **Entrapment hazard**

To avoid accidental start, switch off and lock power supply before starting any dismantling work.

Make sure that separator has come to a complete

standstill before starting any dismantling work



#### **Disintegration hazard**

Do not start the separator after an emergency stop without first remedying the cause of the emergency. Make sure that the bowl is clean before restart.

#### **Maintenance**



#### **Entrapment hazard**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work. The rotation indicator lamp, where applicable, must be off.





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#### **Disintegration Hazards**

Separator parts that are either missing, worn beyond their safe limits or incorrectly assembled, may cause severe damage or fatal injury.



#### **Burn and Corrode Hazards**

Escaping hot and/or corroding process material, which can be hazardous, may still remain in the separator after stop.



#### **Disintegration hazards**

Use of imitation spare parts may cause severe damage.



#### **Entrapment hazard**

To avoid accidental start, switch off and lock power supply before starting any dismantling work.

Make sure that the separator has come to a complete standstill before starting any dismantling work.



The nut must not be removed before the separator has stopped.



#### **Crush hazard**

The top disc can adhere to the bowl hood when lifting. Be careful not to accidentally drop it.



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## Risk for eye injury from flying seal ring parts

The seal ring breaks when removed from the bowl hood.



#### **Crush hazard**

The distributor and disc stack can adhere to the top disc. Separate them from the top disc so that they do not accidentally drop.



#### **Cut hazard**

Sharp edges on the separator discs may cause cuts



#### **Crush hazard**

The ring on the lifting tool must be pushed down against the discharge slide, otherwise the discharge slide may come loose from the tool.



#### **Crush hazard**

Support the bowl body when turning to prevent it from rolling.



#### **Crush hazard**

The motor will come off if the screws are unscrewed.

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#### **Crush hazard**

Do not rotate the spindle assembly during lifting. The spindle assembly may otherwise come loose from the lifting tool.



#### Risk for eye injury from flying snap ring

Use the correct pliers for dismantling of snap ring to avoid accidental release.



#### **Crush hazard**

If not supported, the motor with coupling will drop when removing the screws.



#### **Electrical hazard**

If the cables are not disconnected during lifting procedures, they may become damaged.



#### **Inhalation hazard**

When handling friction blocks/pads wear a mask to avoid inhalation of dust.

DO NOT USE COMPRESSED AIR TO REMOVE

DUST. Remove dust using vacuum or a damp cloth.



#### **Crush hazard**

The centrifugal clutch is heavy and can fall, causing injury, when loosened from the motor shaft.



#### **Electrical hazard**

Never wash down a separator with a direct water stream.

Never play a water jet on the motor. Totally enclosed motors can be damaged by direct hosing to the same extent as open motors, resulting in short-circuit and internal corrosion.



#### **Disintegration hazards**

Always contact your Alfa Laval representative if you suspect that the depth of the corrosion damage exceeds 0.5 mm (0.2 mm for bowl body and bowl hood) or if cracks have been found. Do not continue to use the separator until it has been inspected and given clearance for operation by Alfa Laval.



Max. 0,2 mm



#### **Disintegration hazard**

Pits and spots forming a line may indicate cracks beneath the surface.

All forms of cracks are a potential danger and are totally unacceptable.

Replace any part where corrosion can be suspected of affecting its strength or function.



#### **Disintegration hazard**

All forms of cracks are potentially dangerous as they reduce the strength and functional ability of components.

Always replace a part if cracks are present.

584610-02



#### **Disintegration hazard**

Erosion damage weakens parts by reducing the thickness of the material.

Pay special attention to the pillars between the sludge ports in the bowl wall.

Replace parts if erosion is suspected of affecting strength or function.



#### **Disintegration Hazard**

If the belt pulley must be renewed, check that the new pulley has the correct diameter. An incorrect pulley will cause the separator bowl to run at either an excessive or insufficient speed.



#### **Burn hazard**

Use protective gloves when handling any heated parts.



#### Risk for eye injury from flying snap ring

Use the correct pliers for assembly of snap ring to avoid accidental release.



#### **Cut hazard**

Do not put fingers between the frame and air deflector while lowering the assembly.



#### **Disintegration hazard**

Impact marks may cause the separator to vibrate while running.



#### **Crush hazard**

The ring on the lifting tool must be pushed home against the discharge slide, otherwise it may come loose from the tool.



The number of discs may have to be increased to adjust the disc stack pressure. Always check before operating the separator.



#### **Crush hazards**

A falling separator can cause accidents resulting in serious injury and damage.

Never lift the separator by any other method than described in this manual.



#### **Crush hazards**

Use correct lifting tools and follow lifting instructions.



#### **Disintegration hazard**

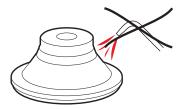
Separator parts that are either missing, worn beyond their safe limits, or incorrectly assembled, may cause severe damage or fatal injury.



#### **Disintegration hazard**

Do not weld nor heat parts that are subject to highspeed rotation.





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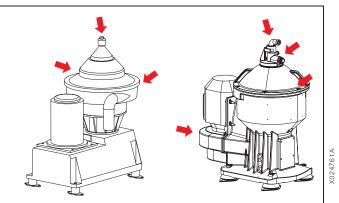
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#### **Separator reassembled**



#### **Breakdown hazard**

Assemble the separator completely before restart. All couplings, covers, and guards must be in place and properly tightened. Failure to do so may lead to breakdown.



#### **Cleaning in place**



#### **Health Risk**

Do not forget to disconnect the CIP equipment and re-connect connections.



Use only Alfa Laval recommended CIP liquids.

### 1.4 Optional Heaters

#### 1.4.1 CBM heaters



#### **Burn Hazard**

The heater must not be used without the insulated protection cover. This shields the hot surfaces and also acts as a safety cover in the unlikely event of leakage.



#### **Burn Hazard**

To prevent pressure or heat shocks in the system, adjustment of the flow rate must be carried out slowly. The heater can otherwise be damaged.



#### **Burn Hazard**

Shut off the oil flow and the heating medium flow before starting maintenance.



#### **Corrosion Hazard**

Pay strict attention to the safety instructions for the cleaning liquid used.



#### **Burn Hazard**

Make sure that the relief valve outlet leads into a collecting tank or below floor level.

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#### 1.4.2 Electric heaters



#### **Electrocution Risk**

Switch off the main power before opening the heater junction box, or dismantling the heater.



It is very important that the correct heater element is installed.

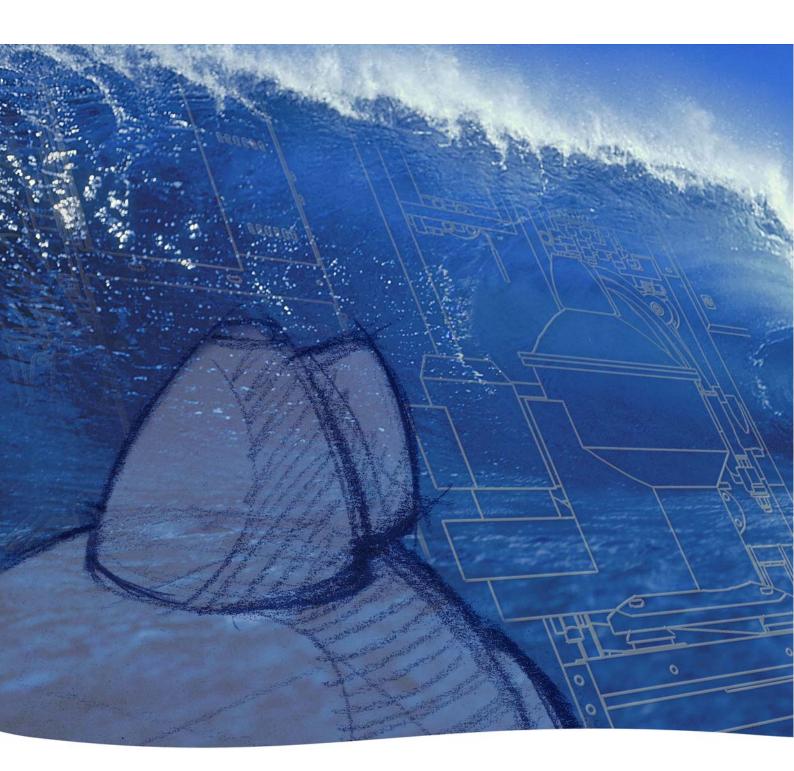
## S 805/815 Flex separation



# **System description**

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# 1 System Overview

The S-Type Separation System is designed for cleaning of fuel and lube oils for diesel engines, and fuel oil for gas turbine engines, in marine and power applications.

In the process, heated oil is fed through the separator to clean the oil from solid particles and water.

The basic separation unit comprises:

- A separator.
- Ancillary equipment including control unit.
- Optional equipment such as, butterfly valve, vibration switch, etc.

During the process, the cleaned oil leaves the separator through the oil outlet while separated water and sludge accumulate at the periphery of the rotating separator bowl.

The control unit supervises the entire operation of the separation system, performing monitoring, control, and alarm functions.

The process adapts automatically to certain changes in conditions, such as increased water content in the unprocessed oil, high or low oil feed temperature, etc.

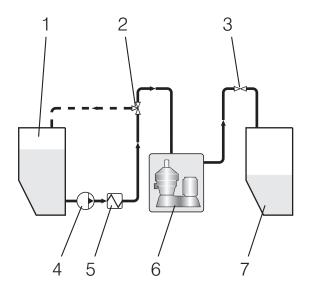
In cases where the water content is too high, the machine can be used as a purifier using the supplied gravty discs.

### 1.1 Oil Flow

The unprocessed oil is fed through a heater by a feed pump, operating at a constant flow.

A change-over valve directs the oil to the separator. The cleaned oil is pumped from the separator to either the daily service tank (fuel oil), or back to the engine (lube oil).

During separator start and stop procedures, during alarm conditions, or if the oil temperature is outside the preset range, the oil is directed by the change-over valve to a return line back to the engine sump or settling tank.

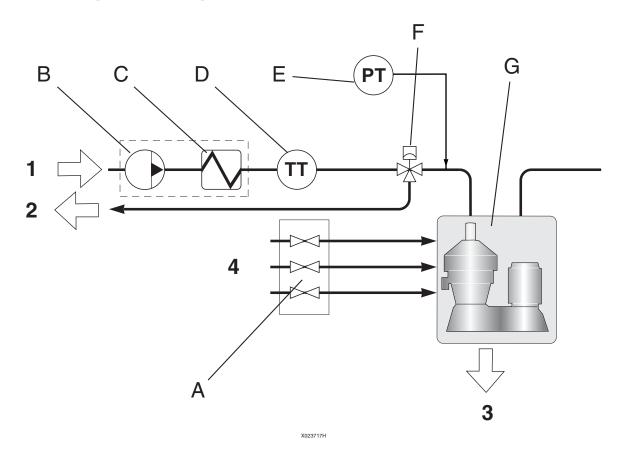


#### P003716b

- 1. Settling tank
- 2. Change-over valve
- 3. Backpressure regulating valve
- 4. Pump
- 5. Heater
- 6. Separator
- 7. Daily service tank

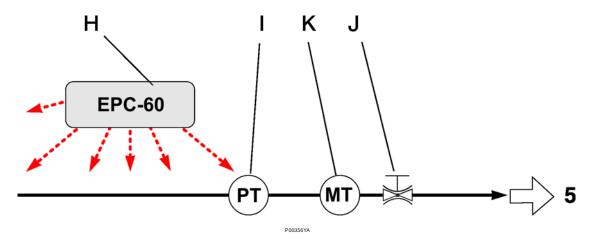
1.1 Oil Flow 1 System Overview

### 1.2 System Layout



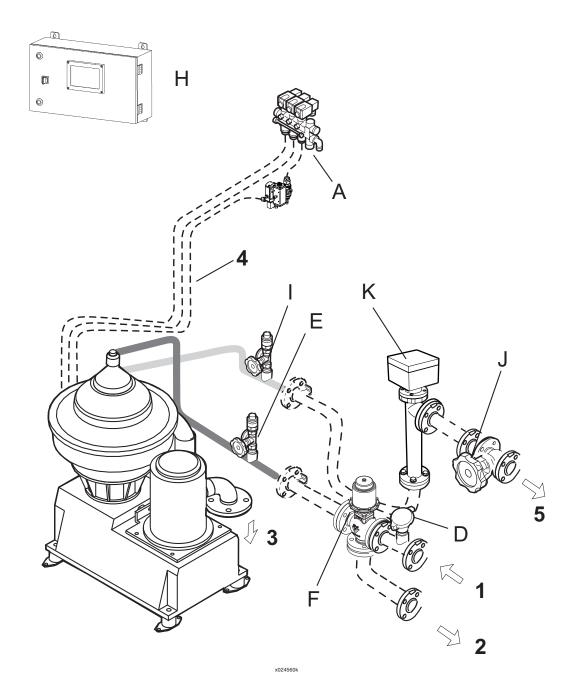
- 1. Unprocessed oil inlet
- 2. Oil return
- 3. Sludge and water outlet
- 4. Water inlet
- A. Solenoid valve block, water: Distributes separator opening/closing water, and conditioning water.
- B. Feed pump: Feeds unprocessed oil to the separator.
- C. Heater: Heats unprocessed oil to separation temperature.
- D. Temperature transmitter (TT1, TT2): Measures the oil temperature and signals the control unit.
- E. Pressure transmitter, oil (PT1): Measures the pressure in the oil inlet, and signals the control unit.
- F. Pneumatically controlled change-over valve (V1):
  Directs the unprocessed oil to the separator, or back to the settling tank (recirculation fuel oil only).
- G. Separator: Cleans the oil by removing water and solid particles.
- ———.Optional equipment not part of the S Flex Separation System

1 System Overview 1.2 System Layout



- 5. Clean oil outlet to service tank
- H. Control unit: Supervises the separation system.
- I. Pressure transmitter, oil (PT4): Measures the pressure in the oil outlet, and signals the control unit.
- J. Regulating valve (RV4): Regulates the backpressure in the clean oil outlet.
- K. Water transducer (MT60): Measures change in water content in the cleaned oil, and signals the control unit.

## 1.3 System Components



- 1. Oil inlet
- 2. Oil recirculation
- 3. Sludge and water outlet
- 4. Operating water
- 5. Clean oil outlet
- A. Safety valve SV10A (lube oil only)
- D. Temp transmitter (TT1, TT2)

- E. Pressure transmitter (PT1)
- F. Change-over valve
- H. EPC 60 Control unit
- I. Pressure transmitter (PT4)J. Back pressure valve (RV4)K. Water transducer (MT60)

# 2 The Process

## 2.1 Principle

During the separation process, sludge and water accumulate at the periphery of the separator bowl.

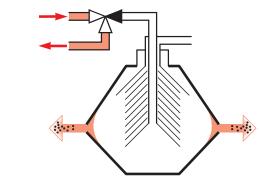
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- A. Sludge and water
- B. Oil

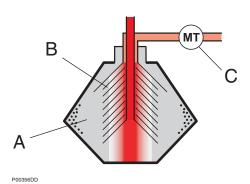
Sludge and water are discharged at preset time intervals. During discharge, the oil inlet is closed.

If there is excessive water in the bowl, this will be discharged between the preset intervals.



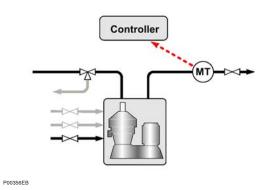
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The cleaned oil leaving the separator is tested for traces of water. Any increase in water is detected by the water transducer.



- A. Water
- B. Disc stack
- C. Water transducer

The signal from the water transducer is continuously transmitted to the control unit, in which a reference value is stored. The control unit compares the transducer signal with the reference value. A significant deviation from the reference value will cause the machine to discharge.

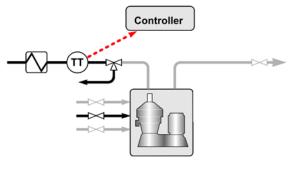


### 2.2 Process Cycle Start

First the oil pump, separator, and heater are started.

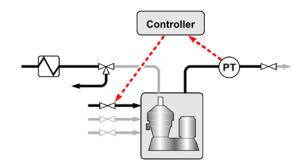
The temperature transmitter (TT) signals the control unit continuously. When the correct separator speed and the correct temperature are reached, a sludge discharge is carried out to ensure the bowl is empty. The control unit then starts the process cycle.

 Conditioning water is added to the separator bowl.

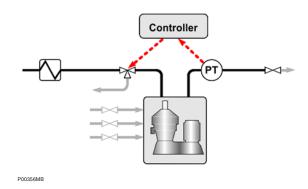


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 The change-over valve opens so that oil is directed to the separator bowl. When pressure in the oil outlet is sensed, the pressure sensor (PT) signals the control unit.

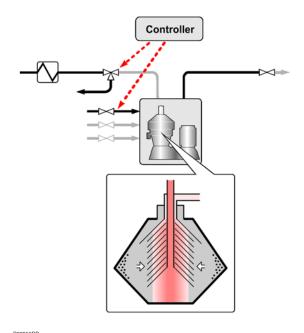


The cleaning process is now running. Unprocessed oil is fed to the separator, and clean oil is pumped from the separator. 2 The Process 2.3 Discharge

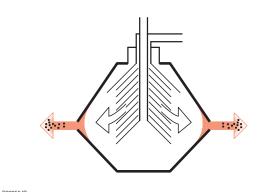
## 2.3 Discharge

The separator discharges after a preset time has elapsed. The following sequence takes place:

- 1. The change-over valve changes to oil recirculation.
- 2. The control unit signals the solenoid valve to open so that displacement water is added to push the oil towards the disc stack.



- 3. After the time for displacement water addition has elapsed, the separator discharges.
- 4. Conditioning water is then added, and a new separation cycle begins.



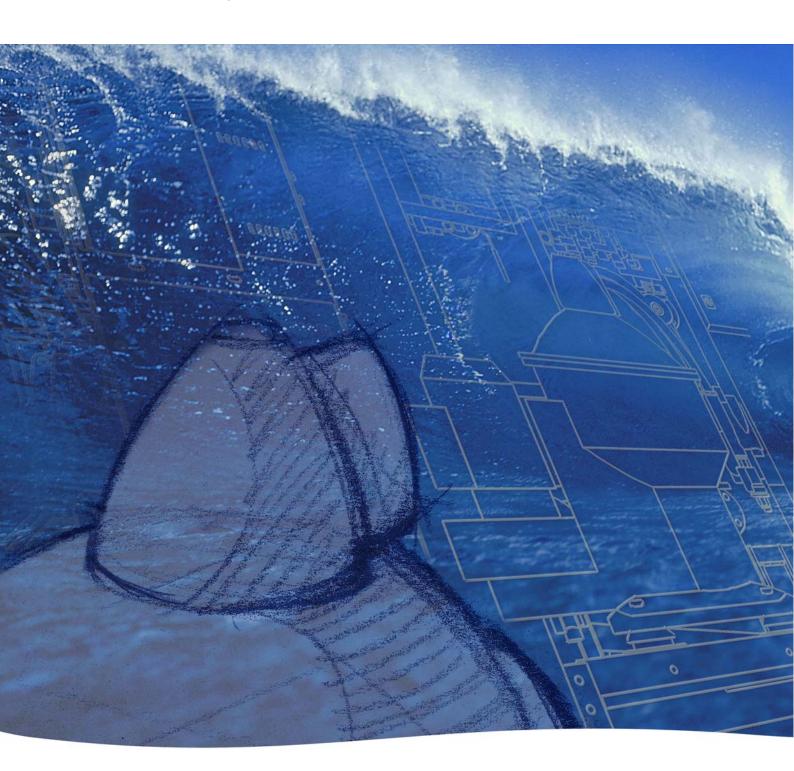
## S and P Flex Separation



# **Operating instructions**

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Alfa Laval Tumba AB SE-147 80 Tumba, Sweden

Telephone: +46 8 530 650 00

Telefax: +46 8 530 310 40

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# 1 Operating

## 1.1 Before First Startup

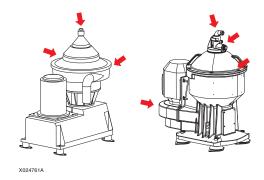
The Control Panel must be configured to suit the system components.

 Check that the separator is correctly assembled and connected to power supply of correct voltage and frequency. The control panel must be ON.



#### Breakdown hazard

Assemble the separator completely before start. All couplings, covers and guards must be in place and properly tightened. Failure to do so may lead to breakdown.





#### **Electrical hazard**

Follow local regulations for electrical installation and earthing (grounding).

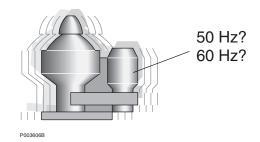


Check that the Emergency Stop Box is properly installed and functioning correctly.



#### Breakdown hazard

Check that the power frequency is in agreement with the machine plate. If incorrect, resulting overspeed may cause breakdown.



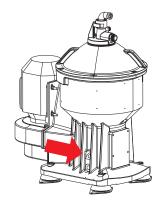


Use the separation system for the purpose, and within the limits, specified by Alfa Laval. Failure to do so could cause a violent breakdown.

2. Check the oil sump level. If necessary, top up until oil starts to run from the oil-filling hole.



Too much or too little oil can damage the separator bearings.



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#### **Rotation Direction**

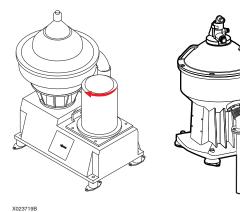
Check the rotation of the bowl using the I/O test function. See 1.16 I/O Test Function on page 47. The motor fan must rotate in a clockwise direction.



If power cable polarity has been reversed, the separator will rotate in reverse, and vital rotating parts can loosen.

#### **Operating Air Pressure**

Check that the air supply is correct (500 - 800 kPa or 5 - 8 Bar).



#### **Operating Water Pressure**

Check that the operating water pressure is sufficient (200 - 800 kPa or 2 - 8 Bar).



The LEDs on the water block and connectors indicate that the valve has power on. They do not indicate if the valve is clogged (an alarm is given if this is the case).

#### **Emergency Stop Push Box**

Check that the Emergency Stop Box is located close to the separator system and electrically connected to the Control Panel



If the Emergency Stop Box is not connected, the system will not start.

#### **Control Panel** 1.2

To start the Control Panel, switch on the main power switch on the control cabinet.

#### General

The Control Panel has three main lists.

- Operation
- **Alarms**
- Setting

#### **Operation List**

To access the Operation List at any time during the operation process press the 'Return button' repeatedly until the Operation List is reached.

The list gives information on the following where installed:

- Feed Flow
- Time to discharge, min
- Speed (SS), rpm
- Pressure (PT1, PT4, PT5)
- Temperature (TT1, TT2)
- Vibration (VIB)
- Transducer value

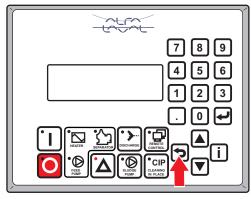
Press the arrow buttons to go up or down in the list.

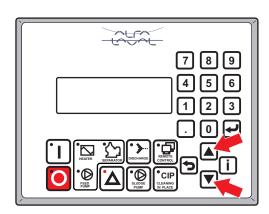


During operation, the 'Operation' list is active on the display. The present stage of operation, for example 'SEPARATION', shows on display together with operating information such as present temperature. Press the downward 'Arrow' button to go down the list.

For further information regarding alarms, see the Alarms and Fault Finding booklet.

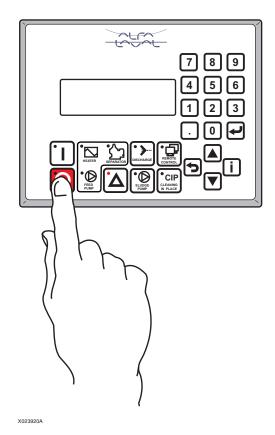
For further information regarding parameters, see the Parameter List booklet





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At any time during operation, the operator can initiate a STOP sequence by pressing the 'Stop' button.





If control panel black screen appear. See "Alarms & Fault finding" manual.

#### **Manual Start from Standstill** 1.3

Press the 'Start' button. The operator can select to start the system manually by setting parameter P130 to 'stepwise'.



First start-up is always manual and not dependant on P130 setting.

A rotation test must be carried out using the I/O test function prior to first start-up.



First start-up after power off should always be carried out manually!

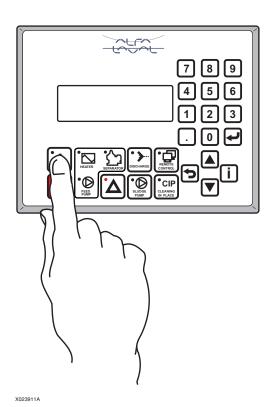


If a butterfly valve is installed, it must be opened manually before that the system can start.



If power cable polarity has been reversed, the separator will rotate in reverse, and vital rotating parts can loosen.

If speed sensor, vibration sensor, and frame cover switch are installed (P113, P114, and P115 = yes), the operator can select to start the system automatically by setting parameter P130 to 'automatic'.

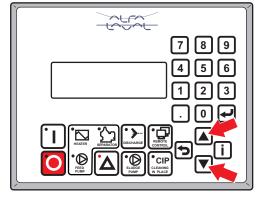


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If the power has been off and/or the separator bowl cover has been removed a number of questions which have to be answered before the system can be started are shown on the display:

'Has the bowl been dismantled? YES, NO' (S-type separator only)

Use the 'arrow' buttons to move to the alternative you want.



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When the alternative you want is blinking, press the 'Enter' button.

 If the bowl has been dismantled choose 'YES' Manual start only is possible.
 If no work has been carried out on the bowl, choose 'NO'.

For S-type separators 'Proceed without calibration' appears on the display. Stepwise/automatic start is possible (set using parameter P 130).

For P-type separators the system then goes to Standstill.



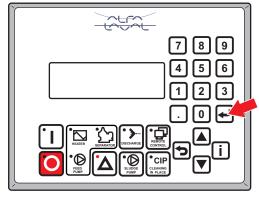
If this is the first start, answer 'YES'.

'Assembled according to manual? YES, NO'

 If the bowl has been dismantled and assembled according to the instructions in the Service Manual, choose 'YES'. (If 'NO' is chosen, the system goes to 'STANDSTILL').

'Bowl cleaned? YES, NO' (S-type separator only)

3. If the bowl has been cleaned choose 'YES'. 'Proceed with calibration' appears on the display. Local manual start only possible. If the bowl has not been cleaned, choose 'NO'. 'Proceed without calibration' appears on the display. Stepwise/automatic start is possible (set using parameter P 130).



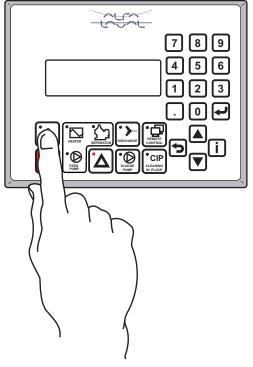
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#### Start

1. The feed pump (if installed) starts.

The LED on the start button flashes, the LED for the feed pump lights, and text 'Starting feed pump' shows on the display.

The start button LED shines steadily and the display shows either 'To start heater, press start button', or 'To start separator, press start button'.



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#### 2. Press the start button a second time.

The heater (if installed) starts.

The LED on the start button flashes, the LED for the heater lights, and text "Starting heater" shows on the display.

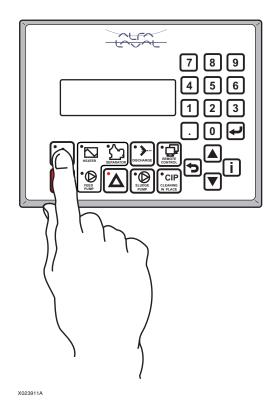
Wait for increasing temperature.

#### **Cold Start Function**

If the viscosity of the oil is high (low temperature), a smooth heater start-up is preferred. The temperature up to which the cold-start gain factor P126 is active is set in parameter P125. Above this temperature the normal P-constant P123 is used.

If the temperature has not reached the value in parameters P184 (HFO/LO low temperature limit) within the time specified in parameter P169 (alarm delay), alarm 'A24 Temperature increase too slow' will show on the display.

If the temperature feedback is correct (reading on temperature sensor TT1 above value in parameter P184), the start button LED shines steadily and the display shows 'To start separator, press start button'.



#### 3. Press the start button a third time.

The separator motor starts.

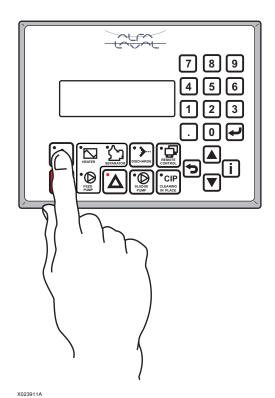
The LED on the start button flashes, the LED for the separator lights, and text 'Starting separator' shows on the display.

Wait for speed feedback (if speed sensor installed), or until the separator max. start time (4 minutes) has elapsed.

If the speed has not increased to over 90 rpm within 10 seconds after contactor K2 response, alarm 'A96 Slow start acceleration' shows on the display.

If the low speed limit value in parameter P180 has not been reached before the separator max. start time has elapsed, alarm 'A95 Separator motor run-up time too long' shows on the display.

If the separator is running above the low speed limit, the start button LED shines steadily, and the display shows the heading 'RECIRCULATION' and text 'To start separation, press start button'.



#### 4. Press the start button a fourth time.

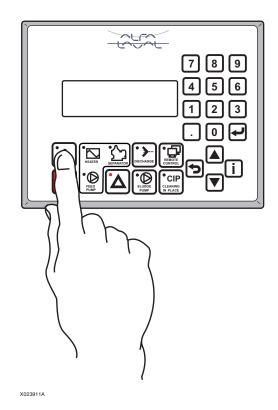
If the feed temperature is below the value in P184, the controller stays in RECIRCULATION mode. The LED on the start button flashes, and text 'Waiting in RECIRCULATION for separation temperature' shows on the display.

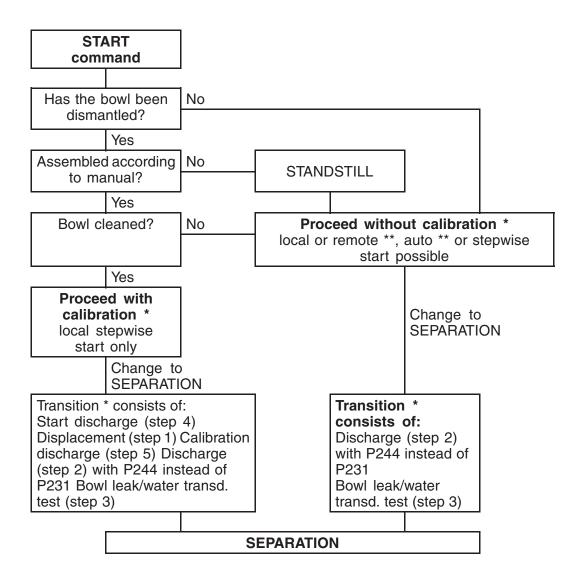
If the correct feed temperature is reached, the controller changes automatically to SEPARATION mode via a transition sequence which is shown on the display. The start button LED shines steadily, and the display shows the heading 'TRANSITION'.

If speed sensor not installed (P113 = no) or disabled (P148 = 0), change over to RECIRCULATION/SEPARATION takes place when the separator max. start time has elapsed.

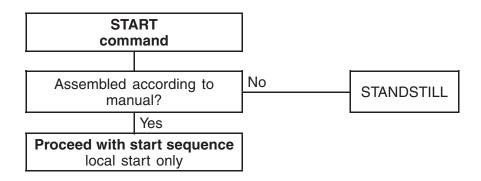


The time in 'RECIRCULATION' is limited by timer P178 to avoid overheating of the separator.





### Start P-type separator start sequence



#### **Automatic Start from Standstill** 1.4

The operator can select to start the system automatically by setting parameter P130 to 'automatic'.

The control panel automatically goes through the same procedure as described under Manual Start from Standstill.

If the bowl has not been dismantled or cleaned, the previously calculated filling time (parameter P233) is used, a discharge sequence and a bowl leakage/water transducer test are run, and the system goes into SEPARATION mode.

The following equipment must be installed for automatic start:

- Vibration monitor
- Speed sensor
- Frame cover switch

## 1.5 During Separation

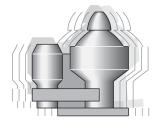
Observe information on the control panel display. The times in each sequence are shown in the bottom left-hand corner of the display



#### Breakdown hazard

If strong vibration occurs, press the emergency stop button and evacuate the room.

Never discharge a vibrating separator. Vibration may then become violent and result in breakdown.





#### Noise hazard

Use ear protection if noise levels are high.



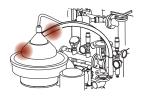
#### Breakdown hazard

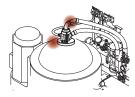
Never reset an alarm without first finding and remedying the cause.



#### **Burn hazard**

Avoid contact with hot surfaces. Process pipes, various machine surfaces, and processed liquid can be hot and cause burns.





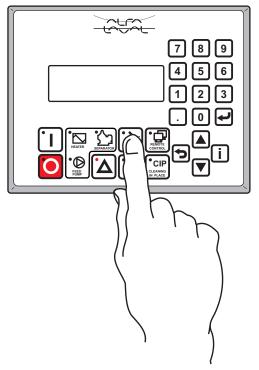


#### Slip hazard

Check all connections for leakage.
Oil leakage may make the floor slippery.

Discharge sequences run automatically at preset intervals (timer P220).

Discharge sequence can also be run manually by pressing the 'Discharge' button.

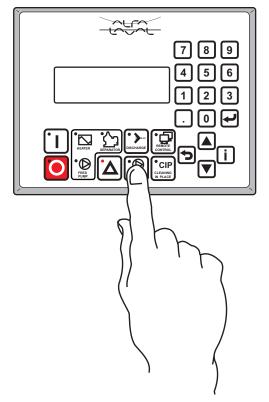


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The Sludge Pump runs during discharge or when there is high level in the sludge tank, or can be started manually by pressing the 'Sludge Pump' button on the control panel.



Do not run the sludge pump longer than necessary. If the pump is run while dry it can be damaged.



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In SEPARATION mode, the feed pump is running, the feed has reached separation temperature (the heater is working) and the separator is running at full speed.

Feed valve V1 is open to the separator inlet.

### **1.6** Stop



#### **Breakdown hazard**

Stop the separator by means of the control unit, and not by turning off the power.



Never attempt to clean the bowl by manual discharge in connection with stop.

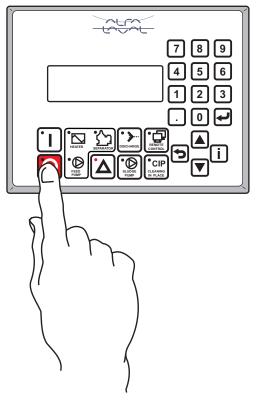
To stop the system:

The operator can stop the system when in the 'START', RECIRCULATION', or 'SEPARATION' modes.

- 1. Stop the system by pushing the 'Stop' button on the control panel. The following sequence takes place:
  - A stop discharge and flushing sequence are initiated (does not apply to stop from 'START').



Filling and flushing are not performed if the discharge feedback has not been received



- The separator motor is turned off and the stop timer starts running. At the same time, the heater is turned off (see 1.13.4 Heater shut down on page 42. The system waits for the feed temperature and speed to decrease.
- If the speed limit in P180 (low speed limit) is not reached within 3 minutes, alarm 'A94 Bowl speed high during STOP' is given.
- When the bowl speed has reached 4000 rpm, closing water valve SV16 is activated for 1 second in order to keep the bowl closed.
- If speed sensor not installed (P113 = no) or disabled (P148 = 0), SV16 opens for 1 second 5 minutes after the separator motor has been turned off.
- When 3 minutes has elapsed, the feed pump is turned off.
- The system waits for the speed sensor (if installed) to indicate zero speed.
   When the bowl has been still for 60 seconds, 'STAND STILL' shows on the display.
- If speed sensor not installed (P113 = no) or disabled (P148 = 0), 'STAND STILL' is shown when the stop timer has elapsed.
- The sludge pump runs for 10 seconds after STAND STILL is reached if stopped from SEPARATION mode or RECIRCULATION mode.
- All equipment except the sludge pump (which can still be run manually) is now deactivated.



If the system is switched off, it can in most cases be switched on again without waiting for the separator to slow down. See 1.3 Manual Start from Standstill on page 10, and the *Alarms and Fault Finding* booklet.



#### Breakdown hazard

The system must not be restarted with the separator rotating if high vibration alarm has been given.



#### Disintegration hazard

If an emergency situation or unusually strong vibration occurs, press the Emergency Stop button and evacuate the room.

If oil spray, feed pump is stopped by emergency stop button.

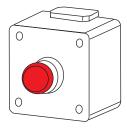
Do not enter the room after an emergency stop while the separator is still rotating.

The following sequence occurs:

- The power to heater pump and separator motor is shut-down immediately.
- Stop timer starts.
- If a steam heater is installed, the steam shutoff valve is forced to close.
- Closing water valve SV16 opens for 15 seconds.
  - SV10 is open for 15 seconds if the speed is supervised and the speed is over P255, or if there is no speed supervision.
- All other equipment is deactivated.



In order to be able to restart, the system must be at standstill.



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### 1.8 After Emergency Stop

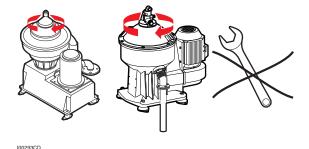
#### Separator standstill

Dismantling work must not be started before all rotating parts have come to a complete standstill.



#### **Entrapment hazard**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work. The rotation indicator lamp, where applicable, must be off.



#### Avoid accidental start



#### **Entrapment hazard**

To avoid accidental start, switch off and lock power supply before starting any dismantling work. Make sure that separator has come to a complete standstill before starting any dismantling work.

#### Remedy the cause

The cause of the emergency must be remedied before attempting to restart the separator. If the cause is not found, an overhaul must be performed on the separator, and all moving parts thoroughly checked.



#### Disintegration hazard

Do not start the separator after an emergency stop without first remedying the cause of the emergency. Make sure that the bowl is clean before restart.

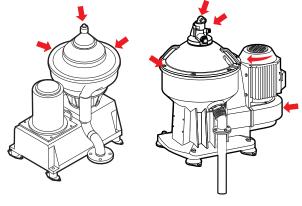
#### Separator reassembled

The separator must be fully reassembled with all covers and guards in place and tightened before unlocking the power supply and starting the system.



#### Breakdown hazard

Assemble the separator completely before restart. All couplings, covers, and guards must be in place and properly tightened. Failure to do so may lead to breakdown.







Check that the Emergency Stop Box is properly installed and functioning correctly.



Check that all ancillary equipment, in particular the heater, is functioning correctly.

### 1.9 Separator Emergency Operation

If the Control System has a total failure, the Separator and Feed Pump can be run manually. Jumpers or pushbuttons can be connected between terminals X1:113 - 114 (for separator) and X1:115 - 116 (for feed pump). Separator and Feed Pump will start immediately when these terminals are bridged, but can be stopped with the Emergency Stop pushbutton.



- No supervision of the separator is performed, as the Control System is deactivated.
- The system must be manually supervised by trained operator when running.
- All actions must be performed by trained operator, such as closing bowl, discharge, sludge pump running and it is done on the manual actuators on the valves.

### 1.10 Cleaning In Place

The use of Cleaning In Place (CIP) equipment is recommended for best separation results. For further information on the CIP equipment, see the CIP booklet, bookno. 1817261.

#### 1.10.1 CIP Start

CIP can be selected from STAND STILL only, and only from a local control panel.

Press the CIP button to select CIP.



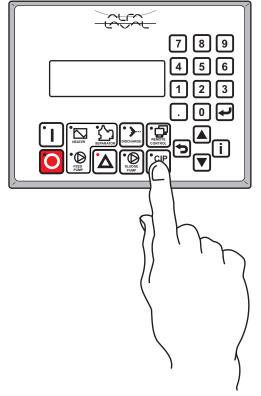
During CIP the separator is running at full speed, but feed pump, heater, process valves, temperature and pressure supervision and water transducer MT60 are neither controlled nor supervised.



Avoid accidental start of feed pump

To avoid accidental start, switch off and lock power supply for feed pump.

Leakage of Hot oil may occur if feed pump is accidentally started.

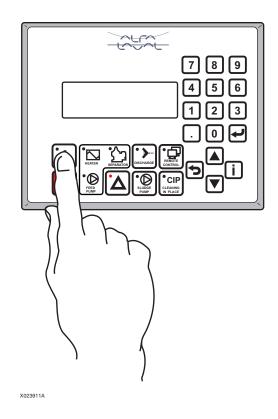


Connect hoses for CIP liquid before pressing "start" button.

With CIP selected from STAND STILL, press the 'START' button to start the separator motor. The motor starts unless the system prevents start, or alarms are active.

Wait for speed feedback.

- Speed has to increase to above 90 rpm within 10 seconds after contactor K2 response, otherwise alarm 'A96 Slow start acceleration' will be shown on the display.
- Speed limit in parameter P180 has to be reached within 4 minutes, otherwise alarm 'A95 Separator motor run-up time too long' will be shown on the display.
- When the separator is running above low speed limit (P180), or 4 minutes has elapsed if speed sensor not installed (P113 = no) or disabled (P148 = 0), a message to start the cleaning liquid supply is given to the operator.

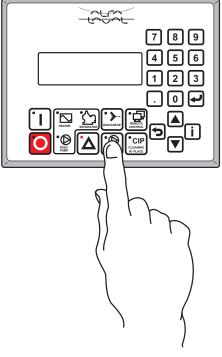


### 1.10.2 CIP Running



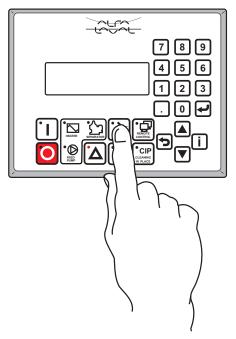
When the bowl has reached normal speed, a bowl closing procedure will be performed.

While the CIP system is running, closing water valve SV16 opens for 2 seconds and closes for the time set in parameter P228 (pulse interval) repeatedly. The sludge pump runs when there is high level in the sludge tank or when activated by pressing the 'SLUDGE PUMP' button on the control panel.



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A discharge can be activated manually during the CIP process by pressing the 'DISCHARGE' button on the control panel.



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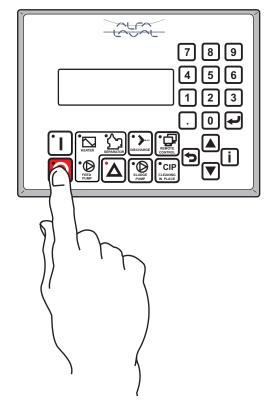
#### 1.10.3 CIP Stop

Stop the CIP process by pressing the 'Stop' button on the control panel. The CIP process can be restarted.

- The separator motor is turned off. Alarm delay (3 minutes) starts, and stop timer starts. If the speed limit in parameter P180 (alarm limit bowl speed low) is not reached within 3 minutes, alarm 'A9 Bowl speed high during STOP' is given.
- When the bowl speed has reached 4000 rpm, closing water valve SV16 is activated for 1 second in order to keep the bowl closed.
- If there is no speed sensor installed (parameter P113 = no) or disabled (parameter P148 = 0), SV16 opens for 1 second 5 minutes after the separator motor has been turned off.
- The system waits for the speed sensor (if installed) to indicate zero speed. When the bowl has been still for 60 seconds, 'STAND STILL' shows on the display.
- If there is no speed sensor installed (parameter P113 = no) or if speed sensor disabled (parameter P148 = 0), 'STAND STILL' is shown when stop timer has elapsed.
- If the bowl speed has been above P180, or the start timer has elapsed, the sludge pump runs for 10 seconds after 'STANDSTILL'.
- Hold the 'CIP' button pressed for 5 seconds to leave CIP mode.

#### After cleaning:

- Open the heater drain valve until the flushing water has drained.
- 2. Close the drain valve.
- Remove the CIP connections.
- 4. Return the turnable connections to their former positions and re-tighten.
- 5. Re-open the valves before and after the heater.



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#### **Health Risk**

Do not forget to disconnect the CIP equipment and re-connect the process connections.

### 1.11 Check if separator bowl is clogged

#### **Valid for Purifiers (not Alcap or Clarifiers)**

Purifiers have no automatic indication if the bowl is clogged or filled with too much solids. Recommendation is to check each Bunker analyze report and determine if there is any risk for a higher than normal sludge production. The time between each sludge discharge should then be reduced accordingly.

From time to time, and especially when a new Bunker is introduced, it is advisable to do as follows:

- Introduce water into the bowl by open manually the SV10 solenoid valve, on the Operating Water Block.
- Check that this water is coming out from the bowl by unscrewing the Inspection Plug on the sludge pipe.
   Please however ,make sure that the machine is not about to make a discharge!
   Splash hazard.

If water is seen flowing in the pipe, turn off SV10 and keep operating as before.
The bowl is not clogged.

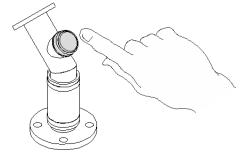
If no water is seen , then the bowl is clogged. Make a discharge.

If still the water is not seen in the Inspection plug ,turn off SV 10 and shut down the Purifier system.

Open and clean up the bowl.



By opening the Inspection Plug without adding any water, it can also be verified that no small oil leakage is escaping from the bowl during operation.



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#### 1.12 **Intervals Between Sludge Discharges**

(Valid for P 625/635/626/636 only)

#### 1.12.1 **Background**



#### Disintegration hazard

Experience has shown that if intervals between sludge discharges are too long, a compact and hard sludge cake can accumulate. On discharge, this cake may break up and be discharged unevenly causing imbalance in the bowl. If imbalance is excessive, there is risk for serious mechanical damage and injury to personnel.

Recommendations are given regarding initial intervals between sludge discharges for different applications. The setting may subsequently have to be changed after actual inspection of the bowl.

#### 1.12.2 **Recommended intervals** between sludge discharges

Many factors influence accumulation and hardening of sludge between the discharges, so the appropriate interval depends on local conditions. However, in order to have a reasonable starting point the following table shows recommended initial discharge intervals and operating times to first inspection.

#### 1.12.3 Fuel oil cleaning

| Type of fuel                         | Recommendations                      |                               |  |
|--------------------------------------|--------------------------------------|-------------------------------|--|
|                                      | Initial intervals between discharges | Time to first bowl inspection |  |
| Distillate (1.5 – 6 cSt/40 °C)       | 4 hours                              | 1 week                        |  |
| Marine Diesel Oil (max. 14cSt/40 °C) | 2 hours                              | 1 week                        |  |
| Heavy Fuel Oil (Max interval)        | 1 hour ( 2 hours )                   | 2 days                        |  |

Conditions may change completely when bunkers are changed. Therefore, great care must be given to the discharge interval setting for each new bunker. In case the actually used discharge interval exceeds the recommended initial value, the interval setting has to be reduced, according to the table above, when a new, unfamiliar bunker is separated. Use of unstable fuel or mixing of incompatible fuel oils may give precipitation of sludge and overloading of the separator.

### 1.12.4 Lubricating oil cleaning

#### Continuous operation:

In a new lubricating oil system the oil is initially clean but as it gets dirtier the interval between discharges will have to be shortened until a "steady state" is reached. Following information refers to systems in "steady state".

| Type of fuel                | Recommended intervals for Crosshead and Trunk |                               |  |
|-----------------------------|---|-------------------------------|--|
|                             | Initial intervals between discharges          | Time to first bowl inspection |  |
| Main lubricating oil system | 1 - 2 hours                                   | 1 week                        |  |

#### If separator has been out of operation:

If the separator has been out of service for 24 hours or longer, while the engine has been running, the interval between discharges has to be shortened. In this case the recommendation is:

- Discharge interval 5 minutes until the whole oil volume has passed twice through the separator.
- After that resume normal discharge interval.

#### Intermittent operation:

For installations where one separator serves one engine which is temporarily stopped the following recommendations apply: If the engine is to be stopped for 24 hours or less:

- Keep the separator in operation for 8 hours after the engine is stopped.
- Start the separator 8 hours before the engine is started again.

Doing so most of the suspended particles and water condensate will be removed from the system and not settle in the sump tank. For installations where one separator serves more than one engine the following recommendations apply:

- Continuous use of the separator whenever possible.
- Frequent switches between the engine systems to be cleaned. In a typical case with one separator serving 2–4 auxiliary engines switching after maximum 24 hours of cleaning.

#### **Discharge interval:**

| Engine has been in operation with-out cleaning of the system oil           | Engine has not been in operation since last cleaning of system oil |
|--|--|
| Discharge interval 5 min.  | Normal discharge interval  |
| Duration until the whole oil volume has passed twice through the separator |  |
| After that resume to normal discharge interval                             |  |

### 1.12.5 Bowl inspection

To check if the initially selected interval is appropriate, the bowl should be inspected after a short test period shown in the previous tables.

#### If sludge space is clean:

Interval may be prolonged with steps of 15 minutes, but it must not exceed three times the recommended initial interval.

"Sludge space is clean" means that no noticeable amount of hard sludge remains in the sludge space.

#### If sludge space is dirty:

Interval has to be shortened.

When the bowl is opened for routine cleaning, the sludge space should always be inspected and evaluated. If necessary, the interval between discharges should then be changed accordingly.



Alfa Laval assumes no responsibility for the actual choice of discharge intervals, as these entirely depend on local conditions.

### 1.13 Heater Control (optional)

The temperature in the feed inlet is normally supervised via TT1, and can be controlled by a heater via TT2. Supervision and control are active even if one of the sensors is disabled. TT2 can be used by the customer; no alarm is given. TT2 is disabled in this case.

The heater is controlled according to temperature setpoint P249 using a PI-regulator with output:

$$Y(k) = Y(k+1) + P + I$$

where the proportional part

$$P = Kp *(e(k) - e(k-1))$$

and integral part

$$I = Ki * e(k) / Ti$$

The error e = SetValue - ActualValue, is the difference between the desired value (P249) and the actual value (reading on TT) where k = point of time

The tuning of the regulator is done by modifying the amplification

Kn = Ki = 100/P122 (P122 is known as the

Kp = Ki = 100/P123 (P123 is known as the proportional band width) and integral time Ti = P124.

Every second a new output Y is calculated, i.e. the interval between each k is 1s.

With P119 it is possible to select heater control mode:

- no (no heater controlled)
- electric (electric heater controlled, P120 active)
- steam (steam heater controlled, P121 active)
- external (start/stop request via programmable output, heater not controlled)

#### **Cold start function**

If the viscosity of the oil is high (low temperature), a faster start-up of the heater might be favourable (a higher Kp). The temperature, up to which the cold-start gain factor P126 is active, is set in P125. Above this temperature the normal P-band P123 is used.

*Example*: P123 = 30, P126 = 40 results in a P-band of  $0.40 \times 30 = 12$  as long as the temperature is below P125.

#### 1.13.1 Control of the electric heater (optional)

P119 = electric. The following parameters should not be displayed in the parameter list: P121, P122.

Five outputs and one input are used to control the electric heater:

- three relay outputs to up to three fixed power steps depending on the heater size (P120)
- one variable load output
- one output "heater on"
- one input "heater fault" (see A05)

The total heater capacity (100%) is the sum of the power available at the three fixed steps, plus the power available via the variable load output (always 16 kW nominal).

This means, if the output signal to the heater is 100%, all available power steps and the variable load output have to be activated continuously.

Output signal 0% means that all outputs are deactivated.

If the output signal is a value between 0 and 100%, the activation pattern of the outputs has to be calculated using the table below.

| Output power (in                                   | Output power (in % of the total available power) |                |                |                              |  |  |  |
|--|--|----------------|----------------|------------------------------|--|--|--|
| Heater size (kW<br>nominal, selected<br>with P120) | Power step 1 %                                   | Power step 2 % | Power step 3 % | Variable load<br>output<br>% |  |  |  |
| 7, 8   | 0  | 0              | 0              | 10 x 10                      |  |  |  |
| 14, 16   | 0  | 0              | 0              | 10 x 10                      |  |  |  |
| 22, 24   | 33,5   | 0              | 0              | 10 x 6,6                     |  |  |  |
| 36, 40   | 20   | 40             | 0              | 10 x 4                       |  |  |  |
| 50, 56   | 14,3   | 28,5           | 28,5           | 10 x 2,9                     |  |  |  |
| 65, 72   | 11   | 22             | 45             | 10 x 2,2                     |  |  |  |
| 100  | 14,3   | 28,5           | 28,5           | 10 x 2,9                     |  |  |  |
| 130  | 11   | 22             | 45             | 10 x 2,2                     |  |  |  |

For each value of P120 the contribution of each power step to the total available heater capacity is given in percent. First use the fixed power steps to fill the power requirement as far as possible, then use the variable load output to fine adjust the output.



It is important that the fixed power steps are working continuously when activated. Use an established method e.g. delay drop out.

As a new output signal is calculated every second, the variable load output is activated for parts (0.1) of a second.

0.1 s activates 1/10 of the available power on the output = 1.6 kW.

0.5 s means 8 kW and so on.

Example 1: Heater size 72 kW and output signal to the heater 50%. Activate step 3 (for 1s) and activate variable. output for 0.2s.

Example 2: Heater size 16 kW and output signal to the heater 88%. Activate variable output for 0.9s.

Example 3: Heater size 130 kW and output signal to heater 88%. Activate steps 1, 2, and 3 (for 1s).

To prevent problems with too heavy momentary load at start of the heater, only one output can be activated per second during the first 6 seconds. After that time all outputs can be used simultaneously.

# 1.13.2 Control of the CBM heater (optional)

P119 = steam. In this case alarm A05 is not supervised.

The steam heater is controlled using three relay outputs:

- increment steam valve
- · decrement steam valve
- steam shut-off valve (hold signal)

The position of the valve is not supervised.

The transition time of the steam valve is set in P121 (time from fully open to fully closed position and vice versa). The controller function defines if the valve should be opened (incremented) or closed(decremented) in relation to its actual position.

The signal to the steam valve is pulsed with an on-time corresponding to the temperature controller output. Example: output = +50% means the increment steam valve output is activated for 0.50 s/s.

When the heater is stopped, the decrement steam valve signal is on for the time set in P121. The hold signal is off if the start of the heater is interlocked (e.g. on alarms A01, A20).

#### If heater not controlled or 1.13.3 external

It is possible to run the system without heater control (P119 = no).

In this case alarms A05, A24 and A25 are not supervised.

It is also possible to run the system with external heater (P119 = external). The 'heater on' signal is given via a programmable output.

In this case alarm A05 is not supervised.

The description for the system with external heater is also valid if one of the temperature sensors is disabled or on sensor error (A22/A30).

### 1.13.4 Heater shut down

The system waits for the feed temperature to decrease (5 degrees or below P184). If the time in P173 has elapsed and the temperature feedback was not received, alarm 'A25 Temperature not decreasing is given.

When the temperature feedback has been received, or P173 has elapsed, P256 is started. When P256 has elapsed, the feed pump (if running) is turned off. If the feedback signal from the pump contactor is not received within 5 seconds, alarm 'A01 Pump starter failure' is given.



Heater shutdown is also initiated at STOP request during START if feed pump and heater are on but the separator is not running.

### 1.14 Cross connection/serial operation

### Valid for P-type separators

It might be desirable to cross-connect two separator modules, or operate them in series. For that purpose the EPC60:s must be able to communicate via Ethernet.

### 1.14.1 Set up communication

The EPC60:s may communicate over any customer defined network or be connected directly to each other <sup>1)</sup>.

The IP-addresses of the EPC60:s must be set so there are no IP-conflict since all EPC60:s are normally delivered with the same default address, e.g. set one EPC60 to have address 192.168.0.1 and the other to have address 192.168.0.2.

1) Direct connection requires a crossover twisted pair cable to be used since the EPC60 does not have automatic MDI/MDI-X configuration.

### 1.14.2 Configure parameters

The parameter to select desired function is P145.

The following values are possible:

- disabled (default)
- cross master
- · cross slave
- serial master
- · serial slave

The adjustment of P145 is only possible, if both systems are in STAND STILL.

The communication between the two control systems is supervised. At communication error an alarm (A136) is given and both systems will go to STOP if running.

#### . .

### 1.14.3 Cross connection

One separator module can use the feed pump and heater of the other one.

- P145 is set to "cross master" in the system which separator is used. The heater/feed pump of this system is automatically disabled. The display shows CROSS CONNECTION MASTER in STANDSTILL.
- P145 is set to "cross slave" in the system which heater/feed pump is used. The separator of this system is automatically disabled. The display shows CROSS CONNECTION SLAVE.

After adjustment of P145, only stepwise local start from resp. panel is possible.

The separator is started/stopped and the separator system is supervised from the master panel as if heater and feed pump were not installed. Temperature readings from the master are transferred to the slave panel.

Heater and feed pump are started/stopped and controlled from the slave panel. Alarms for the heater and feed pump are generated in the slave panel.

### 1.14.4 Serial operation

This function is required when two separators should operate in series, i.e. the oil coming from the first separator (usually a purifier) is further purified in the second one (usually a clarifier, but may be a purifier).

- P145 is set to "serial master" in the first system. The display shows SERIAL CONNECTION MASTER in STANDSTILL.
- P145 is set to "serial slave" in the second system. The display shows SERIAL CONNECTION SLAVE in STAND STILL.

After adjustment of P145, both systems are started individually. The discharge interval is set with P220 in the master system. The slave's automatic discharge initiation is disabled. Instead the master initiates a discharge in the slave system every (P262) time after the own discharge has been completed.

### 1.15 Programmable Inputs and Outputs

An extra I/O kit is available as an option. This kit contains two boards, one with six programmable digital inputs and one with six programmable relay outputs. The customer can select an optional function for each of these inputs and outputs from a list of alternatives (see below).

### 1.15.1 Inputs

See parameters 139 to 144

|   | Alternative               | Comments   |
|---|---------------------------|--|
| 0 | None                      | default  |
| 1 | Remote start              | enter automatic start, only if REMOTE selected on operator panel (pushbutton) Closed (pulse) = start |
| 2 | Remote stop               | enter stop sequence, works with REMOTE button in any position Closed (pulse) = stop                  |
| 3 | Remote start feed pump    | the same as first push at stepwise start. Closed (pulse) = start                                     |
| 4 | External alarm            | used for e.g. a level switch in a tank. See alarm A123. Closed = alarm                               |
| 5 | Remote recirculation      | Request Recirculation, only if REMOTE selected on operator panel (pushbutton) Closed = recirculation |
| 6 | New temperature set point | EPC 60 uses temperature set point P250 during start when the separator is switched off               |

### 1.15.2 **Outputs**

See parameters P133 to P138.

| altld | Alternative                                 | Comments  |
|-------|---|---|
| 0     | None  | default   |
| 1     | Indication heater on/ start external heater | program request "heater function on" Closed = heater on   |
| 2     | Indication separator motor on               | program request "separator motor on" Closed = motor on    |
| 3     | Stand still indication                      | when stand still flag on Closed = stand still             |
| 4     | Indication alarm A20                        | if alarm "Oil feed temp. high" active Closed = alarm      |
| 5     | Indication alarm A21                        | if alarm "Oil feed temp. low" active Closed = alarm       |
| 6     | Indication alarm A51                        | if alarm "Oil backpressure PT4 low" active Closed = alarm |
| 7     | Indication feed pump on                     | program request "feed pump on" Closed = feed pump on      |
| 8     | Remote start allowed                        | allowed to start the system Closed = start allowed        |

### 1 Operating

| altld | Alternative            | Comments  |
|-------|------------------------|---|
| 9     | Remote enabled         | remote button activated Closed = remote activated   |
| 10    | Valve in sludge outlet | controlled if pneumatic valve, see P131 and Activation diagram Closed = open or close valve (set with P131) |
| 11    | Common alarm           | Alternative Common alarm, Closed = no alarm, also see separate description                                  |
| 12    | Indication V1          | Position of valve V1, Closed = feed on to separator   |

### 1.15.3 Common alarm indication

There are two separate outputs for indicating status of the alarms. One is standard and the other is available through the programmable outputs.

### Standard output

When there is no alarm active the contact is closed. When an alarm is triggered the contact opens. If another alarm is triggered the contact will close for 0.5s and then open again. When all alarms have been acknowledged by the operator the contact will close.

### **Programmable output**

Programmable output When there is no alarm active the contact is closed. When an alarm is triggered the contact opens. When all alarms have been acknowledged by the operator and reset (the fault that triggered the alarm no longer persists) the contact will close.

## 1.16 I/O Test Function

| Activity   | Reference/Limits                            |
|--|---|
| If system has active alarms, check and take actions before starting the I/O test.  |   |
| Press button F-step backwards and related arrows up ( C ) and down ( E ) for Log –in into the I / O test.  | Acc. to IB(s)                               |
| Follow the list of I/O's (item 25-72) to check status of all el. connections of the system including the operating function of individual components.  | Acc. to IB(s)                               |
| OUTPUTS  |   |
| K2 - Separator motor Check the operation and rotation of the separator motor. The output will only be activated for a short time. Also check that the correct led is activated on the operating panel. | Valid for:<br>All S and P types             |
| If no operation, check jumpers according to electrical diagram.  |   |
| K3 – Feed pump Check the operation and rotation of the feed pump. Also check that the correct led is activated on the operating panel.   | Optional<br>Valid for:<br>All S and P types |
| If no operation, check jumpers according to electrical diagram.  |   |
| V1 – 3 way valve<br>Verify the operation of the valve, see also that the green diode<br>on the valve connector is lit.   | Valid for:<br>All S and P types             |
| V4 – Oil outlet valve<br>Verify the operation of the valve, see also that the green diode<br>on the valve connector is lit.  | Valid for:<br>All S and P types             |
| Cabinet fan Verify the operation of the fan mounted inside the electrical cabinet.   | Valid for:<br>All S and P types             |
| WARNING  |   |
| Electrocution Hazard  This operation require tests to be made with cabinet door open and with power on. Beware of live parts.  |   |
| Steam shutoff valve<br>Verify the operation of the valve, see also that the green diode<br>on the valve connector is lit.  | Optional<br>Valid for:<br>All S and P types |
| V5 - Drain valve<br>Verify the operation of the valve, see also that the green diode<br>on the valve connector is lit.   | Valid for:<br>All S and P types             |
| Hold/reset vibration switch Ensure that the vibration switch is reset when this output is activated  | Optional<br>Valid for:<br>P605/615          |
| SV10 – Displacement water valve<br>Verify the operation of the valve, see also that the green diode<br>on the valve connector is lit.  | Valid for:<br>All S and P types             |

| SV15 Discharge valve<br>Verify the operation of the valve, see also that the green diode<br>on the valve connector is lit.  | Valid for:<br>All S and P types             |
|---|---|
| SV16 – Closing water valve<br>Verify the operation of the valve, see also that the green diode<br>on the valve connector is lit.  | Valid for:<br>All S and P types             |
| Steam decrease – Closing of steam valve<br>Verify that the valve is moving towards closing position. Note<br>that if the valve is already closed, an opening operation (see<br>below) needs to be done prior to this test.  | Optional<br>Valid for:<br>All S and P types |
| Steam increase – Opening of steam valve Verify that the valve is moving towards opening position.   | Optional Valid for: All S and P types       |
| Programmable output 1 Not to be tested  |   |
| Programmable output 2 Not to be tested  |   |
| Programmable output 3 Not to be tested  |   |
| Programmable output 4 Not to be tested  |   |
| Programmable output 5 Not to be tested  |   |
| Programmable output 6 Not to be tested  |   |
| Electric heater test Optional   |   |
| Before the electric heater i/o-test, please ensure that the electric power to the electric heater cabinet is turned OFF! The operating voltage for the relays is supplied from control cabinet.   |   |
| Elheatvar – Variable output<br>Check that the diodes on the 2 triacs inside the electric heater<br>cabinet are lit.   | Optional Valid for: All S and P types       |
| Heater on signal Check that the relay KA11 (diode, see picture below) and K11 (mechanical indication) in the electric heater cabinet is activated. Note, leave this output activated (indicating 1 on display) when proceeding with the tests of the fixed power steps below! | Optional<br>Valid for:<br>All S and P types |
| ElheatPS1 – Power step 1<br>Check that the relay KA12 (diode, see picture below) and<br>K12 (mechanical indication) in the electric heater cabinet is<br>activated. Optional Valid for: All S and P types   |   |
| ElheatPS2 – Power step 2<br>Check that the relay KA13 (diode, see picture below) and<br>K13 (mechanical indication) in the electric heater cabinet is<br>activated.   | Optional<br>Valid for:<br>All S and P types |
| ElheatPS3 Power step 3 Check that the relay KA14 (diode, see picture below) and K14 (mechanical indication) in the electric heater cabinet is activated.  | Optional<br>Valid for:<br>All S and P types |

| INPUTS  |   |
|---|---|
| Heater fault signal Check that this input is 1 as long as the output "Heater on" is activated. If not ok, check settings of over temperature device Go back to "Heater on" Item no. 47 and deactivate (0 on display), then go back to this section and verify that "Heater fault" is 0. | Optional<br>Valid for:<br>All S and P types     |
| Estop – Emergency stop This input should be 1 when emergency stop button is not pushed. Press emergency stop button and check that it goes to 0.  | Valid for:<br>All S and P types                 |
| Feedback feedpump – Not to be tested  |   |
| Feedback separator - Contactor feedback<br>Not to be tested   |   |
| Sludge tank level switch  If not installed, check that the input is 1, if not? check if jumper is installed according to electrical diagram.  If installed, manually operate the level switch, the input should be 0 when high level.   | Optional<br>Valid for:<br>All S and P types     |
| Cover switch on separator frame<br>Manually operate the cover switch, the input should be 1 when<br>switch (and cover) is closed  | Optional Valid for: All S and P types           |
| Sludge valve interlock Manually operate the sludge valve, the input should be 1 when the valve is closed.   | Optional Valid for: All S and P types           |
| Programmable input 1 Not to be tested   |   |
| Programmable input 2 Not to be tested   |   |
| Programmable input 3 Not to be tested   |   |
| Programmable input 4 Not to be tested   |   |
| Programmable input 5 Not to be tested   |   |
| Programmable input 6 Not to be tested   |   |
| ANALOGUE INPUTS   |   |
| PT5 – Water outlet pressure transmitter<br>Check that the indication shows approx 0 bar.<br>Note that if pipes are connected to the system, pressure might<br>not be 0 bar.   | 4-20mA Input<br>Valid for:<br>All S types       |
| MT – Water transducer, MT60<br>Check that the indication shows 30 pF ±5.<br>Note that this value is only correct when sensor is in air (no media in pipes).   | 4-20mA Input<br>Valid for:<br>All S types       |
| PT1 – Oil inlet pressure transmitter<br>Check that the indication shows approx 0 bar.<br>Note that if pipes are connected to the system, pressure might<br>not be 0 bar.  | 4-20mA Input<br>Valid for:<br>All S and P types |

| PT4 – Oil outlet pressure transmitter<br>Check that the indication shows approx 0 bar.<br>Note that if pipes are connected to the system, pressure might<br>not be 0 bar.  | 4-20mA Input<br>Valid for:<br>All S and P types                                 |
|--|---|
| TT1 – Oil inlet temperature sensor 1<br>Check that the indication shows a relevant temperature.  | PT100 input<br>Valid for:<br>All S and P types                                  |
| TT2 – Oil inlet temperature sensor 2<br>Check that the indication shows a relevant temperature.<br>Note that the temperature should not deviate from TT1 with<br>more than 2 °C                                      | PT100 input<br>Valid for:<br>All S and P types                                  |
| Speed sensor In order to test this input, use the "Separator motor", K2, sect 1, I/O-test to start the separator (for a few seconds), then go back to this input and check the value, it shall be higher then 0 rpm. | Namur input<br>Optional<br>Valid for:<br>All S and P625/626, P635/636<br>types  |
| Vibration switch Check that this input goes to 0 when the switch is in tripped position  | Optional<br>Valid for:<br>P605/615 types  |
| Vibration sensor<br>Check that the indication shows approx 3.5 mm.<br>(Sensor should be installed with 3.5 mm from the axel)   | 4-20mA Input<br>Optional<br>Valid for:<br>All S and P625/626, P635/636<br>types |

# 1.17 Operation without all sensors (Emergency operation)

If a sensor is malfunctioning it is possible to disable it temporarily until it can be fixed or replaced.

## 1.17.1 System Without Speed Sensor

It is possible to run the system without speed sensor (P113 = no).

In this case system control and supervision are much more basic.

Alarms A90 – A97 are not supervised.

Remote start is not allowed.

The separator is started within 4 minutes and stopped with stop timer.

This also applies if the speed sensor is disabled (P148 = 0) or on alarm 'A92, Bowl speed sensor error'.

## 1.17.2 System Without Vibration Sensor

It is possible to run the system without vibration sensor (P114 = no).

In this case alarms A100 - A103 are not supervised.

Remote start is not allowed.

This also applies if the vibration sensor is disabled (P132 = yes) or on alarm 'A102, Vibration sensor error'

## 1.17.3 System Without Cover Switch

It is possible to run the system without cover switch (P115 = no).

In this case alarms A110 - A111 are not supervised.

Remote start is not allowed.

This also applies if the cover switch is disabled (P116 = yes).

### 1.17.4 System With PT1 Disabled

It is possible to run the system with PT1 disabled (P157 = 0).

In this case alarms A40 – A42 and A44 are not supervised.

This also applies on alarm 'A42, Feed pressure sensor PT1 error'.

### 1.17.5 System With PT4 Disabled

It is possible to run the system with PT4 disabled (P153 = 0).

In this case alarms A50 – A52 and A54 – A59 are not supervised.

As a result, calibration of the water flow is not possible. The old values are used for displacement and conditioning water. Cold start function is disabled. Bowl leakage test is disabled.

This also applies on alarm 'A52, Oil pressure sensor PT4 error'.

# 1.17.6 System With PT5 Disabled (S-separator only)

It is possible to run the system with PT5 disabled (P155 = 0).

In this case alarms A70 – A72 and A74 are not supervised.

This also applies on alarm 'A72, Water pressure sensor PT5 error'.

## 1.17.7 System With TT1/TT2 Disabled

It is possible to disable one of the temperature sensors TT1 or TT2 with parameter P146. The readings normally taken from the disabled sensor is then replaced with the readings from the other sensor in all sequences.

When a temperature transmitter is disabled the corresponding sensor error alarm, A22 or A31, is blocked.

Alarms A20, A21, A24 & A25 that normally are triggered by TT1 readings should be triggered by TT2 when TT1 is disabled.

When the system has a Modbus connection (P129=Modbus TCP or Modbus RTU) it is possible to use Modbus registers to receive temperature readings. Both TT1 and TT2 are then disabled and alarms A22, A23, A30 & A31 are blocked. This mode is activated when P146=Modbus. It is not possible select this mode if the system is controlling a heater (P119=steam or electric).

If P146=TT2 custom then all alarm from TT2 is blocked. It is intended for installations where TT2 is permanently not connected to the EPC60.

### 1.17.8 Control of Sludge Pump, Level in Sludge Tank, and Butterfly Valve

The sludge accumulated in the bowl can be discharged into an optional small sludge tank with level switch. At high level signal a sludge pump (P118 = yes) is running until the signal is normal + 10 seconds. Otherwise see alarm A120.

The level switch can be disabled (P159 = 0). In this case A120 is blocked and the sludge pump is running for 30 seconds at discharge (instead of P234, see below).

The sludge pump is also activated during certain timers. These running times are always terminated by an extra pump running time (e.g. during P234, or 5 seconds as in the drain sequence). Note that this extra time is independent of the other timers which may be running simultaneously.

### 1 Operating

See also the Sequence diagram for other occasions when the sludge pump is activated, if selected (Parameter List chapter '2.2 Discharge').

The separator sludge outlet can contain a manual butterfly valve which is used to close the outlet when the separator is standing still.

Select with P131 (no, manual).

If P131 = no, alarm A122 is blocked.

### 1.17.9 System Without Feed Pump

It is possible to run the system without feed pump (P127 = no).

In this case alarms A01 and A44 are not supervised.

Remote start is not allowed.

### 1.17.10 System Without Water Transducer (S-separator only)

It is possible to run the system without water transducer (P117 = no).

In this case alarms A80 - A85 and A74 are not supervised.

There is no calibration of the water flow. In separation, automatic discharges are initiated every 15 minutes (overrides P220). SV10 is never activated (this means no displacement before discharge and no conditioning water). Water draining from the bowl is not allowed.

This also applies if the water transducer is disabled (P128 = standby) or on alarm 'A85, MT60 fault'.

# 1.17.11 Purifier Operation (only valid for S 805 and S 815)

If the water transducer should malfunction, the separator can be converted to purifier operation as long as the feed density is below 991 kg/m<sup>3</sup>.

Stop the separator and change the standard gravity disc to a larger one suitable for the density of the oil used. Change Parameter P147 to 'Purifier'. Change Parameter P117 to 'No'.

The system can now be restarted and run as a purifier system.

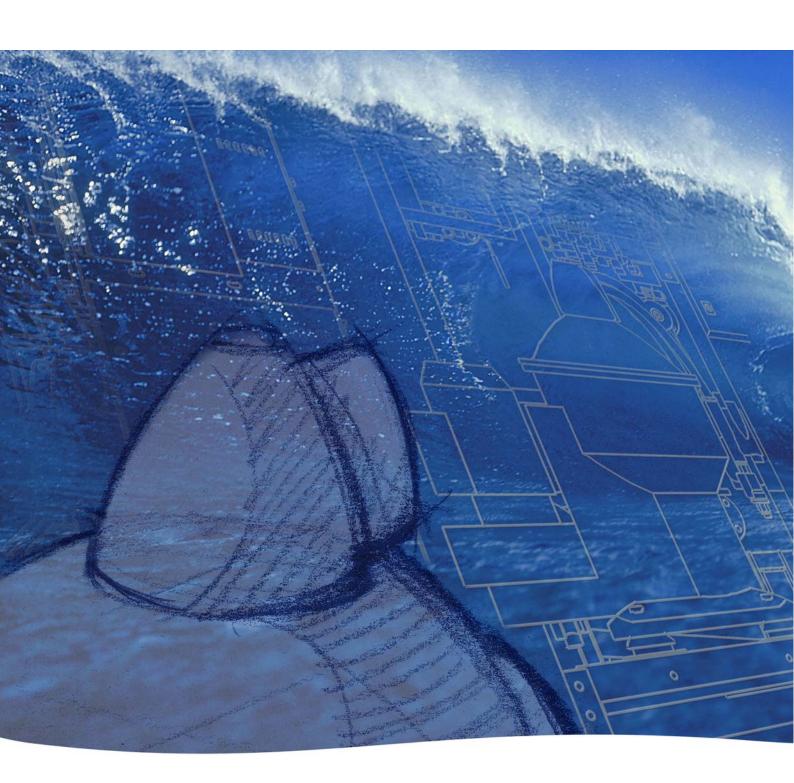
## S 805/S 815 Flex Separation



# **Parameter List**

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Alfa Laval Tumba AB SE-147 80 Tumba, Sweden

Telephone: +46 8 530 650 00

Telefax: +46 8 530 310 40

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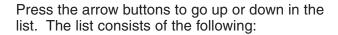
## 1 Parameter list

### 1.1 Setting List

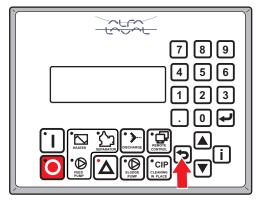
To access the Setting List at any time during the operation process press the 'Return button' repeatedly until the Setting List is reached.



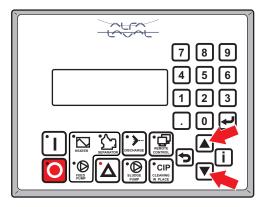
Relevant parameters only are shown on the display.



- Parameters List of all parameters.
   Password protected.
   To go directly to a parameter, enter the parameter number.
- Time settings For setting date, time, etc. Password protected.
   To go directly to a parameter, enter the parameter number.
- 3. Operation time Different counters and timers can be read.
- 4. I/O Test Here it is possible to activate all outputs and to read the status for all inputs, for testing purposes.
- 5. Alarm history List of alarms which have been rectified. The latest alarm shows at the top of the list.
- 6. System info
- 7. IP settings
- 8. Password / Login
- 9. Set contrast



X023912A



X023914A

When in the Parameter Menu a list item is blinking, you can press the 'Enter' button to get the parameter list.

To change the value of a parameter or to have some information about the parameter you move the cursor up/down with the arrow button. When the cursor is in front of the desired parameter, press information button to get more information.

Press the 'Information' button again to return to your previous position.

You can also change this setting – see below.

Press 'Enter' button you will see the actual value, the max value and the min value. You can change the value either by using the number buttons to write in a value, or by choosing a value from the list. Save any change by pressing the 'Enter' button.



Certain parameters can only be changed by the factory, the chief engineer, or an Alfa Laval service engineer.

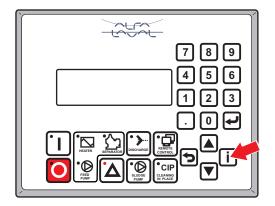
Parameters are divided into three password levels:

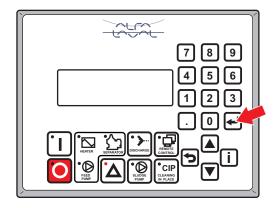
Level 0 – No password needed.

Level 1 – Possible to protect with password.

Level 2 – Alfa Laval password protected.

@ = These configuration parameters can only be adjusted while the system is in STAND STILL (not visible on the HMI in all other modes). The present configuration is displayed in menu "System info".





X023913A

| Parame-<br>ter | Pass-<br>word<br>level | Denomination  | Default<br>value | Unit | Min.<br>value   | Max.<br>value |
|----------------|------------------------|---|------------------|------|---|---------------|
|                |                        | Presentation on display (has effect on parameters with these measuring units, and on the user dialog) |                  |      |   |               |
| P100           | 0                      | Display language:<br>English/ German/ Spanish/ French/<br>Italian/ Portuguese/ Swedish                | English          |      |   |               |
| P101           | 0                      | Selection of temp. presentation Celsius/Fahrenheit  | °C               |      |   |               |
| P102           | 0                      | Selection of feed flow rate presentation m3/h or USG/h  | m3/h             |      |   |               |
| P103           | 0                      | Selection of pressure presentation kPa, bar, psi  | bar              |      |   |               |
| -              | •                      | ed for all following parameters if a  | ctivated!        |      |   |               |
|                | nfiguration            |   |                  |      |   |               |
| P107           | 1                      | Flow correction factor  | 1,00             |      | 0,00  | 2,00          |
| P110           |                        | not used  |                  |      |   |               |
| P111           | 1 @                    | Separator size  | 0                |      | See Parameters depending on the setting of P111, page 12.   |               |
| P112           | 1                      | Oil type  | HF380            |      | See Parar<br>depending<br>setting of<br>page 13.  | on the        |
| P114           | 1 @                    | Vibration sensor installed yes/no   | no               |      | Can even be changed in STOP. See also "System without vibration sensor" in the Operating instructions manual.   |               |
| P115           | 1 @                    | Frame cover switch installed yes/no   | no               |      | Can even be changed in STOP. See also "System without frame cover switch" in the Operating instructions manual. |               |
| P116           | 1                      | Frame cover switch disabled yes/no (if P115 = yes)  | no               |      | See also "System without frame cover switch" in the Operating instructions manual.                              |               |

| Parame-<br>ter | Pass-<br>word<br>level | Denomination                             | Default<br>value | Unit | Min.<br>value   | Max.<br>value          |
|----------------|------------------------|--|------------------|------|---|------------------------|
| P117           | 1 @                    | MT60 (water transducer) installed yes/no | yes              |      | See also without without with transduce the Opera instruction manual. | ater<br>r" in<br>ıting |
| P118           | 1 @                    | Sludge pump installed yes/no             | no               |      | Can even changed i  |                        |

| Parame-<br>ter | Pass-<br>word<br>level | Denomination  | Default value     | Unit         | Min.<br>value   | Max.<br>value |  |
|----------------|------------------------|---|-------------------|--------------|---|---------------|--|
| P119           | 1 @                    | Heater installed no/electric/steam/external   | no                |              | Can even be changed in STOP. See also "Control of Heater" in the Operating instructions manual. |               |  |
| P120           | 1 @                    |   |                   |              |   |               |  |
|                |                        | If P119 = electric: heater size   | 16                | kW           | 7   | 130           |  |
| P121           | 1                      | If P119 = steam: steam valve transition time  | 120               | S            | 0   | 999           |  |
| P122           | 1                      | Deadband heater   | 0.5               | °C<br>(P101) | 0   | 5             |  |
| P123           | 1                      | P-constant heater (if heater controlled) see also P125/P126 (cold start)                                | d)                |              | 10  | 500           |  |
| P124           | 1                      | I-constant heater (if heater controlled)  | 0.4               | min          | 0.1   | 10.0          |  |
| P125           | 1                      | Breakpoint cold start (if heater controlled)  | 50                | °C<br>(P101) | 0   | 99            |  |
| P126           | 1                      | Gain factor cold start (if heater controlled)   | 40                | %            | 1   | 100           |  |
| P127           | 1 @                    | Feed pump controlled yes/no   | no                |              | Can ev<br>change<br>STOP.   |               |  |
| P128           | 1                      | MT60 on/standby. Standby = MT60 disabled. Discharge every 15 min. (overrides P220). SV10 not activated. | on                |              |   |               |  |
| P129           | 1                      | Selection of of communication type digital inputs, Modbus TCP   | digital<br>inputs |              | not available<br>if running in<br>"remote"  |               |  |
| P130           | 1                      | not used  |                   |              |   |               |  |

| Parame-<br>ter | Pass-<br>word<br>level | Denomination   | Default value | Unit | Min.<br>value             | Max.<br>value                   |
|----------------|------------------------|--|---------------|------|---------------------------|---------------------------------|
| P131           | 1 @                    | Valve in sludge outlet installed no, manual, pneumatic NO, pneumatic NC    | no            |      | Can ev<br>change<br>STOP. |                                 |
| P132           | 1                      | Vibration sensor disabled yes/no   | no            |      |                           |                                 |
| P133           | 1                      | Relay OP1 (function optional output 1)                                     | none          |      |                           | ımmable                         |
| P134           | 1                      | Relay OP2 (function optional output 2)                                     | none          |      |                           | outputs" Operating              |
| P135           | 1                      | Relay OP3 (function optional output 3)                                     | none          |      | manual<br>alterna         | for all                         |
| P136           | 1                      | Relay OP4 (function optional output 4)                                     | none          |      |                           |                                 |
| P137           | 1                      | Relay OP5 (function optional output 5)                                     | none          |      |                           |                                 |
| P138           | 1                      | Relay OP6 (function optional output 6)                                     | none          |      |                           |                                 |
| P139           | 1                      | Opt. input 1 (function optional input 1)                                   | none          |      |                           |                                 |
| P140           | 1                      | Opt. input 2 (function optional input 2)                                   | none          |      |                           |                                 |
| P141           | 1                      | Opt. input 3 (function optional input 3)                                   | none          |      |                           |                                 |
| P142           | 1                      | Opt. input 4 (function optional input 4)                                   | none          |      |                           |                                 |
| P142           | 1                      | Opt. input 5 (function optional input 5)                                   | none          |      |                           |                                 |
| P144           | 1                      | Opt. input 6 (function optional input 6)                                   | none          |      |                           |                                 |
| P145           | 1                      | Cross connection/serial operation  | dis-<br>abled |      |                           | o "Cross<br>tion/se-<br>ration" |
| P146           | 1                      | Temperature sensor disabled no, TT1, TT2, TT2 custom                       | no            |      |                           |                                 |
| P147           | 1 @                    |  |               |      |                           |                                 |
|                |                        | Separator mode<br>0 = purifier, 1 = alcap                                  | alcap         |      | alcap                     | purifier                        |
| P148           | 1                      | not used   |               |      |                           |                                 |
| P149           | 1                      | Level switch disabled. Run sludge pump 30 s at discharge (overrides P234). | no            |      |                           |                                 |

| Parame-<br>ter | Pass-<br>word<br>level | Denomination   | De-<br>fault<br>value | Unit         | Min.<br>value | Max.<br>value |
|----------------|------------------------|--|-----------------------|--------------|---------------|---------------|
| Alarm rela     | ited param             | eters: delays, limits etc.   |                       |              |               |               |
| P151           |                        | Not used   |                       |              |               |               |
| P152           | 1                      | Power failure alarm used yes/no (common alarm at power failure given yes/no) | yes                   |              |               |               |
| P153           | 1                      | High oil pressure limit (PT4), 0.0 = pressure sensor disabled                | 3,0                   | bar          | 0,0           | 6,0           |
| P154           | 1                      | Low oil pressure limit (PT4)   | 1,2                   | bar          | 0,0           | 6,0           |
| P155           | 1                      | not used   |                       |              |               |               |
| P156           | 1                      | not used   |                       |              |               |               |
| P157           | 1                      | Alarm limit high feed pressure (PT1), 0.0 = feed pressure sensor disabled    | 3,0                   | bar          | 0,0           | 6,0           |
| P158           | 1                      | Alarm limit low feed pressure (PT1)  | 0,2                   | bar          | 0,0           | 6,0           |
| P160           |                        | not used   |                       |              |               |               |
| P161           |                        | not used   |                       |              |               |               |
| P162           | 2                      | Alarm limit "A81 Transducer value low"                                       | 70                    | pF           | 0             | 320           |
| P163           |                        | not used   |                       |              |               |               |
| P164           |                        | not used   |                       |              |               |               |
| P165           |                        | not used   |                       |              |               |               |
| P166           |                        | not used   |                       |              |               |               |
| P167           |                        | not used   |                       |              |               |               |
| P169           | 1                      | Alarm delay "A24 Temperature increase too slow"                              | 15                    | min          | 0             | 60            |
| P170           |                        | not used   |                       |              |               |               |
| P172           |                        | not used   |                       |              |               |               |
| P173           | 1                      | Alarm delay "A25 Temperature not decreasing" 0 = no temperature supervision  | 5                     | min          | 0             | 30            |
| P174           |                        | not used   |                       |              |               |               |
| P175           |                        | not used   |                       |              |               |               |
| P177           | 1                      | Alarm limit "A32 Difference TT1/TT2 too large"                               | 10                    | °C<br>(P101) | 0             | 30            |
| P178           | 1                      | Time limit in RECIRCULATION  | 10                    | min          | 0             | 30            |
| Setpoints      |                        |  |                       |              |               |               |
| P223           |                        | not used   |                       |              |               |               |
| P224           |                        | not used   |                       |              |               |               |
| P225           |                        | not used   |                       |              |               |               |
| P226           |                        | not used   |                       |              |               |               |
| P227           |                        | not used   |                       |              |               |               |

| Parame-<br>ter | Pass-<br>word<br>level | Denomination  | De-<br>fault<br>value      | Unit | Min.<br>value | Max.<br>value |
|----------------|------------------------|---|----------------------------|------|---------------|---------------|
| P228           | 1                      | SV16 pulse interval in SEPARATION   | 5                          | min  | 1             | 30            |
| P229           |                        | Not used  |                            |      |               |               |
| P232           | 1                      | Draining time operating water and discharge check   | 15                         | s    | 0             | 30            |
| P234           | 1                      | Sludge pump additional/manual running time  | 10                         | S    | 0             | 30            |
| P235           |                        | not used  |                            |      |               |               |
| P236           |                        | not used  |                            |      |               |               |
| P237           |                        | not used  |                            |      |               |               |
| P238           | 2                      | Feed on after discharge   | 30                         | s    | 0             | 60            |
| P239           |                        | not used  |                            |      |               |               |
| P242           |                        | not used  |                            |      |               |               |
| P256           | 1                      | Feed pump stop delay at normal STOP   | 3                          | min  | 0             | 30            |
| P258           | 2                      | Feed on after start discharge   | 30                         | s    | 0             | 60            |
| P259           | 1                      | Alarm limit "A97 Discharge<br>feedback error" if speed sensor<br>not installed (PT1 pressure<br>decrease) 0 = function disabled | 0,05                       | bar  | 0             | 1,0           |
| P260           | 2                      | SV10 open to fill the bowl in STOP 5 s  | open to fill the bowl in 5 |      | 0             | 300           |
| P262           | 1                      | Serial operation: slave discharge frequency (parameter set in master PLC) 0 = no discharge # = every # time master discharges   | 2                          |      | 0             | 10            |

### Parameters depending on the setting of P111

|                | Separator size (P111, default 0) |  |                             |                                |                       |                                |               |               |       |  |  |  |
|----------------|----------------------------------|--|-----------------------------|--------------------------------|-----------------------|--------------------------------|---------------|---------------|-------|--|--|--|
| Parame-<br>ter | Pass-<br>word<br>level           | Description  | S805, if<br>P147 =<br>alcap | S805, if<br>P147 =<br>purifier | S815, if P147 = alcap | S815, if<br>P147 =<br>purifier | Min.<br>value | Max.<br>value | Unit  |  |  |  |
| P179           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P180           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P181           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P182           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P220           | 1                                | Discharge interval   | 30                          | 30                             | 30                    | 30                             | 1             | 300           | mm    |  |  |  |
| P231           | 1                                | SV15 opening time  | 1,0                         | 1,0                            | 1,0                   | 1,0                            | 0,1           | 5,0           | S     |  |  |  |
| P233           | 1                                | Filling time conditioning/ sealing water   | 10                          | 30                             | 10                    | 30                             | 0             | 60            | S     |  |  |  |
| P240           | 1                                | Filling time<br>displacement<br>water  | 30                          | 30                             | 30                    | 30                             | 0             | 300           | S     |  |  |  |
|                |                                  | SV10, constant flow orifice  | 1,3                         | 1,3                            | 1,3                   | 1,3                            |               |               | l/min |  |  |  |
| P243           | 1                                | SV16 open after dis-charge   | 15 s                        | 15 s                           | 15 s                  | 15 s                           | 0             | 120           | s     |  |  |  |
| P244           | 1                                | SV15 open at start discharge   | 5,0                         | 5,0                            | 5,0                   | 5,0                            | 0,1           | 30,0          | s     |  |  |  |
| P246           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P247           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P248           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P255           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P257           | 1                                | SV16 open at start discharges  | 15                          | 15                             | 15                    | 15                             | 0             | 60            | S     |  |  |  |
| P109           |                                  | not used   |                             |                                |                       |                                |               |               |       |  |  |  |
| P261           | 1                                | Filling time seal-<br>ing water after<br>RECIRCULA-<br>TION<br>(if P147 = puri-<br>fier) |                             | 20                             |                       | 20                             | 0             | 60            | S     |  |  |  |



If P111 = 0 (default value), the operator is automatically forced to go through a system configuration procedure to setup the system.

### Parameters depending on the setting of P112

|                     | Oil type (selected with P112) |   |     |     |  |   |                                      |                                      |               |               |              |
|---------------------|-------------------------------|---|-----|-----|--|---|--------------------------------------|--------------------------------------|---------------|---------------|--------------|
|                     |                               |   | D   | 0   | Н  | FO  | L                                    | 0                                    |               |               |              |
| Pa-<br>rame-<br>ter | Pass-<br>word<br>level        | Descrip-<br>tion  | GO  | MDO | IF30<br>IF40<br>IF60<br>IF100              | HF180<br>HF380<br>HF460<br>HF600<br>HF700 | LO TP<br>Trunk                       | LO CH<br>Cross<br>head               | Min.<br>value | Max.<br>value | Unit         |
| P183                | 1                             | High tem-<br>perature<br>limit  | 4   | -0  | 1  | 05  | 100                                  | 100                                  | 0             | 115           | °C<br>(P101) |
| P184                | 1                             | Low tem-<br>perature<br>limit   | 2   | 20  | 8  | 35  | 90                                   | 85                                   | 0             | 115           | °C<br>(P101) |
| P249                | 1                             | Tempera-<br>ture set-<br>point  | 3   | 30  | Ç  | 98  | 95                                   | 90                                   | 0             | 110           | °C<br>(P101) |
| P187                | 2                             | Number of<br>MT60 trig-<br>gered dis-<br>charges<br>before<br>alarm<br>"A84 High<br>water con-<br>tent" | 5   |     |  |   | 2                                    | 2                                    | 0             | 20            |              |
| P251                |                               | MT60 trigger factor (corresponds to 100% increase of the transducer signal)                             | 3,0 |     |  | 1   | ,5                                   | 0,1                                  | 10,0          | pF            |              |
| P252                | 1                             | MT60<br>trigger<br>limit  | 10  | 00  | 1  | 00  | 10                                   | 00                                   | 0             | 250           | %            |
| P189                | 2                             | Alarm<br>limit "A80<br>Trans-<br>ducer<br>value<br>high"  | 110 |     |  | 85  | 78                                   | 0                                    | 320           | pF            |              |
| P254                | 2                             | Reduction<br>of P240 if<br>DO<br>Calculated<br>as P240 *<br>P254  | 1   | ,0  | not<br>valid<br>for<br>this<br>oil<br>type | not<br>valid<br>for this<br>oil type      | not<br>valid<br>for this<br>oil type | not<br>valid<br>for this<br>oil type | 0,0           | 1,0           |              |

# 2 Operation Modes

### 2.1 Change-over Sequence

This sequence is run through when the system changes operation mode from RECIRCULATION to SEPARATION after start (supervision similar as in RECIRCULATION).

A special discharge sequence without displacement is run through. Finally the system ends up in SEPARATION.

The start discharge sequence is:

| SV15, discharge   |   | P244<br>— — — | P232 |               |             |               |               |  |  |
|---|---|---------------|------|---------------|-------------|---------------|---------------|--|--|
| SV16, closing water   |   |               |      | P257<br>— — — |             |               |               |  |  |
| SV10, condition-<br>ing/sealing, displace-<br>ment                                |   |               |      |               | P233<br>——— |               |               |  |  |
| V1, feed inlet (deactiv. = recirculation)   |   |               |      |               |             | P258<br>— — — |               |  |  |
| Sludge pump (optional)  |   |               |      |               |             |               | P234<br>— — — |  |  |
| Vibration supervision blocked   |   |               |      |               |             |               |               |  |  |
|   | Recircu- Start discharge lation  Discharge initiation |               |      |               |             |               |               |  |  |
| — — = activated = deactivated  * Timer interrupted when feedback signal received. |   |               |      |               |             |               |               |  |  |

### 2.2 Discharge

During discharge two different sequences are run through:

- displacement sequence (step 1)
- discharge sequence (step 2)

The following diagram shows the equipment which is activated during the sequences, the activation pattern and the corresponding timers.

### **Sequence Diagram**

If a combination of low PT4 pressure (P154) and low speed (P180) is detected when the feed is on, the system will go to STOP immediately without waiting the time in P238. Alarm 'A57 Oil leaking from bowl'.

| Vibration<br>supervision<br>blocked                               |                 |                |                      |                      |      |                  |                |      |      |                 |
|---|-----------------|----------------|----------------------|----------------------|------|------------------|----------------|------|------|-----------------|
| SV15,<br>discharge  | •               |                |                      |                      | P231 | P232             |                |      |      |                 |
| SV16, closing water   |                 |                |                      |                      |      |                  | P243           |      |      |                 |
| SV10,<br>conditioning,<br>displacement                            |                 |                | P240<br>             |                      |      |                  |                | P233 |      |                 |
| V1, feed inlet (deactiv. = recirculation)                         |                 | P171*          |                      |                      |      |                  |                |      | P238 |                 |
| Sludge pump<br>(optional)   |                 |                |                      | P234<br><br>min 10 s |      |                  |                |      |      | P234<br>        |
|   | Sepa-<br>ration |                | ement se<br>(Step 1) | equence              | Di   | ischarge<br>(Ste | sequen<br>p 2) | ce   |      | Sepa-<br>ration |
|   |                 | narge<br>ation |                      |                      |      |                  |                |      |      |                 |
| = activated   |                 |                |                      |                      |      |                  |                |      |      |                 |
| = deactivated  * Timer interrupted when feedback signal received. |                 |                |                      |                      |      |                  |                |      |      |                 |

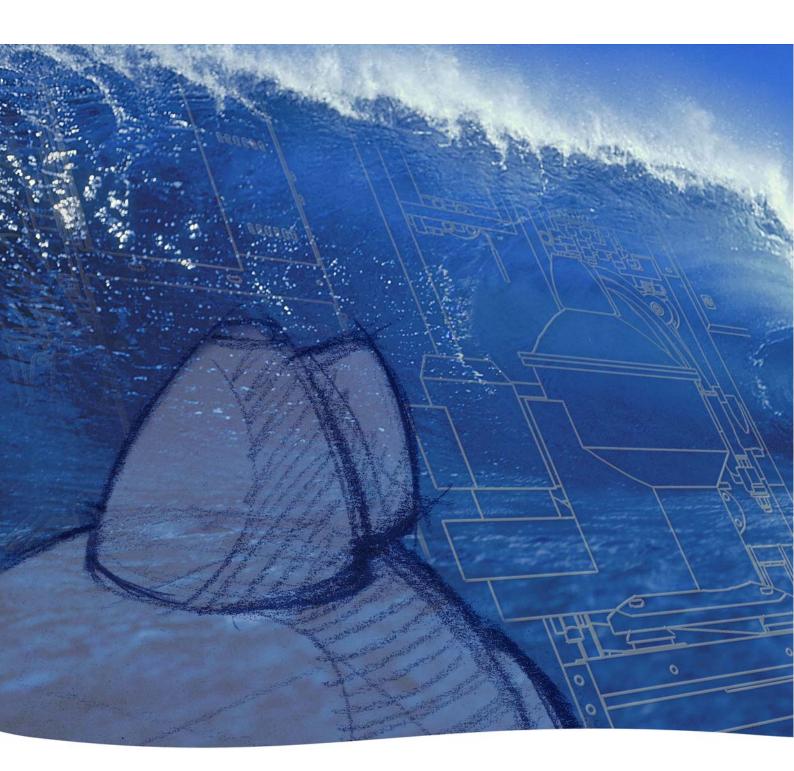
## S 805 / S 815 Flex Separation



# **Alarms and Fault Finding**

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### Published By:

Alfa Laval Tumba AB SE-147 80 Tumba, Sweden

Telephone: +46 8 530 650 00

Telefax: +46 8 530 310 40

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|   | 1.2 | Alarm History List      | 8  |
| 2 | Dis | play Alarms and Actions | 11 |
| 3 | EP  | C 60 Control panel      | 19 |

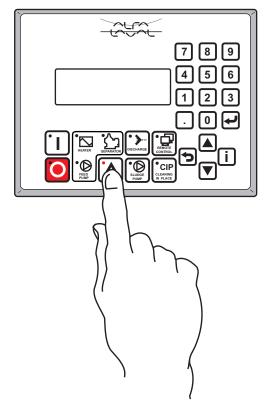
## 1 Alarms

## 1.1 Alarms List

To access the Alarms List press the 'Alarm Button'.

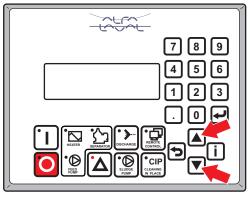


The latest 50 alarms are stored in the Alarm History List. See below.



X023912B

Press the arrow buttons to go up or down in the list.



X023914A

1.1 Alarms List 1 Alarms

For each item in the list you can press the 'Information' button for help and information. Press the 'Information' button again to return to your previous position.

You can also acknowledge and/or reset this alarm.

If the system has a fault, the alarm LED blinks. Press the 'Alarm' button once. The alarm shows on the display.

Press the 'Alarm' button again to acknowledge the alarm.

To go through the alarm list, press the 'Arrow' buttons.



After acknowledging an alarm, go through the alarm list to make sure that there are no other unacknowledged alarms!

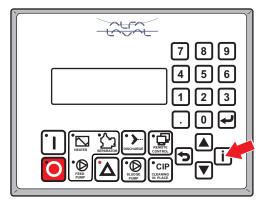
If after all alarms have been acknowledged fault(s) remain in the system, the alarm LED stops blinking and remains on. An 'A' appears at the end of an alarm which has not been rectified.

The alarms disappear automatically when the fault is rectified.

When all the alarms have been rectified, the alarm LED goes out.

For safety reasons, certain alarms must not only be acknowledged, but also rectified before the system can continue in operation, for example alarm A122 'Butterfly valve in sludge outlet closed'.

Also for safety reasons, some alarms will set the system into recirculation or stop. These alarms must be rectified before the operator can put the system into operation.



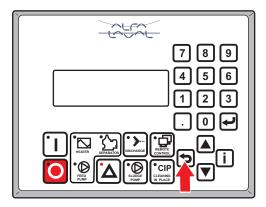
X023915A



X023919A

1 Alarms List

Press the 'Return' button to leave the list.



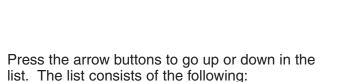
X023912A

## 1.2 Alarm History List

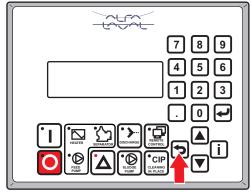
To access the Alarm History List at any time during the operation process press the 'Return button' repeatedly until the Alarm History List is reached.



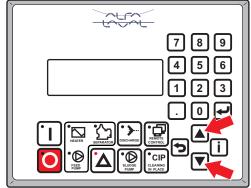
Relevant parameters only are shown on the display



- Parameter menu List of all parameters. Password protected. To go directly to a parameter, enter the parameter number.
- Time settings For setting date, time, etc. Password protected.
   To go directly to a parameter, enter the parameter number.
- 3. Operation time Different counters and timers can be read.
- 4. I/O Test Here it is possible to activate all outputs and to read the status for all inputs, for testing purposes.
- 5. Alarm history List of alarms which have been rectified. The latest alarm shows at the top of the list.
- 6. System info
- 7. IP settings
- 8. Password / Login
- 9. Set contrast



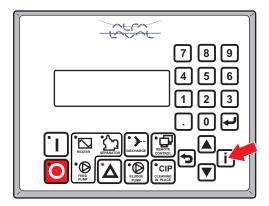
X023912A



X023914A

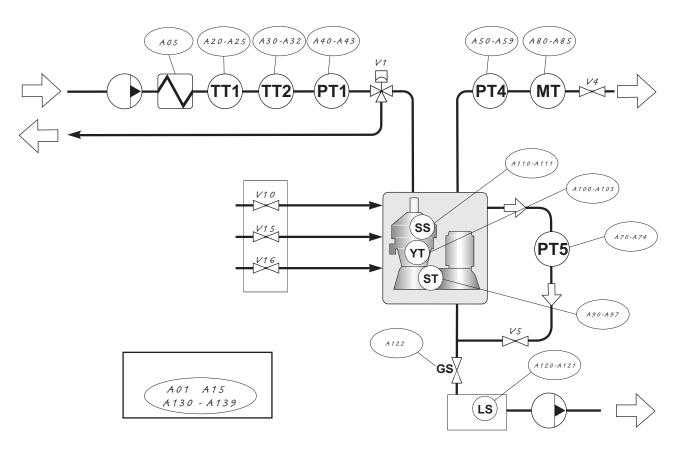
When the item, Alarm history, is blinking press the enter button. You get the history list of the last alarms. Use the Up/Down cursor to select an alarm.

Press the 'Information' button for information. Press the 'Information' button again to return to your previous position.



X023915A

# 2 Display Alarms and Actions



| X | 024 | 9 | 68 | 8 |
|---|-----|---|----|---|
|   |     |   |    |   |

| Alarm code    | Alarm text                | Conditions /<br>Consequences             | Why?                                       | What to do   |
|---------------|---------------------------|--|--|--|
| Feed p        | oump (if P127 = yes)      |  |  |  |
| A01           | Pump starter failure      | Delayed by P168.<br>Heater Off, Pump Off | Feedback signal from contactor K3 missing. | Check the contactor function. Check input terminal in the PLC. |
| Heater        | r, electric (if P119 = el | lectric)                                 |  |  |
| A05           | Heater fault (electric)   | Delayed 2 s.<br>Heater Off               |  | Check the power supply to the heater.                          |
| Separa        | ator (motor)              |  |  |  |
| A15           | Separator starter failure | Delayed 2s.                              | Feedback signal from contactor K2 error.   | Check the contactor function. Check input terminal in the PLC  |
| Alarm<br>code | Alarm text                | Conditions / Consequences                | Why?                                       | What to do   |

Temperatur transmitter feed inlet TT1

| A20 | Oil feed temperature high               | Delayed by P150.<br>Limit in P183.<br>Heater Off                                | Steam supply valve faulty Faulty triac module(s) in the power unit or faulty controller in the control unit. (electric heater).  Broken wiring or defective heater resistance, or faulty controller in the control unit. | Investigate cause and remedy.  |
|-----|---|---|--|--|
| A21 | Oil feed temperature low                | Delayed by P150.<br>Limit in P184   | Heater clogged  Steam supply insufficient  Steam trap faulty   | Investigate cause and remedy. Investigate cause and remedy. Investigate cause and remedy.  |
|     |   |   | Steam supply valve insufficient Faulty fuses or burned contactors (electric heater)  | Investigate cause and remedy.  Check and renew broken fuses. Reset overcurrent protection (applicable for 8/7 - 24/22 kW power unit).  Check wiring and contactor coils.   |
|     |   |   | Broken wiring or<br>defective heater<br>resistance (electric<br>heater)  | Check wiring and heater resistance of each block or heater element.  |
| A22 | Temperature alarm<br>sensor error (TT1) | Signal out of range,<br>delayed by P150.<br>Alarm switches heater<br>off.       | Short circuit / broken sensor or cable.  | Disconnect cable at sensor. Measure resistance between 1-3. Resistance shall be within 100-142 ohms = 0-110 C/32-230 F. Replace sensor if broken. If no spare sensor available, set parameter P146 = TT1 to be able to run the system. |
| A23 | Temperature alarm sensor disabled       | Reminder only, if P146<br>= TT1<br>Possible to supervice<br>the system via TT2. |  |  |

| Alarm code | Alarm text                                | Conditions / Consequences   | Why?   | What to do  |
|------------|---|---|--|---|
| A24        | Temperature increase too slow             |   | Insufficient heating during start.                     | Check heater function.  |
| A25        | Temperature not decreasing                | Delayed by P173.<br>(Stop sequence<br>continues after alarm                     | Heating on during stop sequence. Recirculating oil not | Check heater function. Reset alarm to   |
|            |   | reset) Temp. down<br>5 degrees or below<br>P184<br>Disabled if P173 = 0.        | cooling.   | continue.   |
| Tempe      | eratur transmitter heat                   |   |  |   |
| A30        | Temperature control<br>sensor error (TT2) | Signal out of range,<br>delayed by P150.<br>Alarm switches heater<br>off.       | Short circuit / broken sensor or cable                 | Disconnect cable at sensor. Measure resistance between 1-3. Resistance shall be within 100-142 ohms = 0-110 C/32-230 F. Replace sensor if broken. If no spare sensor available, set parameter P146 = TT2 to be able to run the system |
| A31        | Temperature control sensor disabled       | Reminder only, if P146<br>= TT2<br>Possible to control the<br>system via TT1    |  |   |
| A32        | Difference TT1/TT2 too large              | Delayed by P176.<br>Alarm limit in P177.<br>Blocked if A22, A23,<br>A30, or A31 |  |   |
| Pressu     | ure transmitter feed ir                   | ilet PT1  |  |   |
| A40        | Feed pressure PT1 high                    | Delayed by P150.<br>Limit in P157   | Pipe restricted.                                       | Check recirculation for restriction.  |
| A41        | Feed pressure PT1                         | Delayed by P150.  | Pump not working                                       | Check pump.   |
|            | low                                       | Limit in P158.<br>Not supervised during<br>discharge sequence.                  | Pressure in feed line too low                          | Check feed line and flow regulation. Check heater for fouling.  |
| A42        | Feed pressure sensor<br>PT1 error         | Delayed by P150.<br>Signal out of range<br>(4-20 mA).                           | Sensor or cable damaged.                               | Check cable connections. Replace sensor. If no spare sensor available, set parameter P157 = 0.  |
| A43        | PT1 disabled                              | Reminder only, if P157 = 0.   |  |   |

| Alarm code | Alarm text                         | Conditions / Consequences                            | Why?  | What to do  |
|------------|------------------------------------|--|---|---|
|            | ure transmitter oil out            |  |   |   |
| A50        | Oil backpressure PT4 high          | Delayed by P150.<br>Alarm limit in P153.             | Increased throughput  | Check. Reduce backpressure.   |
|            |                                    |  | Regulating valve too restricted                                       | Adjust valve.   |
| A51        | Oil backpressure PT4 low           | Delayed by P150.<br>Alarm limit in P154.             | Decreased throughput  | Check feed pump and adjust flow.  |
|            |                                    |  | Regulating valve open too much  | Adjust back pressure valve  |
|            |                                    |  | Change over valve<br>V1 in recirculation<br>position                  | Check air pressure, solenoid valve SV1 and output from EPC 50.                                  |
|            |                                    |  | Bowl opens unintentionally during operation because:                  |   |
|            |                                    |  | Strainer and piping in the operating water supply is clogged.         | and check the whole system fore limestone deposits.   |
|            |                                    |  | Too little or no water in the operating water system                  | Measure the water flow in the three hoses from the water block and compare with correct values. |
|            |                                    |  | Hoses between the supply valves and separator are incorrectly fitted. | Fit hoses correctly.  |
|            |                                    |  | Nozzle in bowl body clogged   | Clean the nozzle.   |
|            |                                    |  | Rectangular ring in discharge slide is defective.                     | Renew the rectangular ring.   |
|            |                                    |  | Valve plugs are defective.  | Renew all plugs.  |
|            |                                    |  | Supply valves SV15 and SV 16 are leaking.                             | Rectify the leak.   |
| A52        | Oil pressure sensor<br>PT4 error   | Delayed by P150.<br>Signal out of range<br>(4-20mA). | Sensor or cable damaged.  | Check cable connections. Replace sensor. If no spare sensor available, set parameter P153 = 0.  |
| A53        | PT4 disabled                       | Reminder only, if P153 = 0.                          |   |   |
| A54        | Oil pressure PT4 high at discharge |  | No decrease in oil pressure at discharge                              | Check function of change-over valve V1.   |

| Alarm code | Alarm text                         | Conditions /<br>Consequences  | Why?                                      | What to do   |
|------------|------------------------------------|---|---|--|
| A57        | Oil leaking from bowl              | This alarm is given under special conditions.                             | Bowl periphery sealing damaged            | Change seal ring in bowl hood. Check/change rubber rings and valve plugs.                            |
|            |                                    |   | Leakage somewhere in oil outlet           | Check for leakage.   |
|            |                                    |   | Closing water leaking                     | Check/change sealings and plugs.   |
| Water      | transducer MT60                    |   |   |  |
| A80        | Transducer value high              | Delayed by P150.<br>Limit in P189.<br>Not supervised during               | Extremely high water content.             | Check where the water is coming from.  |
|            |                                    | discharge.  | Fouling in the MT60.                      | Dismantle and clean with detergent.  |
| A81        | Transducer value low               | Delayed by P150.<br>Limit in P162.<br>Not supervised during<br>discharge. | Too much air in oil outlet.               | Check oil backpressure.  |
| A82        | MT60 in standby more than 24 hours | Reminder only, if P128 = standby more than 24h.                           |   |  |
| A84        | High water content                 | P187 alcap-triggered discharges before                                    | Too much water in oil outlet.             | Investigate cause and remedy.  |
|            |                                    | alarm. (P187 reset at alarm reset.)                                       | Much water in the feed.                   | Check where the water is comimg from.  |
|            |                                    |   | Paring tube not moving properly.          | Check that movement is not impeded by friction.  |
| A85        | MT60 fault                         | Delayed by P150.<br>Signal out of range<br>(4-20mA).                      | Sensor or cable damaged.                  | Check cable connections. Replace sensor. If no spare sensor available, set parameter P128 = standby. |
| Pressu     | ure transmitter feed in            | let PT1   |   |  |
| A97        | Discharge feedback error           | Stop alarm limit in P259. Test during P231 and P232.                      | The pressure PT1 has not decreased enough |  |

| Alarm | Alarm text              | Conditions /  | Why?                                 | What to do   |
|-------|-------------------------|---|--------------------------------------|--|
| code  |                         | Consequences  |                                      |  |
|       | ion sensor separator    | • • •   |                                      |  |
| A101  | High vibration shutdown | Delayed by 1s. No restart possible. Activate hold/reset output for 1s at alarm reset. (need to check) | Sludge remaining in part of the bowl | Dismantle, clean<br>and check the bowl<br>before restart. See<br>Service Manual. |
|       |                         | WARNING   |                                      | AWARNING Disintegration beyond   |
|       |                         |   |                                      | The separator bowl   |
|       |                         | Disintegration hazard   | d                                    | must be manually   |
|       |                         | If excessive  |                                      | cleaned before starting  |
|       |                         | vibration occurs,   |                                      | up again.  |
|       |                         | stop separator and  |                                      |  |
|       |                         | keep bowl filled with liquid during   |                                      |  |
|       |                         | rundown. The cause  |                                      |  |
|       |                         | of the vibration must   |                                      |  |
|       |                         | be identified and   |                                      |  |
|       |                         | corrected before  |                                      |  |
|       |                         | the separator is restarted.   |                                      |  |
|       |                         | - Tootai toui   | Bowl wrongly                         | Check assembly.  |
|       |                         |   | mounted                              |  |
|       |                         |   | Disc stack                           | Check assembly.  |
|       |                         |   | compression incorrect Bowl assembled | Check assembly.  |
|       |                         |   | with parts from other separators     | Check assembly.  |
|       |                         |   | Height position                      | Stop the separator,  |
|       |                         |   | of paring disc is incorrect.         | measure and if necessary adjust the height.                                      |
|       |                         |   | Bowl spindle bent.                   | Renew the bowl spindle.  |
|       |                         |   | Bearing(s) damaged or worn.          | Renew all bearings.  |
|       |                         |   | The frame feet are worn out.         | Renew the frame feet.  |
|       |                         |   | Spindle top bearing spring broken.   | Renew all springs.   |
| A103  | Vibration sensor        | Reminder only. If P132  |                                      |  |
|       | disabled                | = yes.  |                                      |  |

| Alarm code | Alarm text  | Conditions / Consequences  | Why?  | What to do  |
|------------|---|--|---|---|
| Frame      | cover switch sepa   | rator (if P115 = yes)  |   |   |
| A110       | Frame cover open  | Delay 1s.<br>Alarm given if signal on<br>A3:13 high  | Separator not properly assembled                    | Assemble the separator according to instructions.   |
|            |   |  | Faulty frame cover switch                           | Replace cover<br>switch. If no spare<br>switch available, set<br>parameter P116 = yes<br>to be able to run the<br>system. |
| A111       | Frame cover switch disabled   | Reminder only, if P116 = yes.  |   |   |
| Sludge     | e handling  | •  |   |   |
| A120       | Sludge tank level<br>high   | Delay 60s Delayed by P159 Alarm delay and max pump running time 60s in all modes without feed flow, P159 in Separation. Note: This alarm function is not dependent on the setting of P118. | Pump has not drained the tank                       | Check the pump function.  |
| A121       | Level switch disabled   | Reminder only, if P149 = yes.  |   |   |
| A122       | Valve in sludge<br>outlet closed<br>Discharge not<br>possible. Start not<br>possible. | Delayed 5s   | Valve closed.                                       | Open manual valve.  |
| A123       | External alarm  | Delay 2 s<br>Via prog. input. If signal<br>high.   |   |   |
| Syster     | n   |  |   |   |
| A130       | Emergency stop button pushed  | Delay 1s. No restart.  | Emergency stop button pushed                        | Reset pushbutton.   |
| A132       | Power failure   | Black-out has occurred during operation. Can be disabled with P152 = no.   | Black-out has occurred during operation.            | Check plant conditions and restart.   |
| A133       | Too long time in RECIRCULATION  | Delayed by P178.<br>System goes to STOP.   | Time in RECIRCULATION expired.                      |   |
| A136       | Communication error   | If P145 different from "disabled".   |   |   |
| A137       | Cabinet over temperature  | Reminder only. CPU temperature > 85°C.   |   |   |
| A138       | Too many start attempts   |  | Contactor activated 5 times within last 60 minutes. |   |

| Alarm code | Alarm text                    | Conditions /<br>Consequences | Why?   | What to do   |
|------------|-------------------------------|------------------------------|--|--|
| A139       | EPC60 internal failure        | Delay 2s                     | IO-card status or PLC status not OK PLC has detected an IO-configuration that does not exist   | Check IO cards have no red LEDs Check if IO-configuration is right or verify electrical drawings |
| A140       | Too long time out o operation | f                            | Alarm is created if the separator has been out of operation for one month or more. It is reset if the separator has been running for at least 5 hours. | Pre-lubricate spindle bearings. After service always run the separator continuously for          |
| A145       | Panel communication error     | Delay 2s                     |  | Check wiring.  |

# 3 EPC 60 Control panel

| Fault        | Remedy   |
|--------------|--|
| Black screen | Press and hold Enter button and adjust contrast with up and down button. This can be done regardless of which page is currently displayed. |

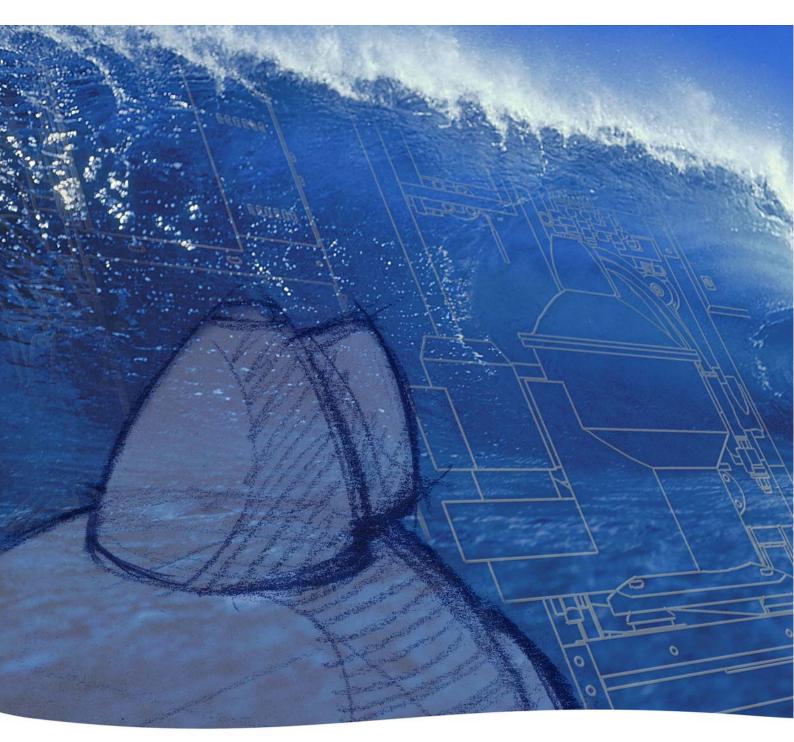
## Flex Separation System



## **Installation System Reference**

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Alfa Laval Tumba AB SE-147 80 Tumba, Sweden

Telephone: +46 8 530 650 00

Telefax: +46 8 530 310 40

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Original instructions

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## 1 Technical Data

### 1.1 Demand Specifications Water

Alfa Laval ref. 574487 Rev. 1

Poor quality of the operating water may with time cause erosion, corrosion and/or operating problems. The water shall be treated to meet certain demands.

#### The following requirements are important:

- 1. Turbidity-free water, solids content <0,001% by volume. Max. particle size 50  $\mu$ m. Deposits shall not be allowed to form in certain areas in the system.
- 2. Total hardness less than 180 mg CaCO<sub>3</sub> per litre, which corresponds to 10 °dH or 12,5 °E. Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency. These effects become more severe the harder the water is.
- 3. Chloride content max. 100 ppm NaCl (equivalent to 60 mg Cl/l). Chloride ions contribute to corrosion on surfaces in contact with the operating water. Corrosion is a process that is accelerated by increased separating temperature, low pH, and high chloride ion concentration.
- 6,5 < pH < 9</li>
   Bicarbonate content (HCO<sub>3</sub>) min. 70mg HCO<sub>3</sub> per litre, which corresponds to 3,2 °dKH.
- 5. Pressure 200 800 kPa (2 8 bar).



Alfa Laval accepts no liability for consequences arising from unsatisfactorily purified operating water supplied by the customer.

## 1.2 Demand Specifications Air

#### Specific requirements regarding the quality of air

- 1. Pressure 500 800 kPa (5 8 bar).
- 2. Free from oil, and solid particles larger than 0.01 mm.
- 3. Dry, with dew point min. 10 °C below ambient temperature.



Electrical interconnections must be made by qualified electricians.

Mechanical interconnections must be made by qualified mechanical technicians.

1 Technical Data 1.3 System Data

## 1.3 System Data

### Application

| Cleaning of fuel and lubricating oils |  |
|---------------------------------------|--|
| Min. density                          | 820 kg/m <sup>3</sup> at 15°C  |
| Max. density                          | 1010 Kg/m <sup>3</sup> at 15°C in ALCAP mode<br>991 kg/m <sup>3</sup> at 15°C in Purifier mode |
| Max. viscosity. S 805 – S 927         | 55 cSt at 100°C ( 700 cSt at 50°C)   |
| Max. viscosity. P 605 – P 626         | 50 cSt at 100°C ( 600 cSt at 50°C)   |
| Feed temperature                      | 5°C to 100°C   |
| Ambient temperature                   | 5°C to 55°C  |
| Feed capacity                         | In accordance with the separator size capacity table   |

#### Media inlet/outlet data at separator connections

| Pressure                       |   |
|--------------------------------|---|
| Oil inlet                      | Max. 2 bar at separator inlet   |
| Oil outlet                     | Max. 2.5 bar  |
| Sludge outlet from separator   | without pressure  |
| Sludge outlet from sludge pump | Max. 5 bar at 6 bar air pressure  |
| Separated water                | Max. 4 bar ( if not diverted into sludge outlet)                          |
| Temperature                    | According to capacity table, depending on oil viscosity ±2 °C Max. 100 °C |

1.3 System Data 1 Technical Data

#### Sludge Removal kits (optional)

The systems can be equipped with their own sludge tank for collecting the sludge discharge from the separator.

Sludge Removal Kit tank volumes:

P 605, P 615, S 805, S 815 - 23 Litres

P 625, P 626, S 821, S 826, S 921, S 926, S 927 – 11.5 Litres.

| SV 10: 8.0 l/m<br>SV 15: 18 l/m<br>SV 16: 0.9 l/m  |
|--|
| SV 10: 1.3 l/m<br>SV 15: 18 l/m<br>SV 16: 0.9 l/m  |
| SV 10: 15 l/m<br>SV 15: 11 l/m<br>SV 16: 2.8 l/m   |
| SV 10: 0.9 I/m<br>SV 15: 11.0 I/m<br>SV 16: 2.8 I/m<br>For further details see "1.1 Demand Specifications<br>Water on page 7". |
|  |
| 2 – 8 bar  |
| 5 °C – 55 °C (unheated water)  |
|  |
| Instrument air   |
| 5 – 8 bar (an optional pressure reducer is available for above 8 bar)  |
|  |
| 10 N I/h   |
| 1000 N I/h at max. 1I/s<br>For further details see "1.2 Demand Specifications<br>Air on page 8".                               |
|  |
|  |
| Max. 6 bar (for steam / condensate Max. 9 bar)   |
| Max. 9 bar (for steam/condensate Max. 14 bar)  |
| 5 °C – 180 °C  |
| PN 16 DIN 2573/2633  |
| Material; ASTM A 106 gr. B seamless schedule 40 thickness. Sizes; from ½" upto 4"  |
|  |
| Max. 6 bar   |
| 5 °C – 55 °C   |
|  |

1 Technical Data 1.3 System Data

| Auxiliary systems                 |   |
|-----------------------------------|---|
| Auxiliary media - Air             |   |
| Design pressure                   | Max 10 bar  |
| Material                          | Nitrile rubber-steel braided hose or PTFE pipes where possible.       |
| Drip tray volume                  | Max. 17 litres  |
| Drip tray Material                | Steel sheet laser cut and welded parts                                |
| Drip tray Drain connection size   | 2 x 1" G (internally threaded)  |
| Frame Baseplate Material          | Steel sheet laser cut and welded parts                                |
| Electrical design                 |   |
| Mains supply                      |   |
| Voltage                           | 3x 230 /400V/ 440V / 480V / 575V / 690V ± 10 %                        |
| Frequency                         | 50 / 60 Hz  |
| Separator el.motor                | In accordance with the separator size selected and related data sheet |
| Separator el motor power range    | From 2.2 kW up to 6.4 kW  |
| Feed Pump el. Motor               | In accordance with the pump size selected and related data sheet      |
| Feed Pump el motor power range    | from 0.25 kW up to 4 kW   |
| EPC                               |   |
| Voltage                           | 24 V DC (internal)  |
| Control voltage, operating supply | 24 V AC ( from internal transformer )                                 |
| Frequency                         | 50 or 60 Hz ± 5 %   |
| Control cabinet                   |   |
| Enclosure class                   | IP 55   |
| Material                          | Steel sheet   |
| Ambient temp.                     | Max 55 °C   |

1.3 System Data 1 Technical Data

| Planned Maintenance Kits (not including wear items) P 605, P 615, S 805, S 815 |           |                     |                        |  |  |  |  |
|--|-----------|---------------------|------------------------|--|--|--|--|
| Hours Period Separator Ancillary Equipment                                     |           |                     |                        |  |  |  |  |
| 2000   | 3 months  | Inspection          |                        |  |  |  |  |
| 8000   | 12 months | Major               |                        |  |  |  |  |
| 16000  | 2 years   | Major               |                        |  |  |  |  |
| 24000  | 3 years   | Major               |                        |  |  |  |  |
| As necessary   |           |                     | Repair<br>(components) |  |  |  |  |
| With delivery  |           | Commissioning Tools | 8                      |  |  |  |  |

| Planned Maintenance Kits (not including wear items) P 625, P 626, S 821, S 826, S 921, S 926, S 927 |              |                       |                             |                |              |                 |            |     |
|---|--------------|-----------------------|-----------------------------|----------------|--------------|-----------------|------------|-----|
| Hours   | Period       | Separa-<br>tor        | Module                      | Sludge<br>pump | Feed<br>pump | Control cabinet | El. heater | СВМ |
| 4000  | 6 months     | Inspec-<br>tion       |                             |                |              |                 |            |     |
| 12000   | 18<br>months | Overhaul              |                             | Overhaul       |              |                 |            |     |
| 24000   | 3 years      | Overhaul              | Overhaul                    | Overhaul       | Overhaul     |                 |            |     |
| As necessary  |              | CIP                   | Repair<br>(compon-<br>ents) |                |              |                 | Repair     | CIP |
| With delivery   |              | Inspec-<br>tion Tools |                             |                |              |                 |            |     |
| Backup  |              | Support               |                             |                |              | Support         |            |     |



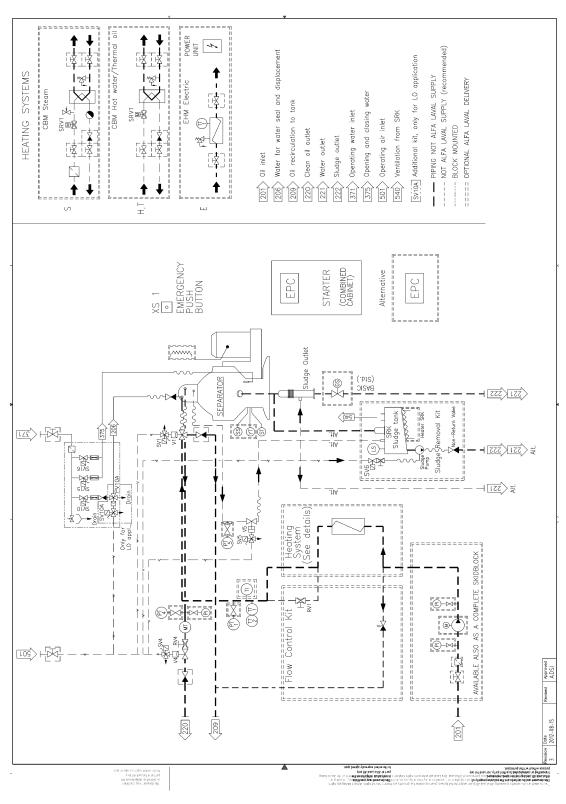
The lifespan of wear items, such as friction blocks and main seal ring, depends on the number of startups, as well as plant and feed conditions. Check wear items regularly and change when necessary.

# 2 Mechanical Drawings

### 2.1 Flow charts

#### 2.1.1 S 821 - S 927 Separator, Basic and Optional Components

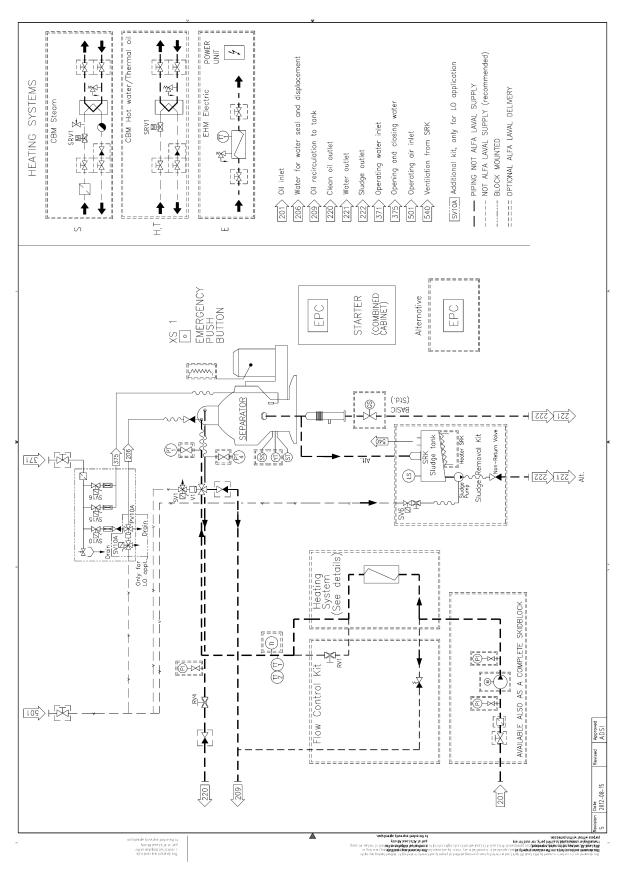
Alfa Laval ref. 584767 Rev. 3



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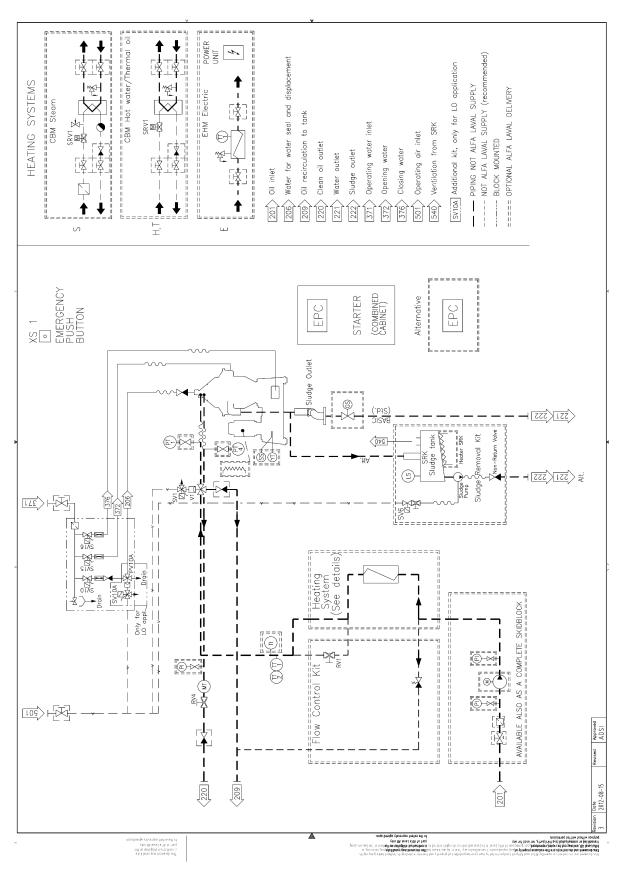
#### 2.1.2 P 605/615, P 625/626 Separator Basic and Optional Components

Alfa Laval ref. 584768 Rev. 5



### 2.1.3 S 805/815 Separator Basic and Optional Components

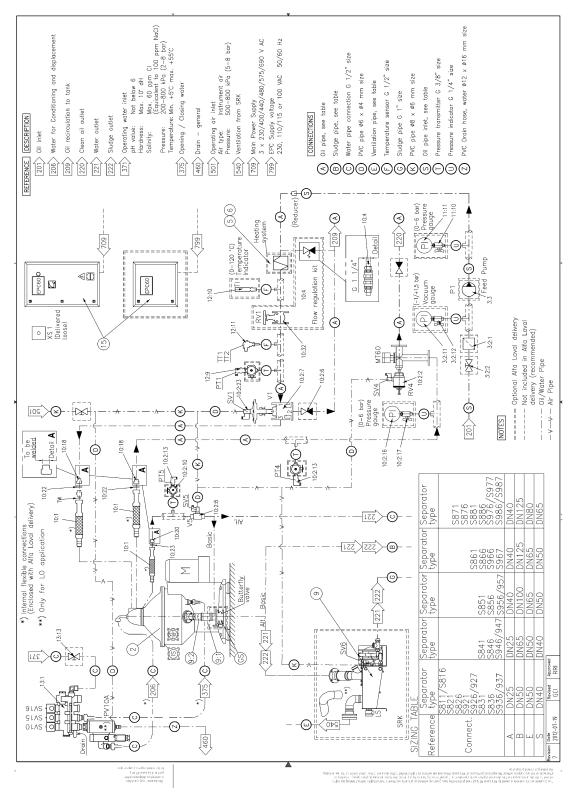
Alfa Laval ref. 588919 Rev. 3



## 2.2 Mounting Drawings

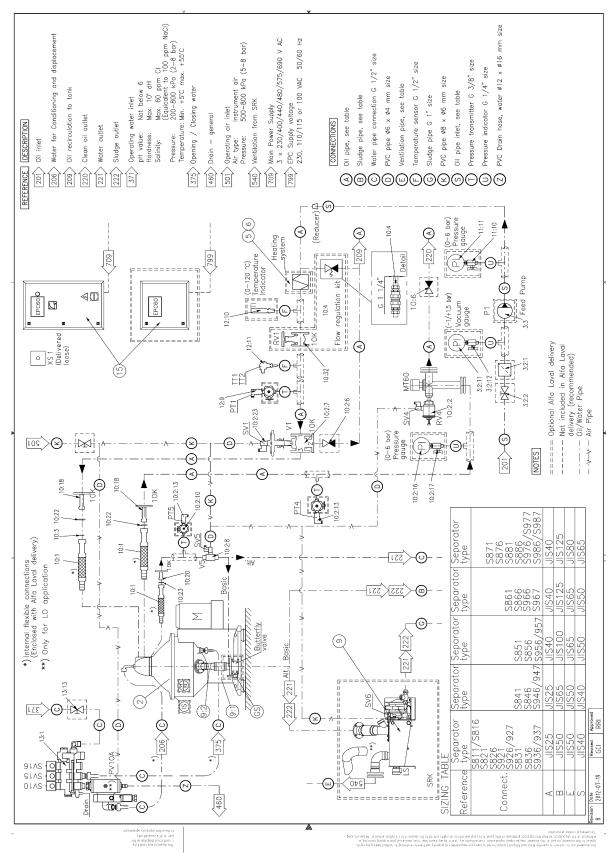
### 2.2.1 S 821 - S 927 Separator, DIN Mounting Drawing

Alfa Laval ref. 584354 Rev. 7



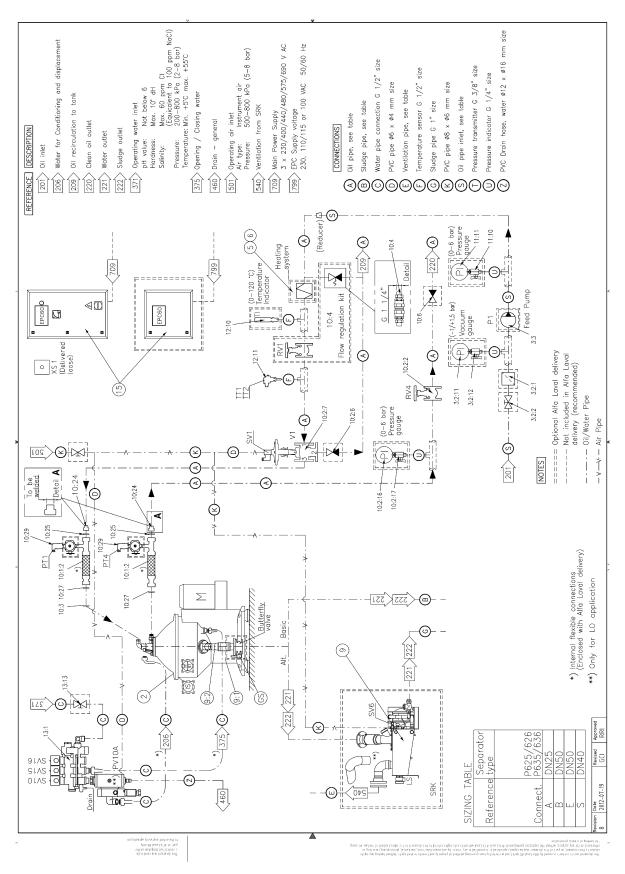
#### 2.2.2 S 821 - S 927 Separator JIS Mounting Drawing

Alfa Laval ref. 584355 Rev. 8



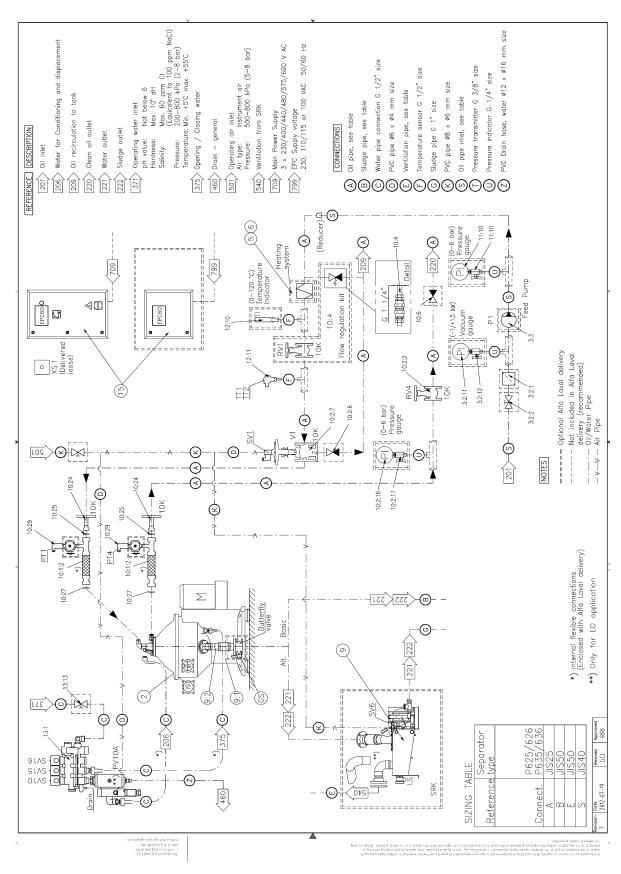
#### 2.2.3 P 605, P 615, P 625/626 Separator, DIN Mounting Drawing

Alfa Laval ref. 584356 Rev. 8



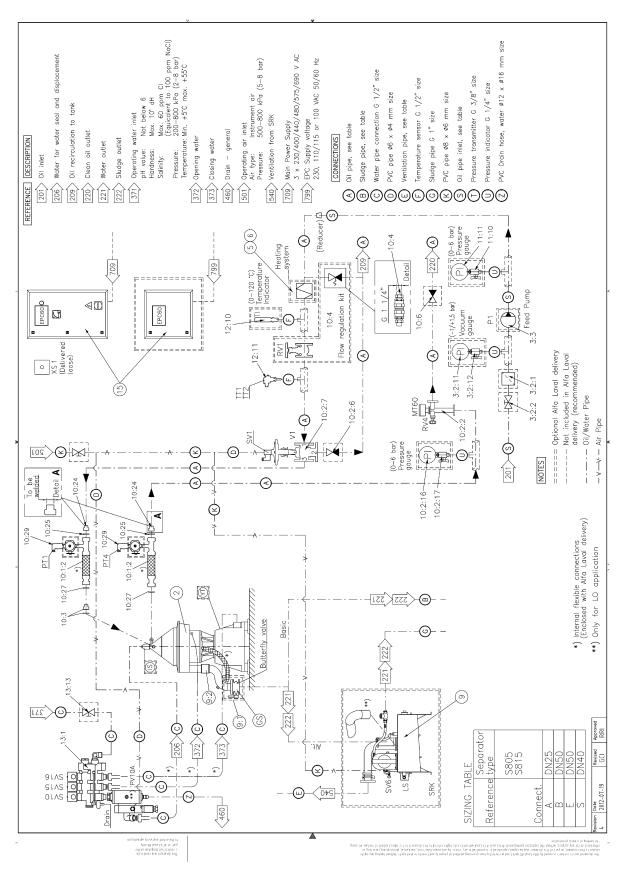
#### 2.2.4 P 605, P 615, P 625/626 Separator, JIS Mounting Drawing

Alfa Laval ref. 584357 Rev. 7



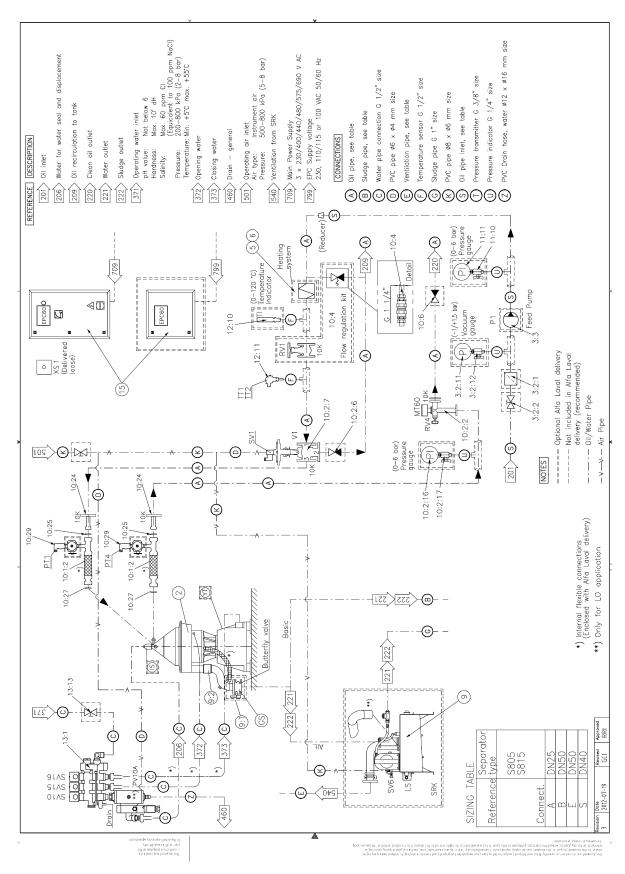
#### 2.2.5 S 805, S 815 Separator DIN Mounting Drawing

Alfa Laval ref. 588920 Rev. 4



#### 2.2.6 S 805, S 815 Separator JIS Mounting Drawing

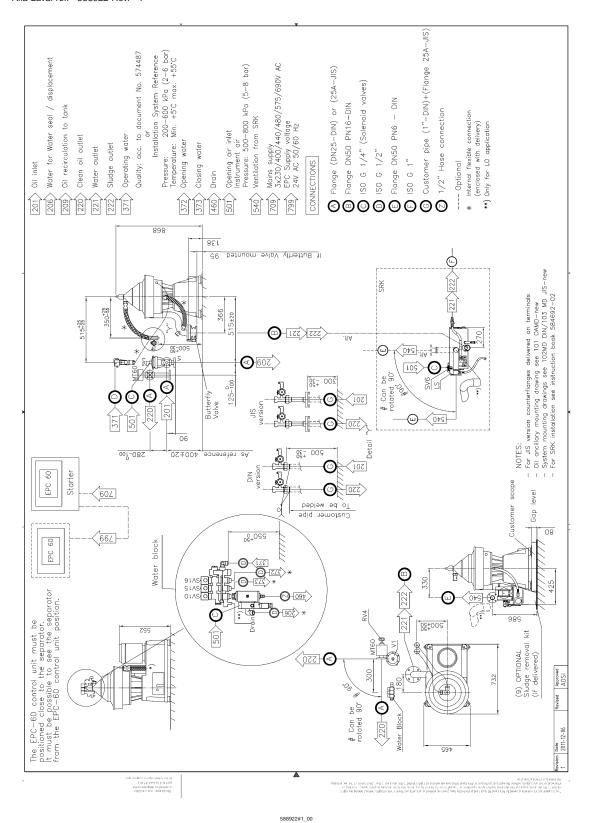
Alfa Laval ref. 588921 Rev. 3



# 2.3 Installation Drawings

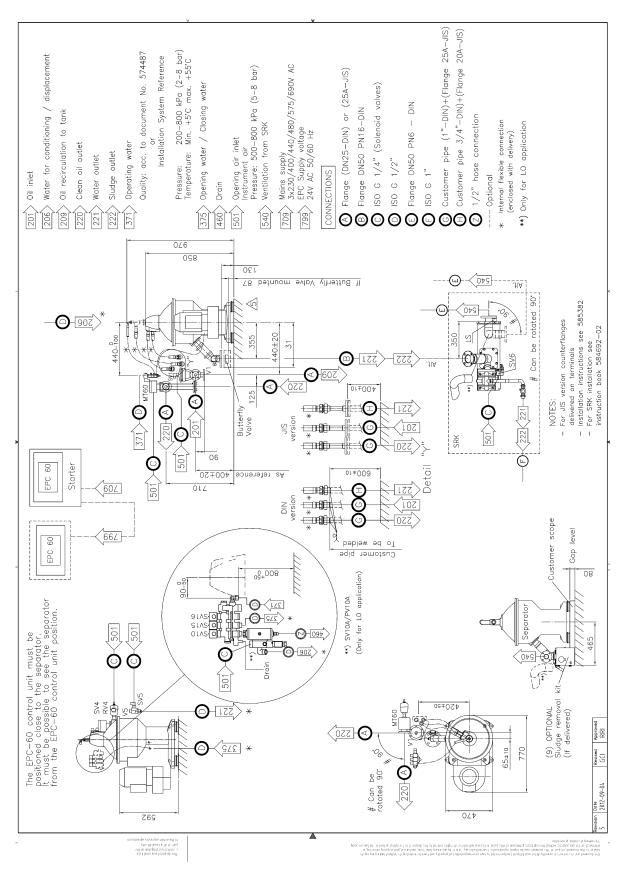
#### 2.3.1 S 805/815 Separator Installation Drawing

Alfa Laval ref. 588922 Rev. 1



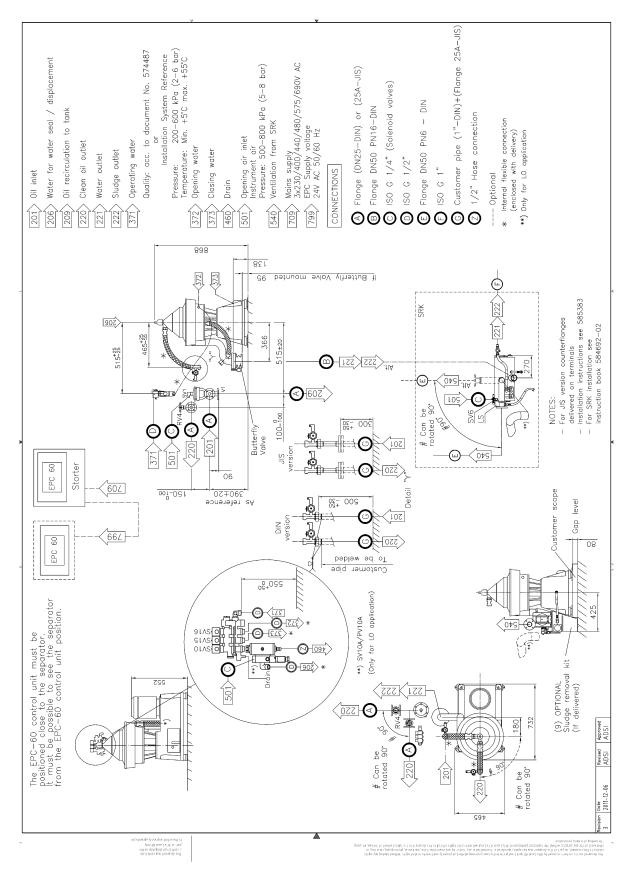
#### 2.3.2 S 821 - S 927 Separator Installation Drawing

Alfa Laval ref. 585169 Rev. 5



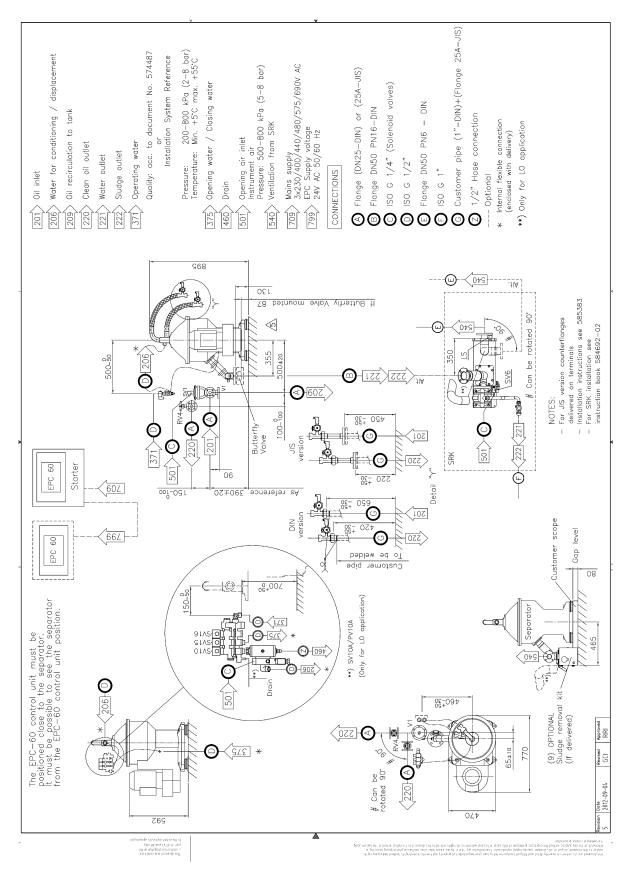
#### 2.3.3 P 605/P 615 Separator Installation Drawing

Alfa Laval ref. 585165 Rev. 3



#### 2.3.4 P 625/626 Separator Installation Drawing

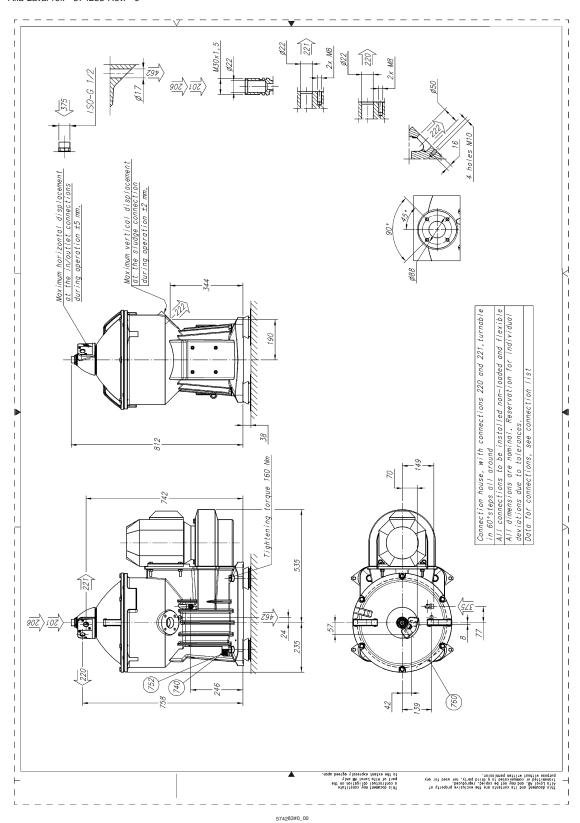
Alfa Laval ref. 585166 Rev. 5



# 2.4 Basic Size Drawings

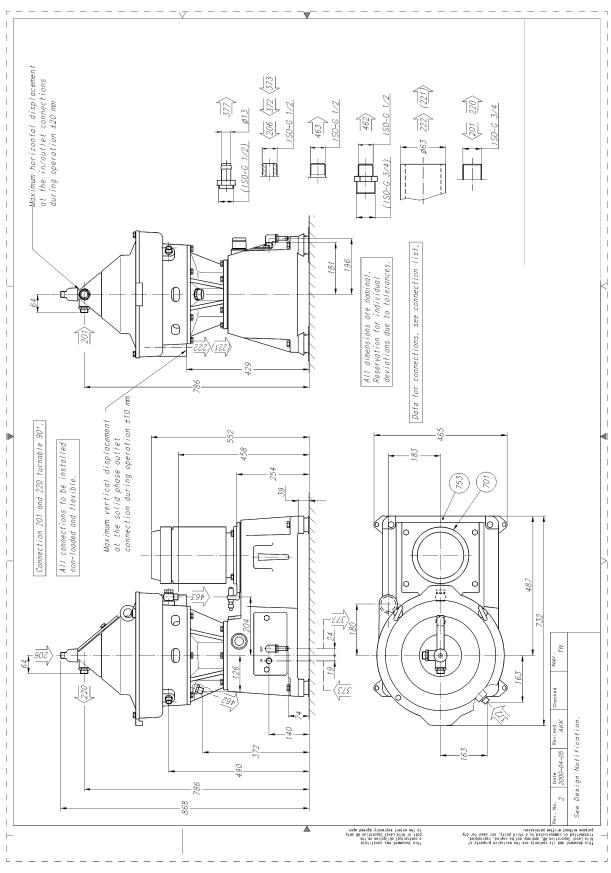
### 2.4.1 S 821 - S 927 Basic Size Drawing

Alfa Laval ref. 574283 Rev. 0



### 2.4.2 P 605, S 805 Separator Basic Size Drawing

Alfa Laval ref. 565297 Rev. 2

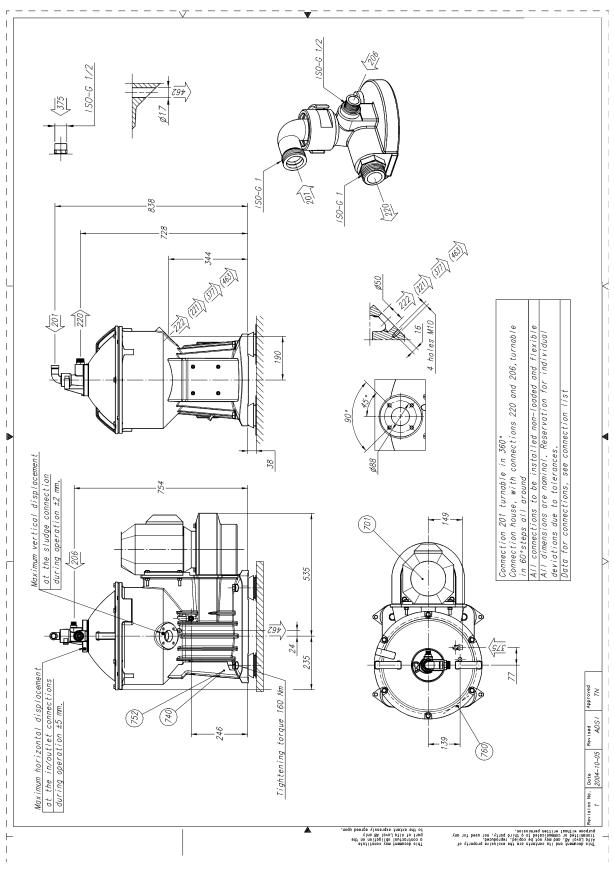


### 2.4.3 P 615, S 815 Separator Basic Size Drawing

Alfa Laval ref. 565298 Rev. 2 Maximum horizontal displacement at the in/outlet connections during operation ±20 mm 727 75J see connection list. 197 All dimensions are nominal.
Reservation for individual
deviations due to tolerances. 181 0 Data for connections, Maximum vertical displacement at the solid phase outlet connection during operation ±10 mm Connection 201 and 220 turnable 90° All connections to be installed non-loaded and flexible. (5) 39 487 0 720 sed Design Notification This document and its contents are the exclusive property of Alfa Lavol Separation AB, and may not be copied, reproduced, transmitted or communicated to a third party, nor used for any purpose without written permission.

### 2.4.4 P 625, S 626 Separator Basic Size Drawing

Alfa Laval ref. 574932 Rev. 1



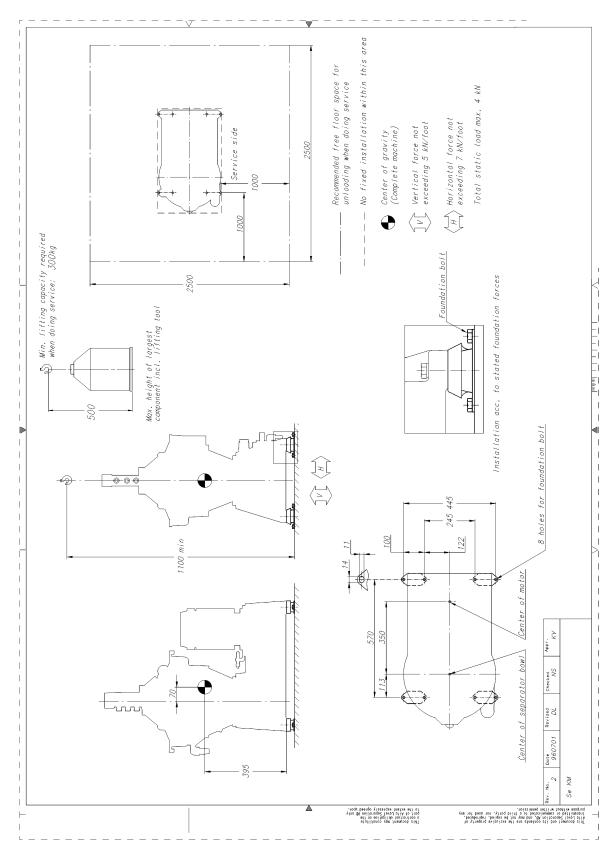
# 2.5 Foundation drawings

### 2.5.1 S 821 - S 927, P 625/626 Separator Foundation Drawing

Alfa Laval ref. 574284 Rev. 1 Recommended free floor space for from separator do not exc Force in ony separator fo Force in ony separator fo Vertical 48 kN Horizontal 48 kN Total foundation force (s Vertical 48 kN Horizontal 48 kN 008 Foundation turnable 360 8 holes Ø13,5 for foundation bolt This document may constitute a contractual obligation on the part of Alfa Laval AB only to the extent expressly agreed up This document and its contents are the exclusive property of Mifa Loval AB, and may not be copied, reproduced, framsmitted or communicated to a third porty, nor used for any purpose without written permission. 574284#1\_00

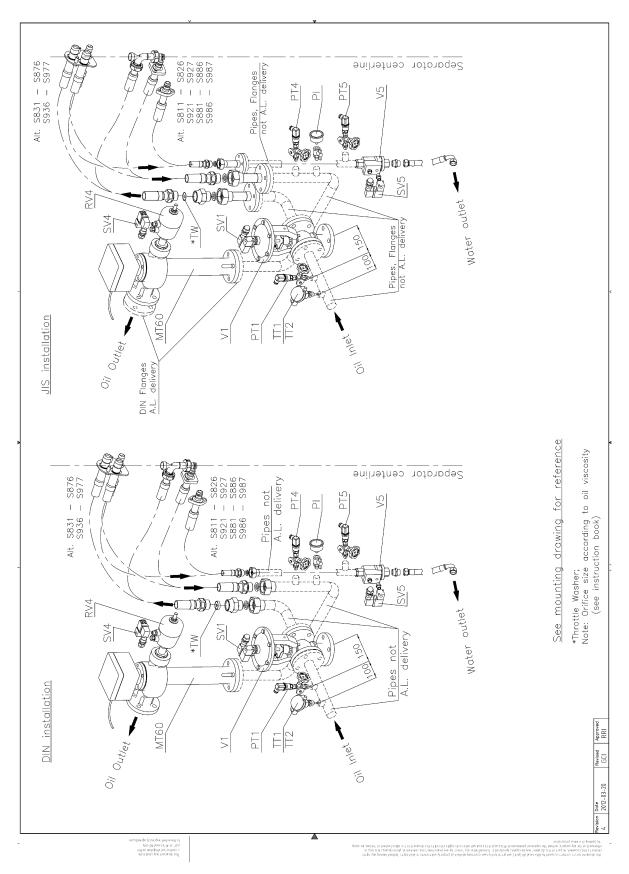
### 2.5.2 P 605/615, S 805/815 Separator Foundation Drawing

Alfa Laval ref. 548711 Rev. 2



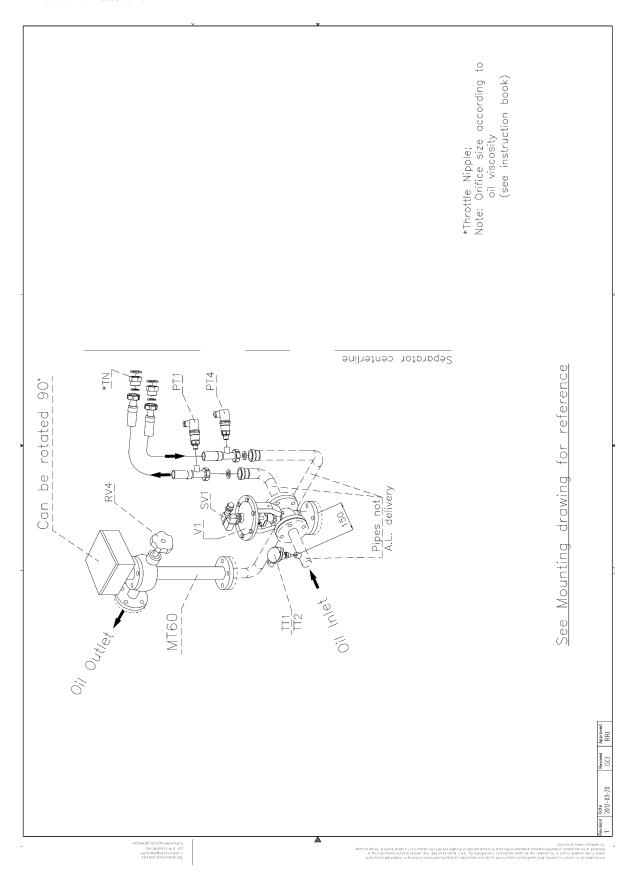
# 2.6 S 821 - S 927 Separator, Pipe Arrangement

Alfa Laval ref. 585382 Rev. 4



# 2.7 S 805, S 815 Separator Pipe Arrangement

Alfa Laval ref. 588923 Rev. 1

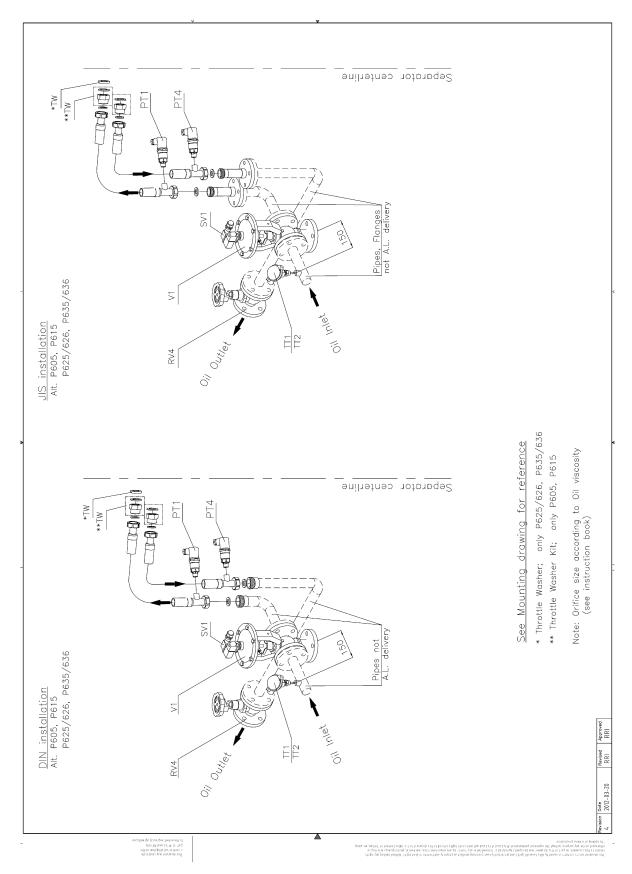


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34

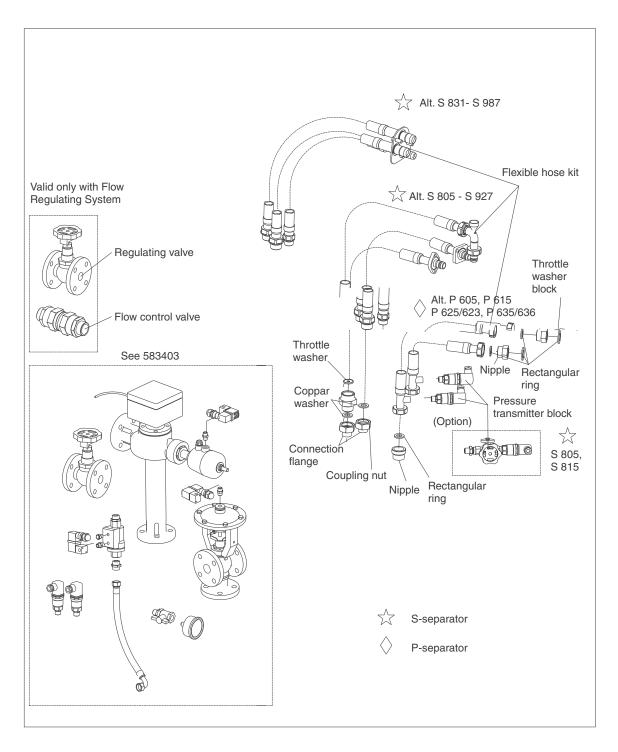
# 2.8 P 605, P 615, P 625/626 Separator, Pipe Arrangement

Alfa Laval ref. 585383 Rev. 4



# 2.9 Valve Block Oil Assembly Drawing

Alfa Laval ref. 583476 Rev. 2

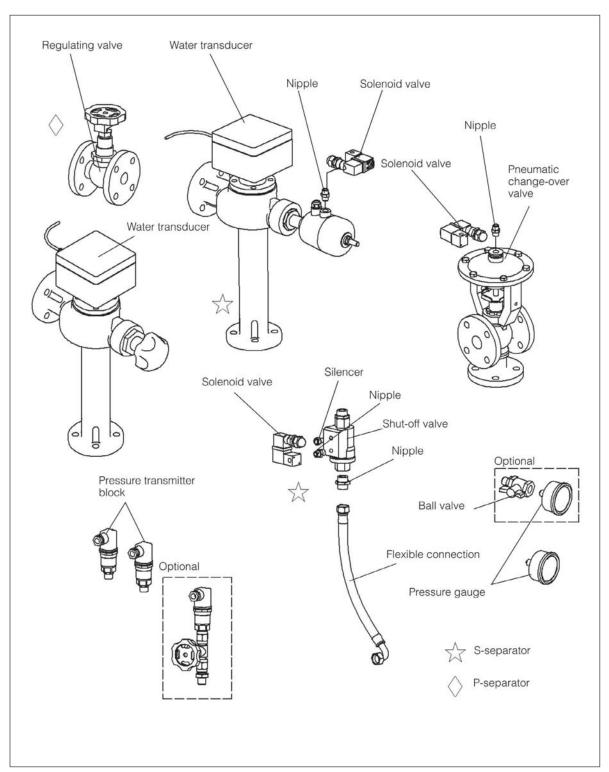


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| Throttle washers |  |                 |  |  |  |  |  |  |
|------------------|--|-----------------|--|--|--|--|--|--|
|                  | Oil type   | Hole diam. (mm) |  |  |  |  |  |  |
| P 625/626        | IF60, IF100, LOTP, LOXH,<br>HFO180, HFO380, HFO460,<br>HFO6009 | 9               |  |  |  |  |  |  |
| S 821 — S 927    | LOTP, LOXH, HFO180,<br>HFO380, HFO460, HFO600,<br>HFO700       | 7,5             |  |  |  |  |  |  |

# 2.10 Valve Block Oil Assembly Drawing cont.

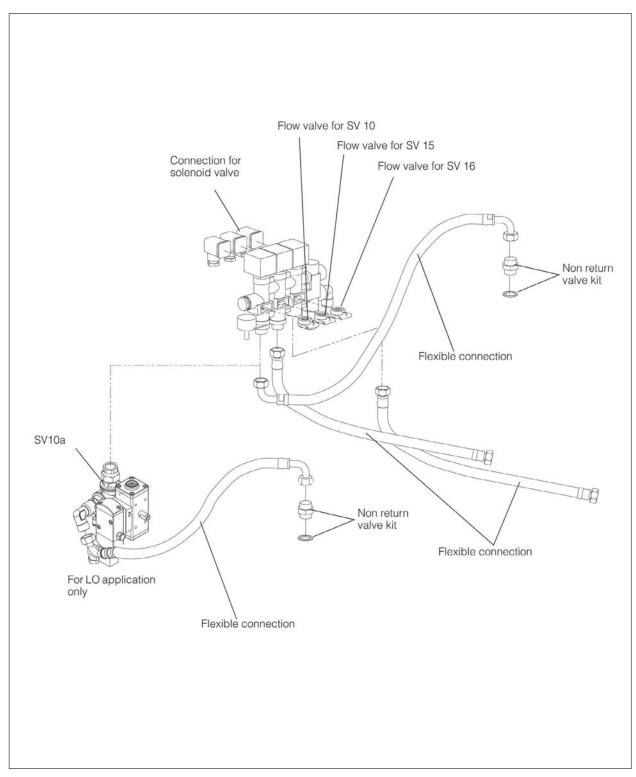
Alfa Laval ref. 583403 Rev. 2



G091051

# 2.11 Valve Block Water Assembly Drawing

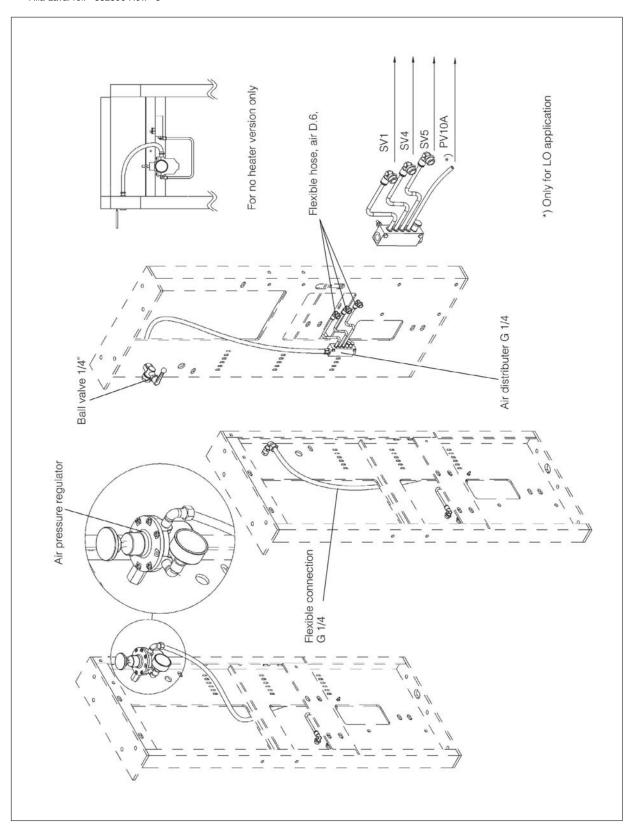
Alfa Laval ref. 583410 Rev. 1



G091061A

# 2.12 Air Distributer Kit

Alfa Laval ref. 582806 Rev. 3



G091071A

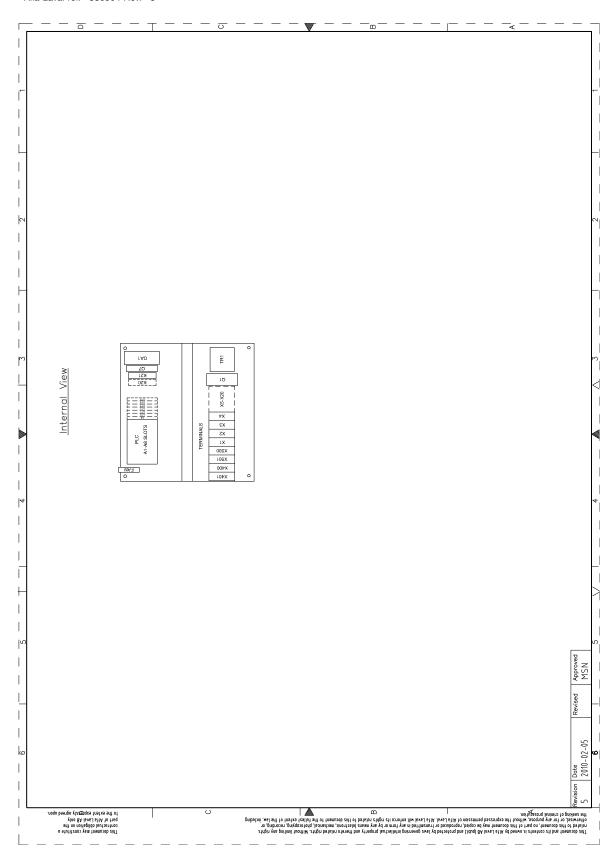
# 2.13 Control Cabinet Dimension Drawing

Alfa Laval ref. 580903 Rev. 3 , retainer Opening angle 130° RAL 7035-60 µm 24VAC - 24Vdc Sheet of Steel : IP 55 : Max 55°C : Tonx. kg (1) Fixing plates (turnable 90°) only for wall mounted request Nut for Grounding Screw (M8) 1 Operation panel display Protection Class Cabinet Material Control Voltage Cabinet Colour Ambient Temp. Technical Data Cabinet Doors NOTE: 0000000000 0000000000 Bottom View Side 000000000 000000000 Left 010 Back View Front View Top View Date 2012-01-12 **(** Φ :: \$ £ This document may constitute a contractual obligation on the part of Alfa Laval AB only to the extent expressly agreed upon.

# 2.14 Control Cabinet Assembly Drawing, External

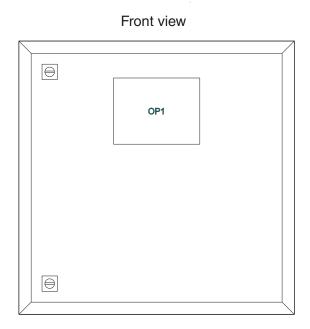
Alfa Laval ref. 580904 Rev. 5 (1) Size of cable glands A - M20 (EMC) B - M25 (EMC) Left side @ @ , (8) SV1 -SS, ST, YT -mergency stop -TT1 & TT2 -⋖ ⋖ ⋖ ⋖ ₃ ⅎ ⅎ ⅎ ⋖ Bottom View Front View ⋖ ⋖ ⅎ ∢ OP1 ⋖ ⋖ ⊚ ∢ ∢  $\odot$ (m) (m) (m) **(**  $\oplus$ Date 2010-02-05 This document and its contents to entered by All's Leval. All Qualitals and protected by Leve governing intellectional property and threet's including any inflats and will be seeking of criminal protections, prote

Alfa Laval ref. 580904 Rev. 5

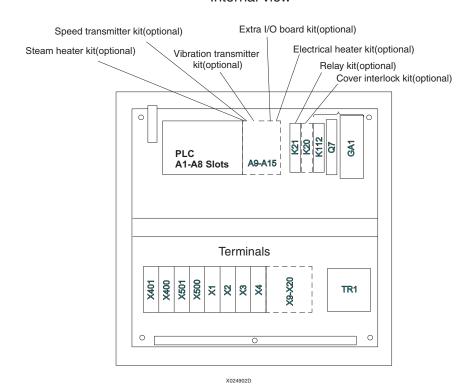


# 2.15 Control Cabinet Assembly Drawing, Internal

Alfa Laval ref. 581002 Rev. 6



#### Internal view



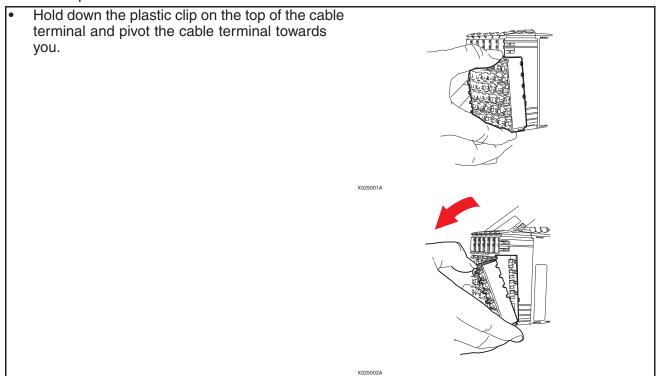
# 2.16 Change of EPC 60 Components

#### **Operating Panel**

- Switch power off.
- Remove the connections on the reverse side of the panel.
- Unscrew the four screws holding the panel and remove the panel.
- Mount the new panel and connect in reverse order

#### I/O-Board

Switch power off.



the boards are mounted in the right places.

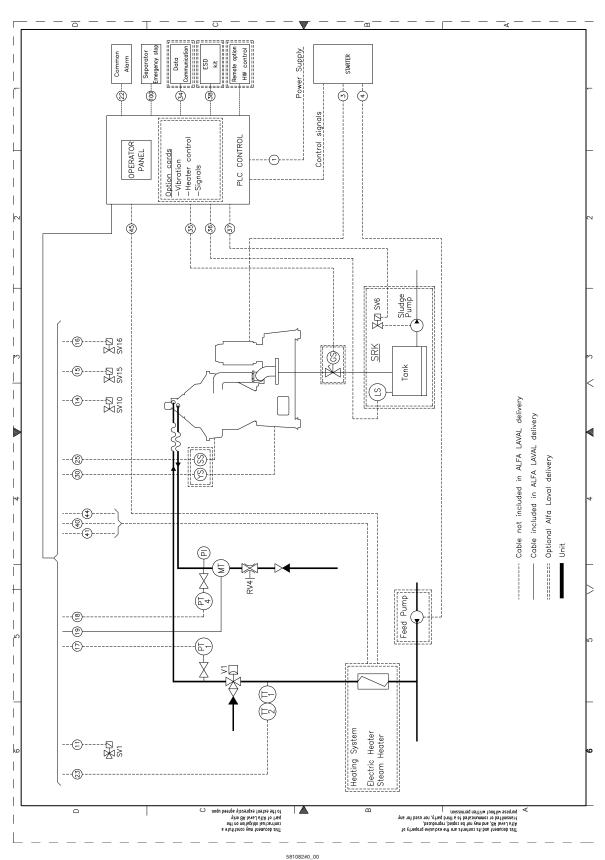
Pull away the cable terminal. Hold down the triangle on the top of the I/O board and loosen the board. Pull the board straight out (otherwise it can fasten in one of its guides) X025004A Compare the part number of the new I/O board to the old board to make sure it is correct. If changing more than one board at a time, check with the electrical diagram to ensure that

Mount the new I/O board by pressing it straight into place. Make sure the board is firmly in place otherwise it will be impossible to mount the cable terminal. Remount the cable terminal. Make sure that the clip on the bottom of the terminal fastens properly in place on the axel on the bus holder. Pivot the terminal on the axel until the clip on the terminal top fastens into place in the I/O board.

# 3 Electrical Drawings S 805/815

# 3.1 Electrical System Layout S 805/815

Alfa Laval ref. 581082 Rev. 0



# 3.2 Control and Starter Electrical Diagrams

#### 3.2.1 Starter cable list

Alfa Laval ref. 580881 Rev. 8

|  | Туре           |              | Connection point A | Instruction | Connection point B  | Remarks                    |  |  |
|--|----------------|--------------|--------------------|-------------|---------------------|----------------------------|--|--|
| Basic design (currents according to order) |                |              |                    |             |                     |                            |  |  |
| 1  | MPRXCX         | 3x4          | Mains supply       |             | Starter             | 1) Fuse 20 A               |  |  |
| 1  | MPRXCX         | 3x10         | Mains supply       |             | Starter             | 1) Fuse 35A                |  |  |
| 1  | MPRXCX         | 3x16         | Mains supply       |             | Starter             | 1) Fuse 50 A               |  |  |
| 1  | MPRXCX         | 3x25         | Mains supply       |             | Starter             | 1) Fuse 63 A               |  |  |
| 1  | MPRXCX         | 3x35         | Mains supply       |             | Starter             | 1) Fuse 80 A               |  |  |
| 2  | MPRXCX         | 2x2m5        | Supply             |             | Starter             | 1) Fuse 16 A               |  |  |
| 3  | MPRXCX         | 3x1,5        | Starter            | Marked 3A   | Separator motor     | 4,0 - 6,3 A                |  |  |
| 3  | MPRXCX         | 3x2,5        | Starter            | Marked 3B   | Separator motor     | 6,3 – 16 A                 |  |  |
| 3  | MPRXCX         | 3x4          | Starter            | Marked 3C   | Separator motor     | 16 – 20 A                  |  |  |
| 3  | MPRXCX         | 3x6          | Starter            | Marked 3D   | Separator motor     | 20 – 25 A                  |  |  |
| 3  | MPRXCX         | 3x10         | Starter            | Marked 3E   | Separator motor     | 25 – 32 A                  |  |  |
| 3  | MPRXCX         | 3x16         | Starter            | Marked 3F   | Separator motor     | 32 – 45 A                  |  |  |
| 3  | MPRXCX         | 3x25         | Starter            | Marked 3G   | Separator motor     | 45 – 63 A                  |  |  |
| Opti                                       | ional or custo | mer's ow     | n feed pump (as    | s ordered)  | •                   | •                          |  |  |
| 4  | MPRXCX         | 3x25         | Starter            |             | Feed pump           | 2)                         |  |  |
| Optional sludge handling (as ordered)      |                |              |                    |             |                     |                            |  |  |
|  | RFE-HF         | 1x4x0,7<br>5 | Starter            |             | GS, Valve switch    |                            |  |  |
|  | RFE-HF         | 1x2x0,7<br>5 | Starter            |             | LS, Sludge level    |                            |  |  |
| 37   | RFE-HF         | 1x2x0,7<br>5 | Starter            |             | SV6, Solenoid valve | For pneumatic sludge pump  |  |  |
| 73   | RFE-HF         | 2x0,75       | Starter            |             | Heatpac on tank     | Included in heater element |  |  |
| Optional space heating (as ordered)        |                |              |                    |             |                     |                            |  |  |
| 71   | MPRXCX         | 2x1,5        | Starter            |             | Separator pump      |                            |  |  |
| 73   | MPRXCX         | 2x1,5        | Starter            |             | Feed pump           | 2)                         |  |  |
| Optional heat tracing (as ordered)         |                |              |                    |             |                     |                            |  |  |
| 74   | MPRXCX         | 2x1,5        | Starter            |             | Thermostat          |                            |  |  |
| 75   |                | 3x1,5        | Starter            |             | Heating cable       |                            |  |  |

<sup>1)</sup> Cable not included in Alfa Laval delivery.

<sup>2)</sup> Cable only included in the Alfa Laval delivery when Feed Pump is delivered mounted on Module

| No                                 | Туре  |              | Connection | Instruction | Connection point                 | Domarko   |  |  |  |
|------------------------------------|---|--------------|------------|-------------|----------------------------------|---|--|--|--|
| 140.                               | Туре  |              | point A    | instruction | B                                | nemarks   |  |  |  |
| Sigr                               | Signal cables (currents according to order) |              |            |             |                                  |   |  |  |  |
| 11                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | SV1                              |   |  |  |  |
| 12                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | SV4                              |   |  |  |  |
| 13                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | SV5                              | S-type only   |  |  |  |
| 14                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | SV10                             |   |  |  |  |
| 14<br>A                            | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | SV10A                            | Lube oil only                                       |  |  |  |
| 15                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | SV15                             |   |  |  |  |
| 16                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | SV16                             |   |  |  |  |
| 17                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | PT1                              | 1)  |  |  |  |
| 18                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | PT4                              |   |  |  |  |
| 19                                 | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60     |             | MT                               | S-type only   |  |  |  |
| 20                                 | RFE-HF                                      | 4x2x0,7<br>5 | EPC 60     |             | ST, (YT, SS)                     | Not for P605,<br>P615, S805,<br>S815                |  |  |  |
| 21                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | PT5                              | S-type only   |  |  |  |
| 22                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | Common alarm                     | 2)  |  |  |  |
| 23                                 | RFE-HF                                      | 4x2x0,7<br>5 | EPC 60     |             | TT1/TT2                          | 3)  |  |  |  |
| Opti                               | ons (as ordere                              | ed)          |            |             |                                  |   |  |  |  |
|                                    | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60     |             | SS                               | <sup>2)</sup> Only for P605,<br>P615, S805,<br>S815 |  |  |  |
| 30                                 | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60     |             | YS                               | S815  2) Only for P605, P615, S805, S815  2) 4)     |  |  |  |
| 38                                 | MPRXCX                                      | 4x1,5        | EPC 60     |             | Syst. Emergency                  |   |  |  |  |
|                                    | MPRXCX                                      | 4x1,5        | EPC 60     |             | Sep. Emergency stop              | 2) 4)   |  |  |  |
|                                    | onal Electric H                             | leater (as   | ordered)   |             |                                  |   |  |  |  |
| 40                                 | RFE-HF                                      | 4x2x0,7<br>5 | Starter    |             | Power unit                       |   |  |  |  |
| 45                                 | RFE-HF                                      | 1x2x0,7<br>5 | Starter    |             | Power unit                       |   |  |  |  |
| Optional heat tracing (as ordered) |   |              |            |             |                                  |   |  |  |  |
| 41                                 | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60     |             | Steam reg. valve                 |   |  |  |  |
| 44                                 | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60     |             | Shut-off valve                   |   |  |  |  |
| 50                                 | RJ45 Cat 5e                                 |              | EPC 60 CPU |             | Client remote data communication | 2), 5)  |  |  |  |

- 1) Cable not included in Alfa Laval delivery
- 2) Cable only included in the Alfa Laval delivery when PT1 is delivered mounted on Module.
- 3 )Cable only included in the Alfa Laval delivery when Electric Heater is delivered mounted on Module.
- 4) This cable cannot be longer than 25 m to avoid voltage drop.
- 5) Crossconnection cable only included in Alfa Laval delivery when multiple modules is delivered.

Other equivalent and approved cables may be used.

Cable areas are calculated with correction factor 0.7.

Cables used are Shipboard Cables, designed according to IEC 60092-3.

Flame retardant according to IEC 60332-1-2 and IEC 60332-3-22.

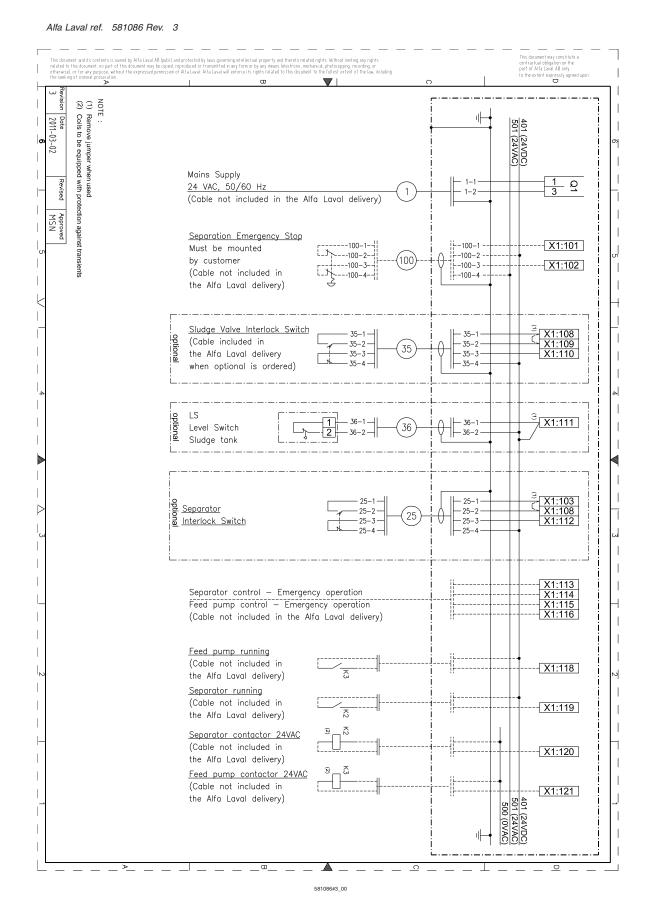
Halogen-free according to IEC 60754 series.

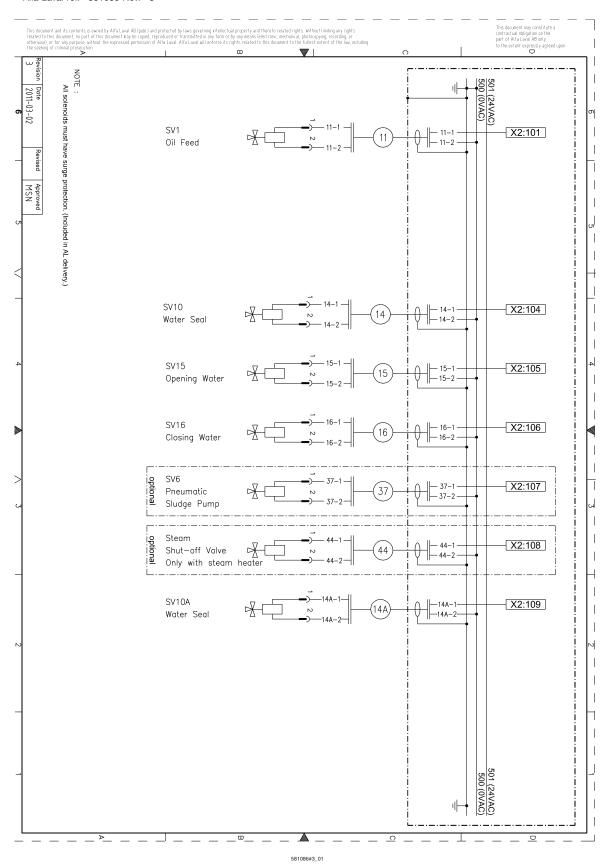
Smoke emission according to IEC 61034 series.

All power cables should be Signal Shielded Cables with the shield properly connected to earth as shown in the electrical drawings.

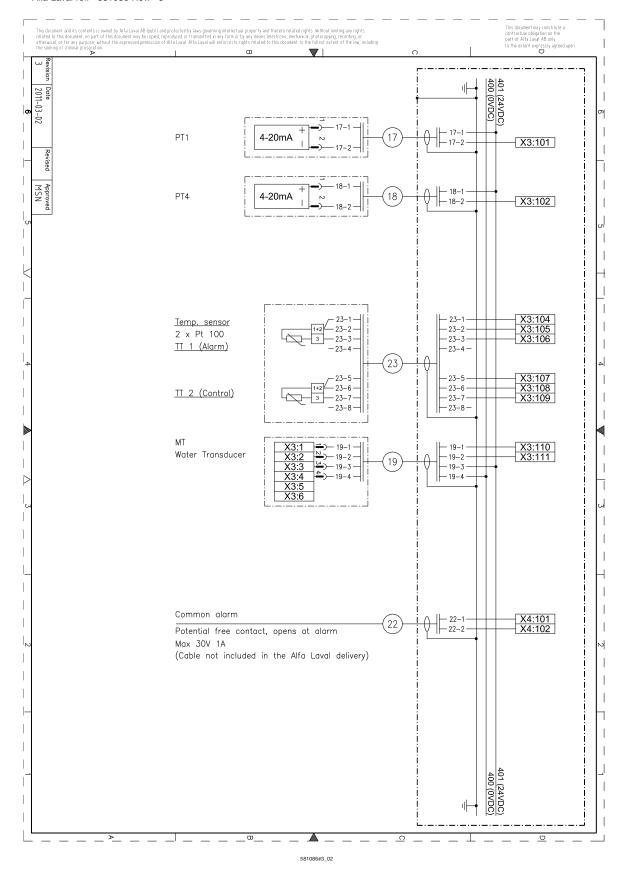
For armoured power cables, the armour must be connected to earth, as shown in the electrical drawings, and must give sufficient EMI protection. Copper wire armouring is normally used.

#### 3.2.2 Separator Interconnection Diagram

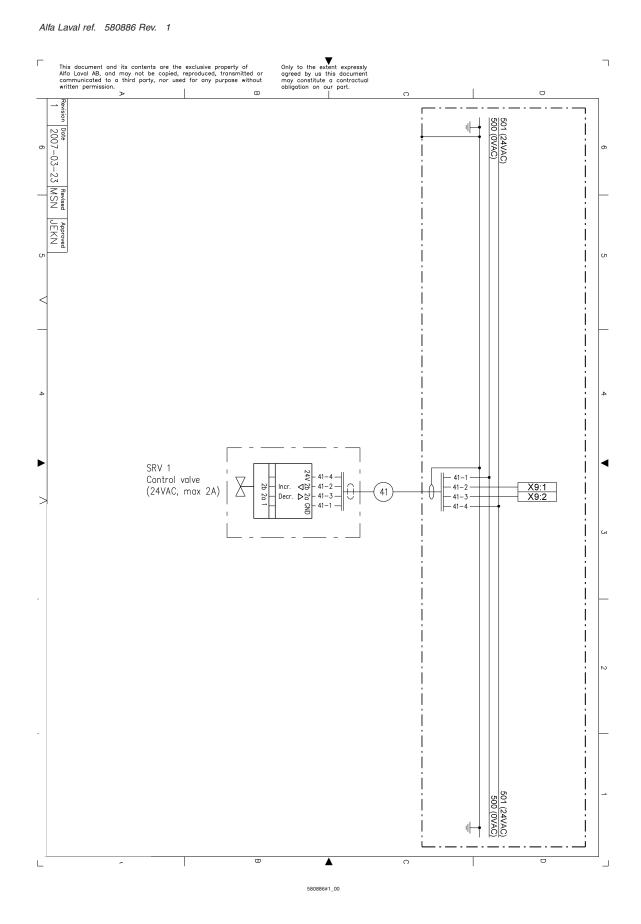




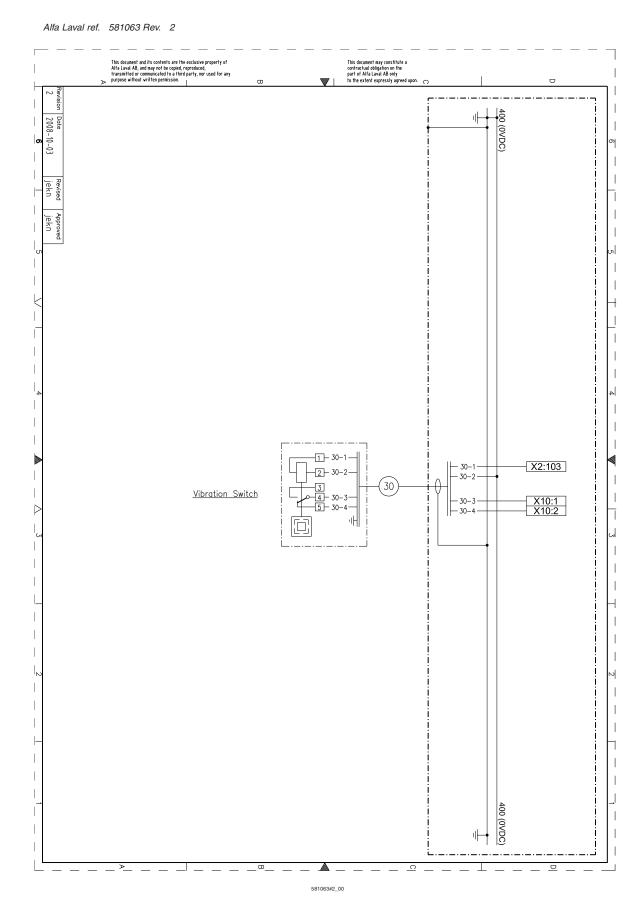
#### Alfa Laval ref. 581086 Rev. 3



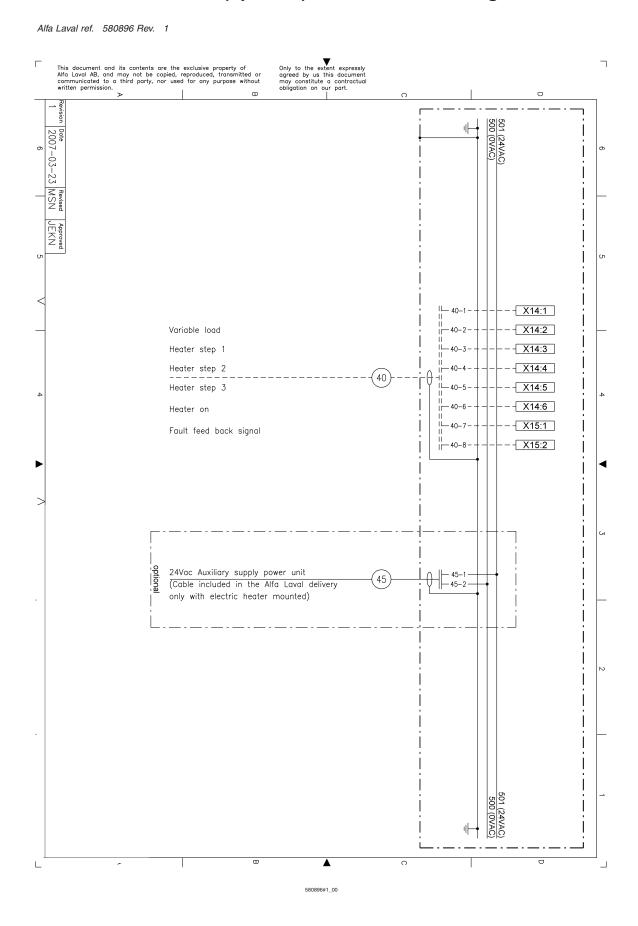
## 3.2.3 Steam Regulating Valve (optional) Interconnection Diagram



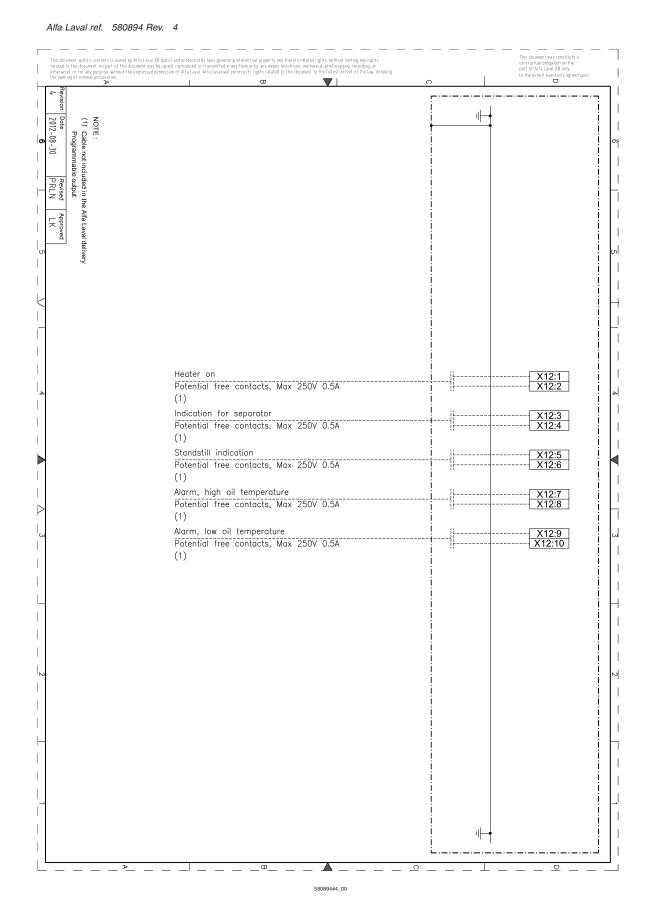
## 3.2.4 Vibration Switch (optional) Interconnection Diagram



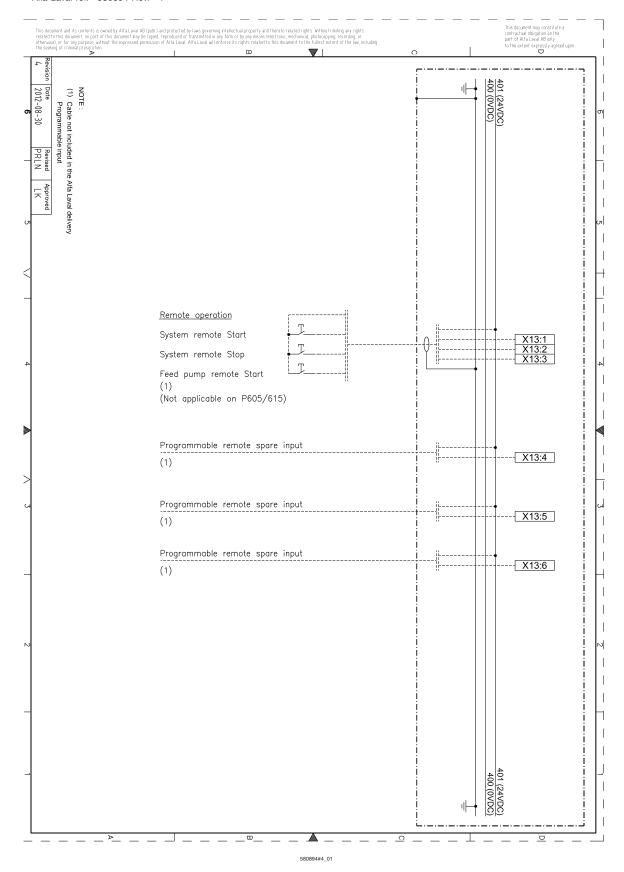
#### 3.2.5 Electric Heater (optional) Interconnection Diagram



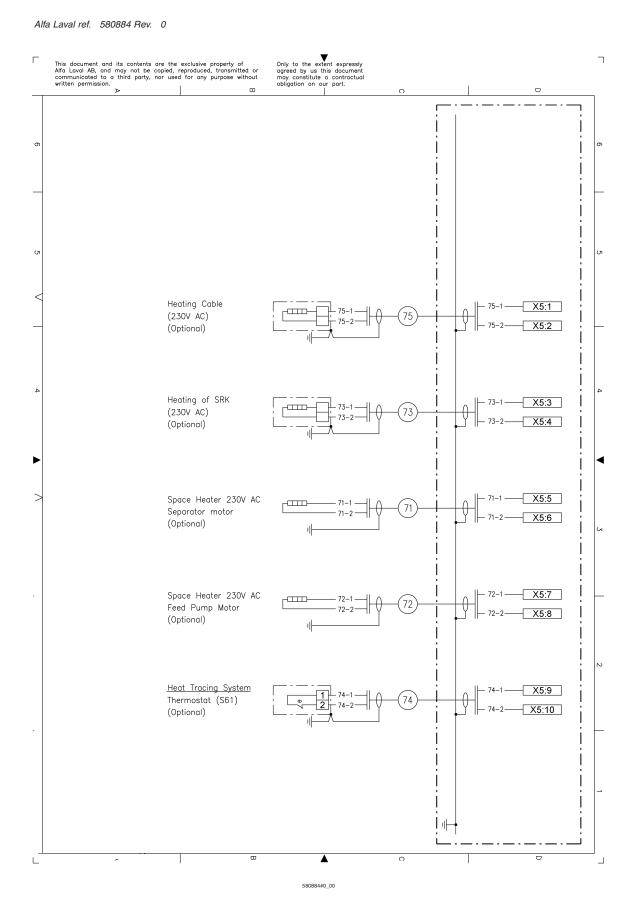
#### 3.2.6 I/O (optional) Interconnection Diagram



#### Alfa Laval ref. 580894 Rev. 4



#### 3.2.7 Heat Tracing (optional) Interconnection Diagram



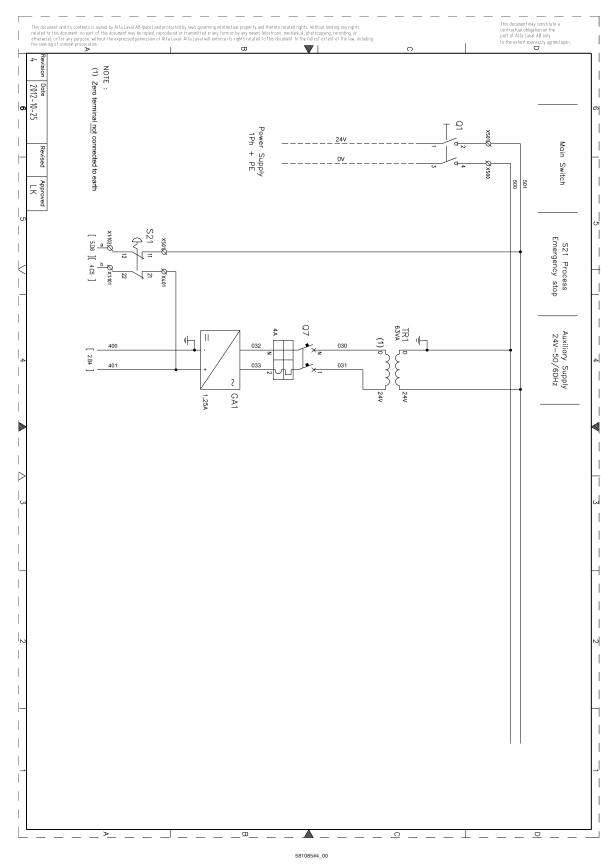
#### 3.2.8 Emergency Shutdown Interconnection Diagram

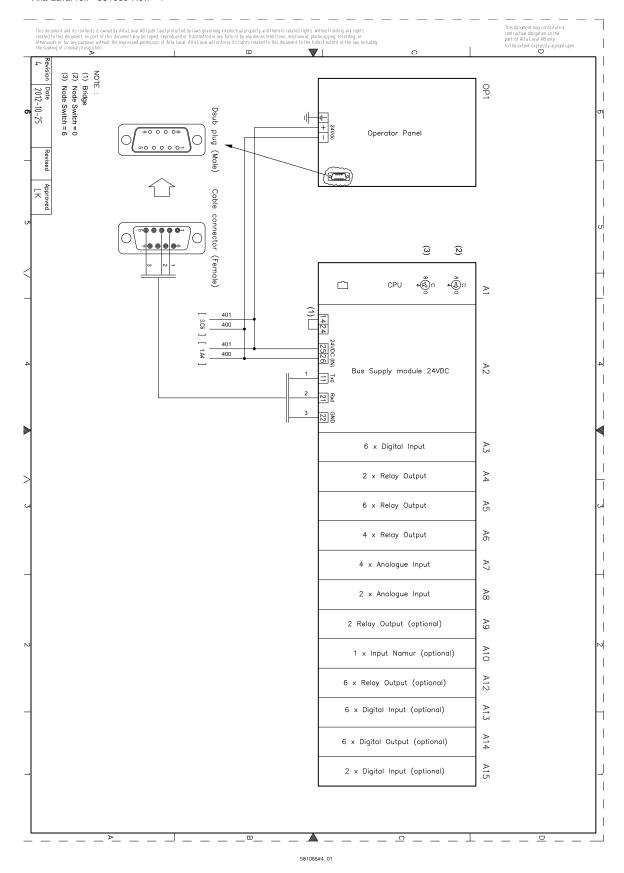
Alfa Laval ref. 580898 Rev. 0 Only to the extent expressly agreed by us this document may constitute a contractual obligation on our part. This document and its contents are the exclusive property of Alfa Laval AB, and may not be copied, reproduced, transmitted or communicated to a third party, nor used for any purpose without written permission. Emergency Shut Down (ESD) signal 24Vdc (Replaces "Systems Em. Stop" when used) (Cable not included in the Alfa Laval delivery) Emergency Shut Down (ESD) remote feedback Potential free contacts, Max 250V 0.5A (Cable not included in the Alfa Laval delivery)

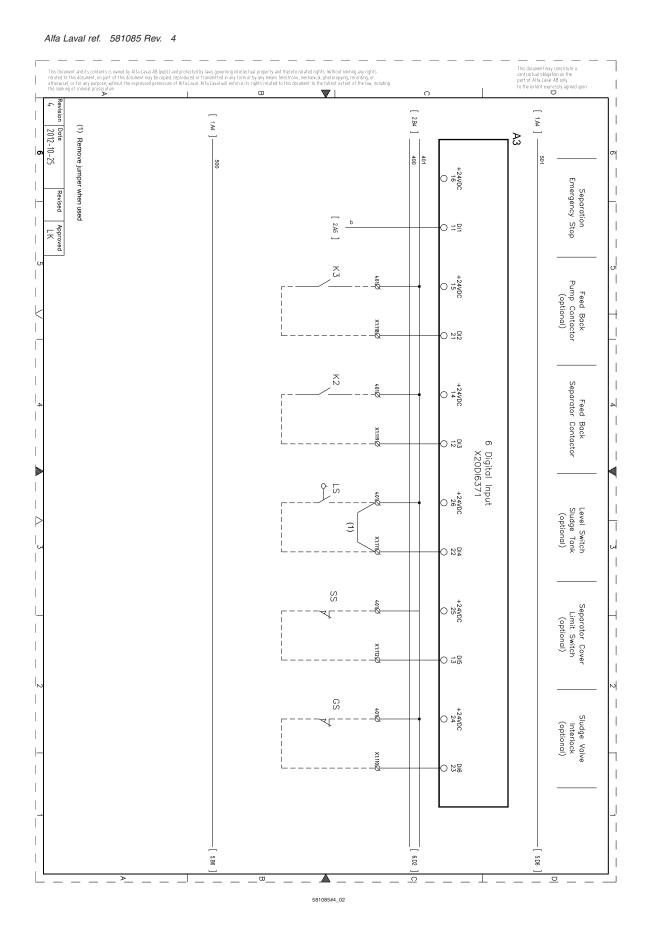
580898#0\_00

## 3.2.9 Circuit Diagram

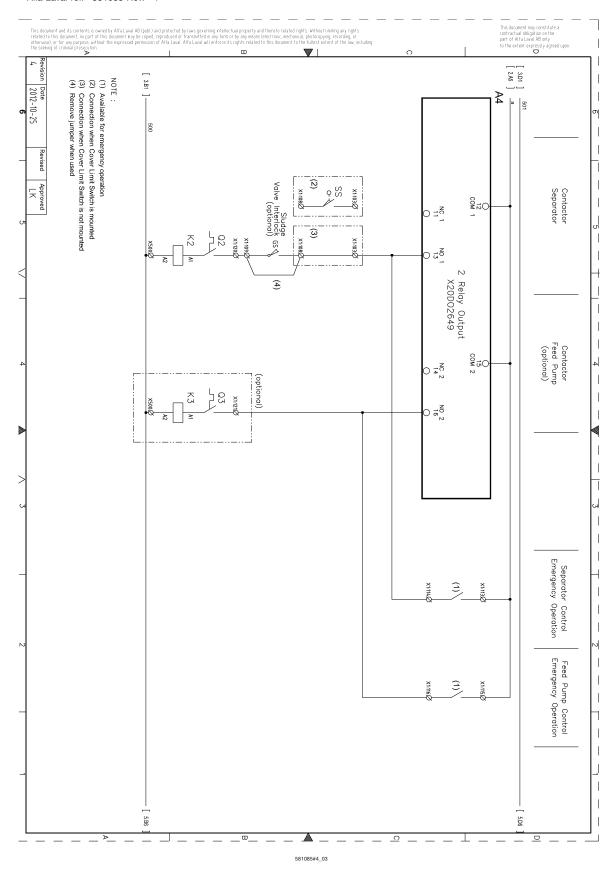




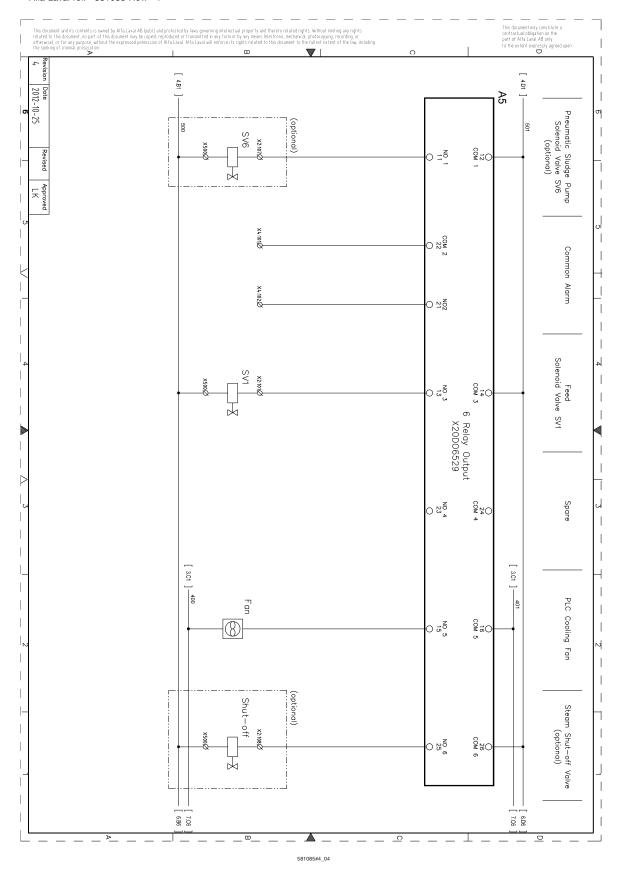




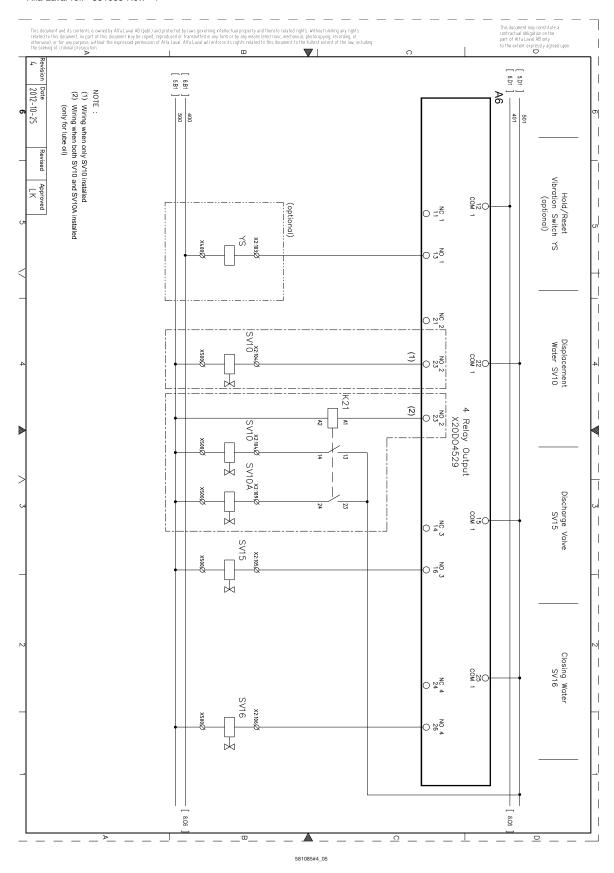




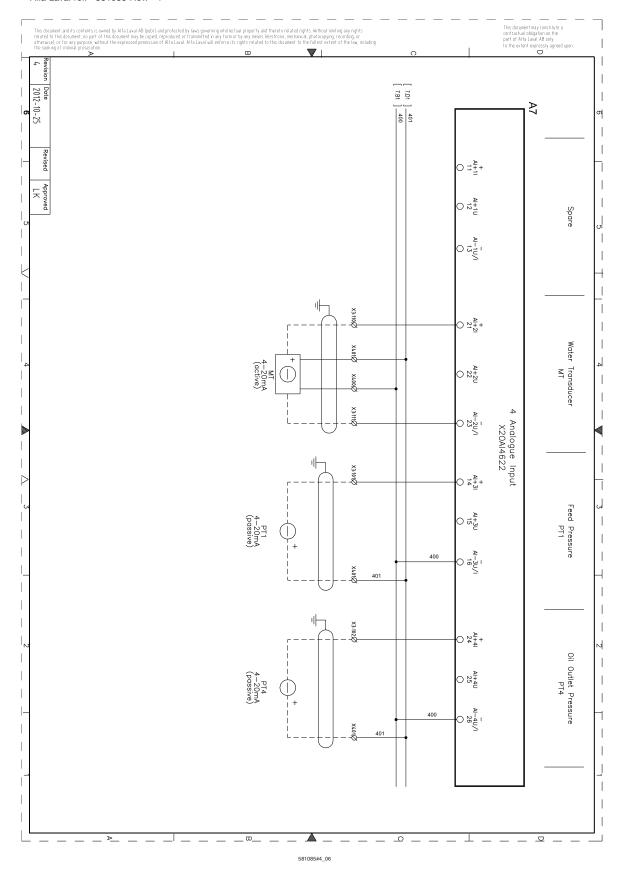
#### Alfa Laval ref. 581085 Rev. 4



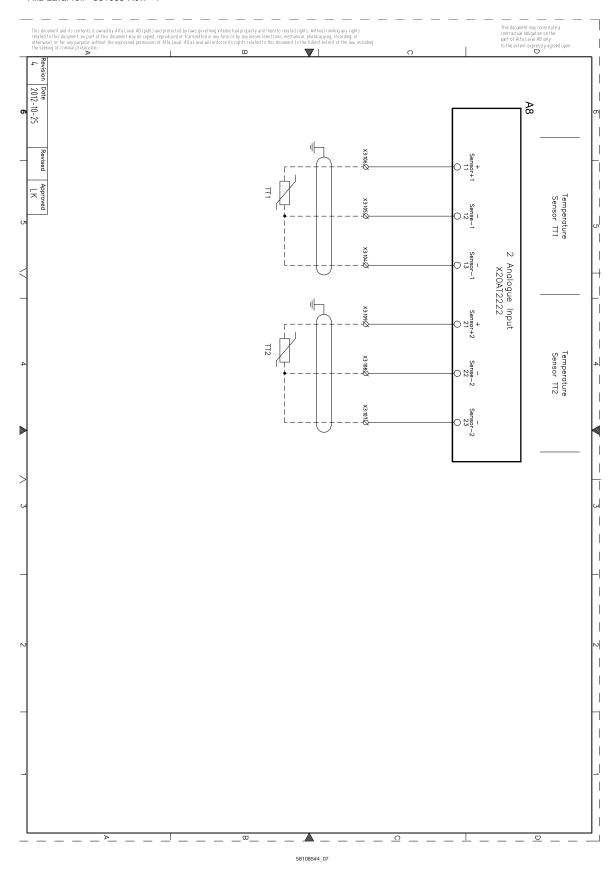
#### Alfa Laval ref. 581085 Rev. 4



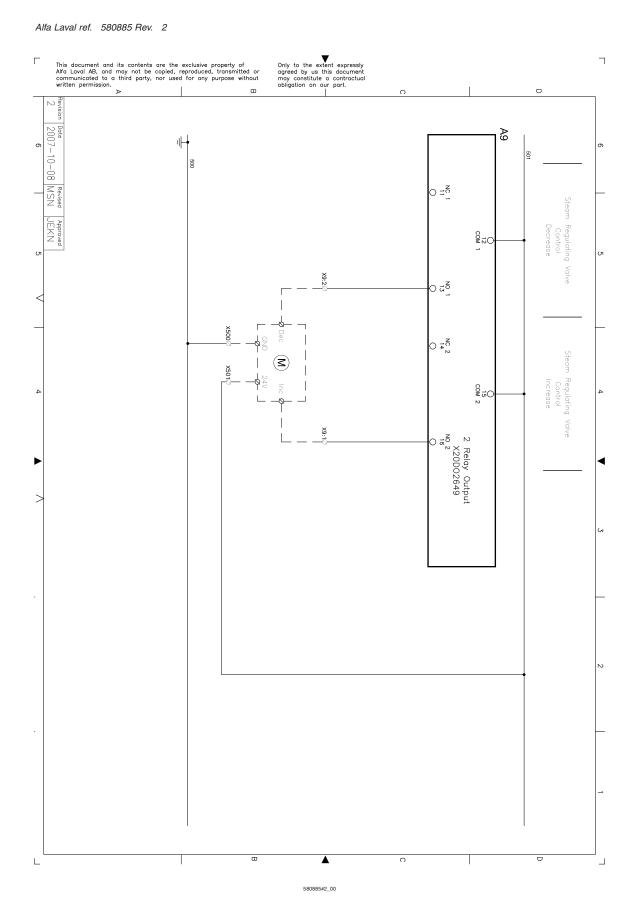




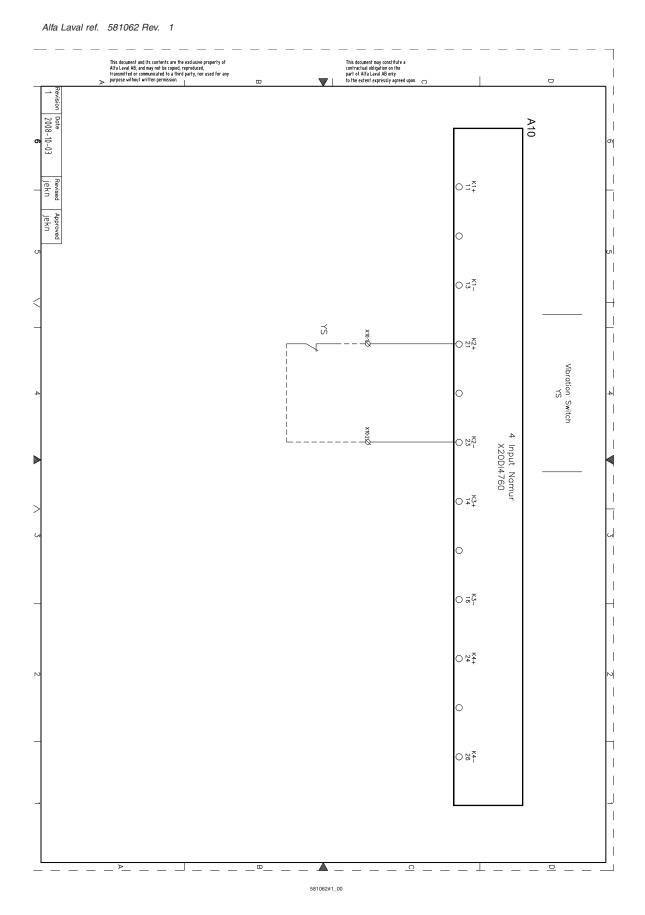
#### Alfa Laval ref. 581085 Rev. 4



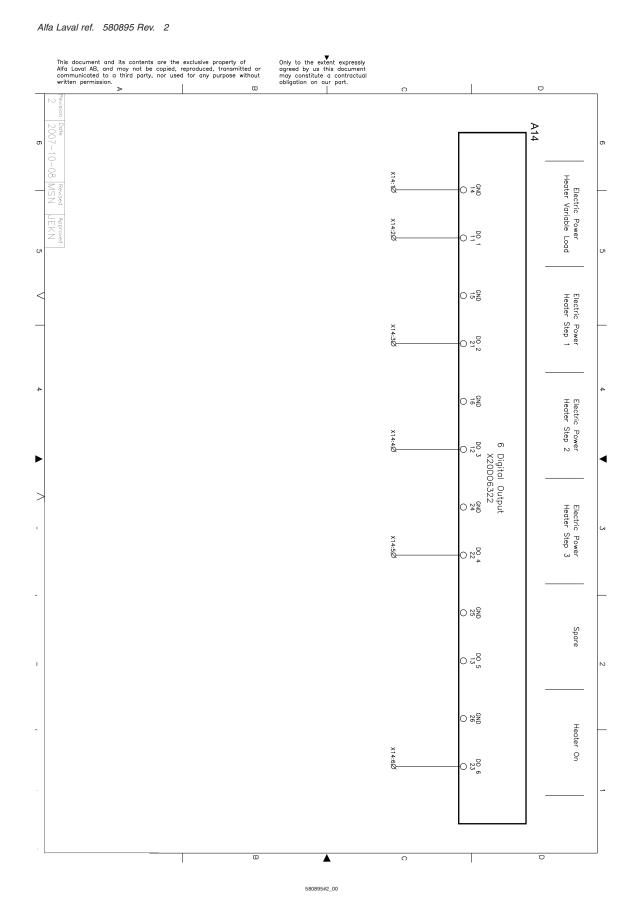
## 3.2.10 Steam Regulating Valve (optional) Circuit Diagram



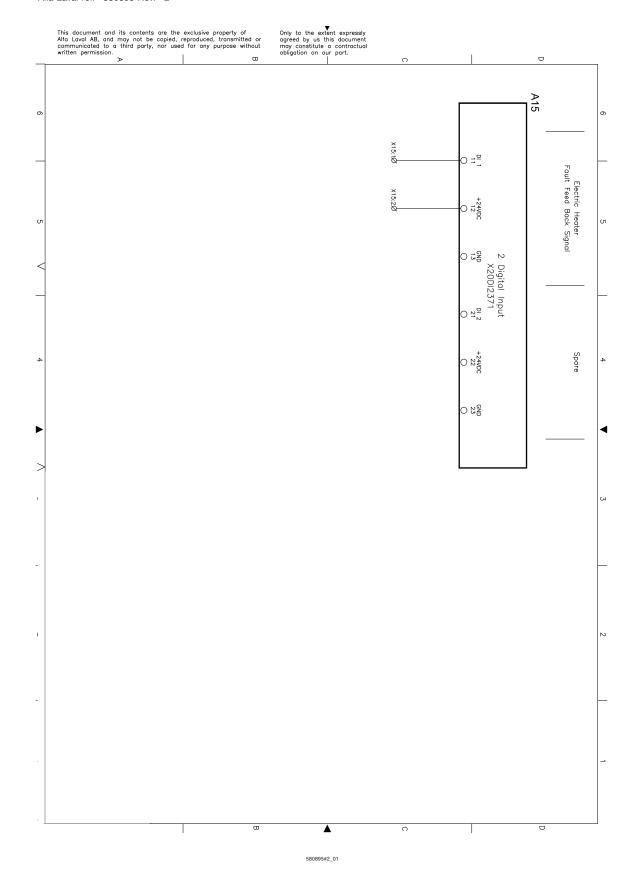
## 3.2.11 Vibration Switch (optional) Circuit Diagram



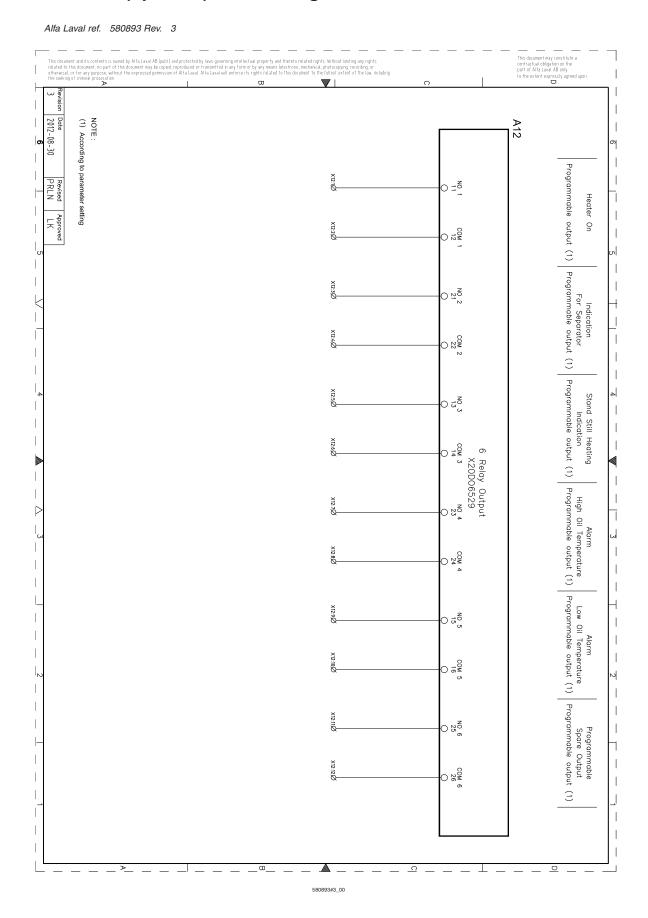
## 3.2.12 Electric Heater (optional) Circuit Diagram

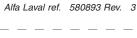


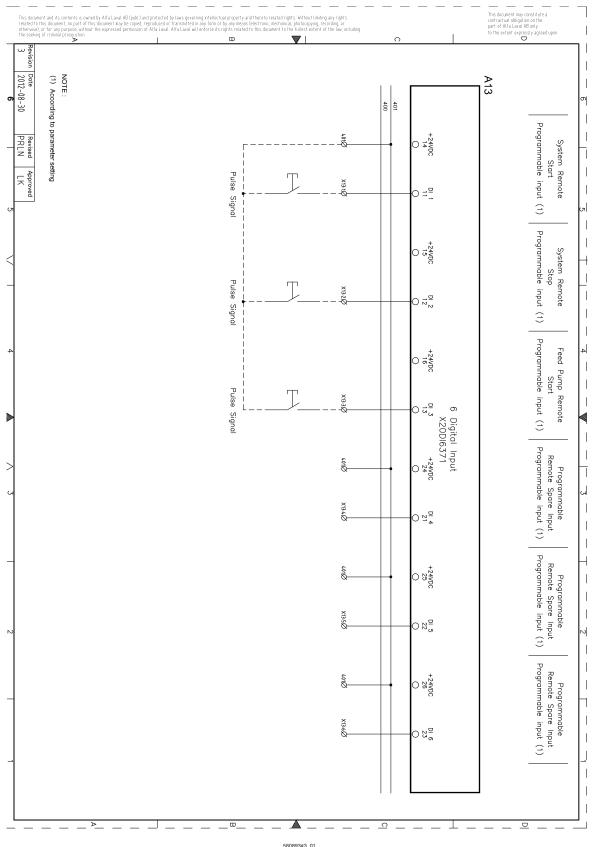
Alfa Laval ref. 580895 Rev. 2



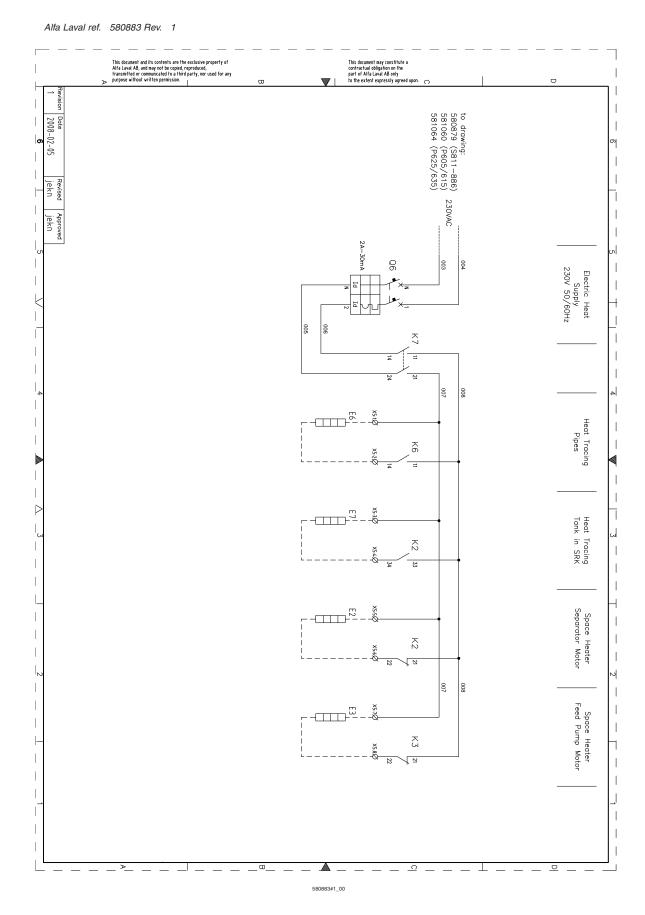
## 3.2.13 I/O (optional) Circuit Diagram

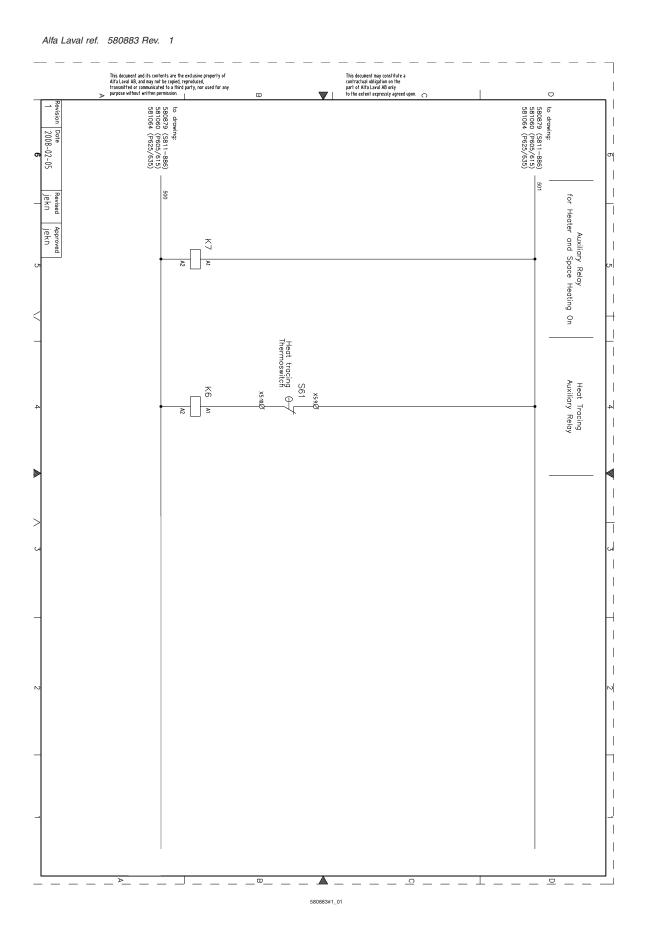




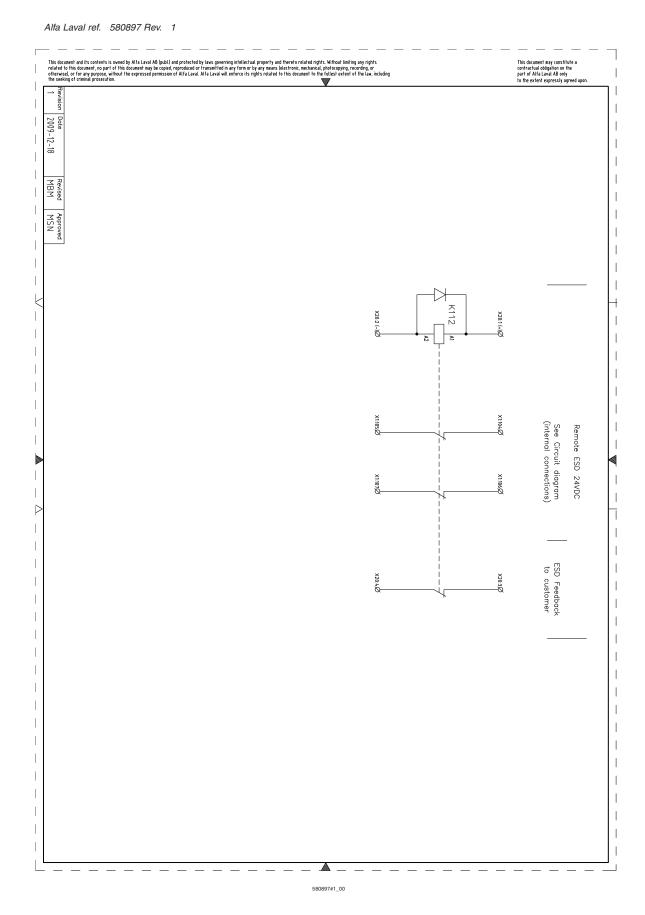


## 3.2.14 Heat Tracing (optional) Circuit Diagram





#### 3.2.15 Emergency Shutdown Circuit Diagram



# 4 Electrical Drawings S 821- S 927

# 4.1 Electrical System Layout S 821–S 927

Alfa Laval ref. 580907 Rev. 4 ESD kit (b) (d) CONTROL (8) - PA-S □-X ₹ Optional Alfa <u>a</u> Feed Approved MSN NOTE: (1) Only used in Lube Oil application Revised MBM Date 2010-06-04

580907#4\_0

## 4.2 Control and Starter Electrical Diagrams

#### 4.2.1 Starter cable list

Alfa Laval ref. 580881 Rev. 8

|   | Туре   |              | Connection point A | Instruction | Connection point B  | Remarks                    |  |  |  |  |
|---|--------|--------------|--------------------|-------------|---------------------|----------------------------|--|--|--|--|
| Basic design (currents according to order)        |        |              |                    |             |                     |                            |  |  |  |  |
| 1   | MPRXCX | 3x4          | Mains supply       |             | Starter             | 1) Fuse 20 A               |  |  |  |  |
| 1   | MPRXCX | 3x10         | Mains supply       |             | Starter             | 1) Fuse 35A                |  |  |  |  |
| 1   | MPRXCX | 3x16         | Mains supply       |             | Starter             | 1) Fuse 50 A               |  |  |  |  |
| 1   | MPRXCX | 3x25         | Mains supply       |             | Starter             | 1) Fuse 63 A               |  |  |  |  |
| 1   | MPRXCX | 3x35         | Mains supply       |             | Starter             | 1) Fuse 80 A               |  |  |  |  |
| 2   | MPRXCX | 2x2m5        | Supply             |             | Starter             | 1) Fuse 16 A               |  |  |  |  |
| 3   | MPRXCX | 3x1,5        | Starter            | Marked 3A   | Separator motor     | 4,0 - 6,3 A                |  |  |  |  |
| 3   | MPRXCX | 3x2,5        | Starter            | Marked 3B   | Separator motor     | 6,3 – 16 A                 |  |  |  |  |
| 3   | MPRXCX | 3x4          | Starter            | Marked 3C   | Separator motor     | 16 – 20 A                  |  |  |  |  |
| 3   | MPRXCX | 3x6          | Starter            | Marked 3D   | Separator motor     | 20 – 25 A                  |  |  |  |  |
| 3   | MPRXCX | 3x10         | Starter            | Marked 3E   | Separator motor     | 25 – 32 A                  |  |  |  |  |
| 3   | MPRXCX | 3x16         | Starter            | Marked 3F   | Separator motor     | 32 – 45 A                  |  |  |  |  |
| 3   | MPRXCX | 3x25         | Starter            | Marked 3G   | Separator motor     | 45 – 63 A                  |  |  |  |  |
| Optional or customer's own feed pump (as ordered) |        |              |                    |             |                     |                            |  |  |  |  |
| 4   | MPRXCX | 3x25         | Starter            |             | Feed pump           | 2)                         |  |  |  |  |
| Optional sludge handling (as ordered)             |        |              |                    |             |                     |                            |  |  |  |  |
|   | RFE-HF | 1x4x0,7<br>5 | Starter            |             | GS, Valve switch    |                            |  |  |  |  |
|   | RFE-HF | 1x2x0,7<br>5 | Starter            |             | LS, Sludge level    |                            |  |  |  |  |
| 37  | RFE-HF | 1x2x0,7<br>5 | Starter            |             | SV6, Solenoid valve | For pneumatic sludge pump  |  |  |  |  |
| 73  | RFE-HF | 2x0,75       | Starter            |             | Heatpac on tank     | Included in heater element |  |  |  |  |
| Optional space heating (as ordered)               |        |              |                    |             |                     |                            |  |  |  |  |
| 71  | MPRXCX | 2x1,5        | Starter            |             | Separator pump      |                            |  |  |  |  |
| 73  | MPRXCX | 2x1,5        | Starter            |             | Feed pump           | 2)                         |  |  |  |  |
| Optional heat tracing (as ordered)                |        |              |                    |             |                     |                            |  |  |  |  |
| 74  | MPRXCX | 2x1,5        | Starter            |             | Thermostat          |                            |  |  |  |  |
| 75  |        | 3x1,5        | Starter            |             | Heating cable       |                            |  |  |  |  |

<sup>1)</sup> Cable not included in Alfa Laval delivery.

<sup>2)</sup> Cable only included in the Alfa Laval delivery when Feed Pump is delivered mounted on Module

| Na      | Typo  |              | Connection                            | Instruction | Connection point                 | Domarka   |  |  |  |  |
|---------|---|--------------|---------------------------------------|-------------|----------------------------------|---|--|--|--|--|
| NO.     | Туре  |              | point A                               | Instruction | Connection point B               | nemarks   |  |  |  |  |
| Sign    | Signal cables (currents according to order) |              |                                       |             |                                  |   |  |  |  |  |
| 11      | RFE-HF                                      | 1x2x0,7      | EPC 60                                |             | SV1                              |   |  |  |  |  |
| 12      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | SV4                              |   |  |  |  |  |
| 13      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | SV5                              | S-type only   |  |  |  |  |
| 14      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | SV10                             |   |  |  |  |  |
| 14<br>A | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | SV10A                            | Lube oil only                                       |  |  |  |  |
| 15      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | SV15                             |   |  |  |  |  |
| 16      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | SV16                             |   |  |  |  |  |
| 17      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | PT1                              | 1)  |  |  |  |  |
| 18      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | PT4                              |   |  |  |  |  |
| 19      | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60                                |             | MT                               | S-type only   |  |  |  |  |
| 20      | RFE-HF                                      | 4x2x0,7<br>5 | EPC 60                                |             | ST, (YT, SS)                     | Not for P605,<br>P615, S805,<br>S815                |  |  |  |  |
| 21      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | PT5                              | S-type only   |  |  |  |  |
| 22      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | Common alarm                     | 2)  |  |  |  |  |
| 23      | RFE-HF                                      | 4x2x0,7<br>5 | EPC 60                                |             | TT1/TT2                          | 3)  |  |  |  |  |
| Opt     | ions (as order                              | ed)          | -                                     | -           | •                                |   |  |  |  |  |
| 25      | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60                                |             | SS                               | <sup>2)</sup> Only for P605,<br>P615, S805,<br>S815 |  |  |  |  |
| 30      | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60                                |             | YS                               | <sup>2)</sup> Only for P605,<br>P615, S805,<br>S815 |  |  |  |  |
| 38      | MPRXCX                                      | 4x1,5        | EPC 60                                |             | Syst. Emergency                  |   |  |  |  |  |
|         | MPRXCX                                      | 4x1,5        | EPC 60                                |             | Sep. Emergency stop              | 2) 4)   |  |  |  |  |
|         | ional Electric I                            |              | <u> </u>                              |             |                                  |   |  |  |  |  |
| 40      | RFE-HF                                      | 4x2x0,7<br>5 | Starter                               |             | Power unit                       |   |  |  |  |  |
| 45      | RFE-HF                                      | 1x2x0,7<br>5 | Starter                               |             | Power unit                       |   |  |  |  |  |
| _       | ional heat trac                             | <u> </u>     | · · · · · · · · · · · · · · · · · · · |             |                                  |   |  |  |  |  |
| 41      | RFE-HF                                      | 1x4x0,7<br>5 | EPC 60                                |             | Steam reg. valve                 |   |  |  |  |  |
| 44      | RFE-HF                                      | 1x2x0,7<br>5 | EPC 60                                |             | Shut-off valve                   |   |  |  |  |  |
| 50      | RJ45 Cat 5e                                 |              | EPC 60 CPU                            |             | Client remote data communication | 2), 5)  |  |  |  |  |

- 1) Cable not included in Alfa Laval delivery
- 2) Cable only included in the Alfa Laval delivery when PT1 is delivered mounted on Module.
- 3 )Cable only included in the Alfa Laval delivery when Electric Heater is delivered mounted on Module.
- 4) This cable cannot be longer than 25 m to avoid voltage drop.
- 5) Crossconnection cable only included in Alfa Laval delivery when multiple modules is delivered.

Other equivalent and approved cables may be used.

Cable areas are calculated with correction factor 0.7.

Cables used are Shipboard Cables, designed according to IEC 60092-3.

Flame retardant according to IEC 60332-1-2 and IEC 60332-3-22.

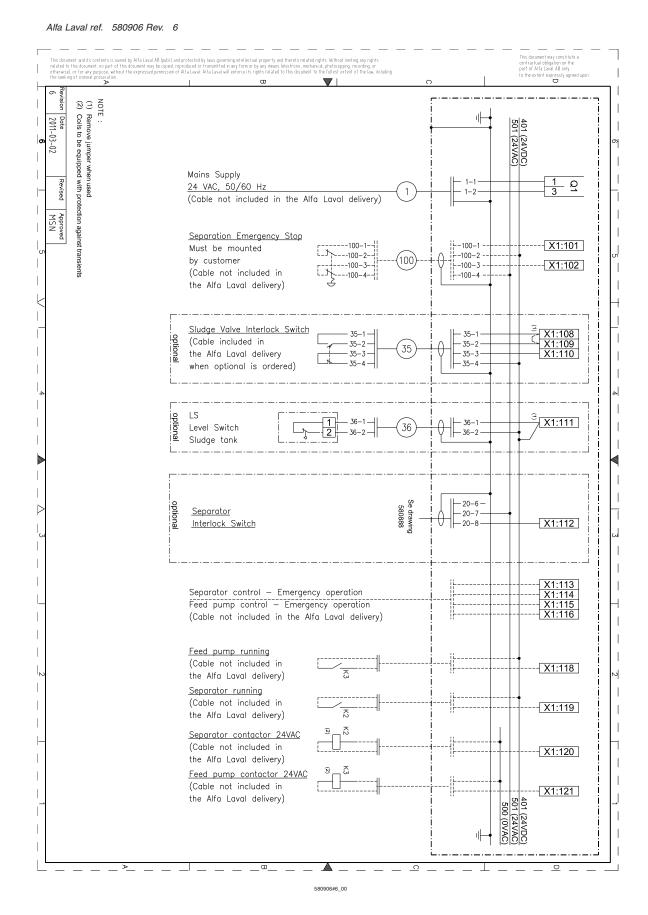
Halogen-free according to IEC 60754 series.

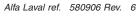
Smoke emission according to IEC 61034 series.

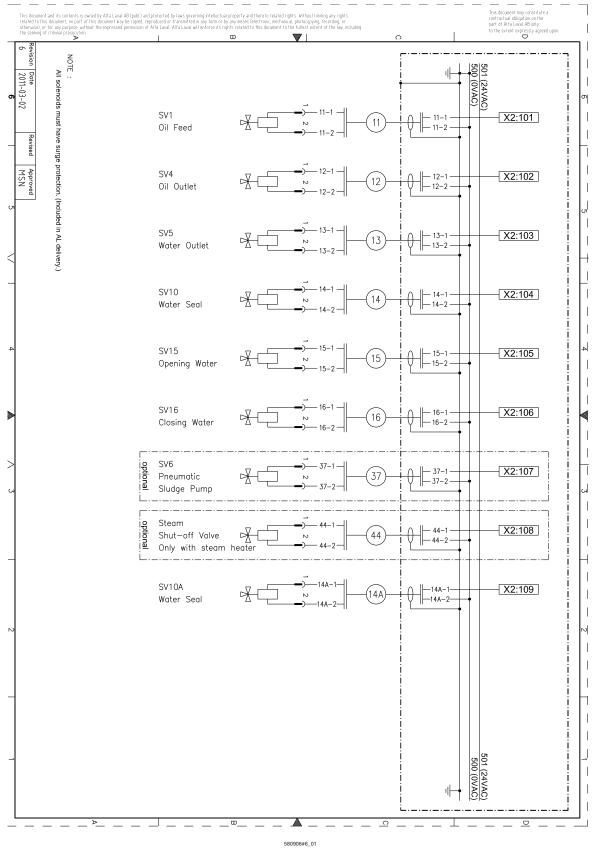
All power cables should be Signal Shielded Cables with the shield properly connected to earth as shown in the electrical drawings.

For armoured power cables, the armour must be connected to earth, as shown in the electrical drawings, and must give sufficient EMI protection. Copper wire armouring is normally used.

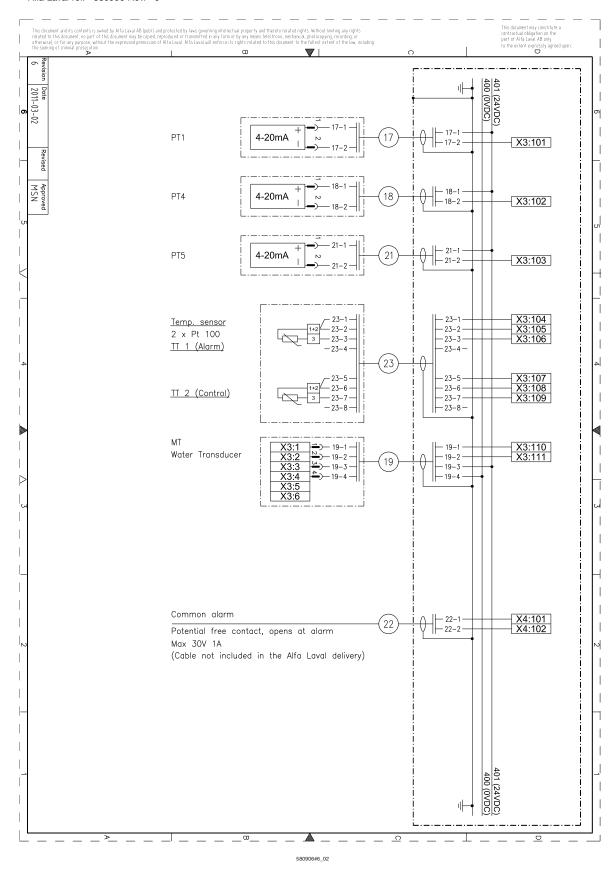
#### 4.2.2 Separator Interconnection Diagram



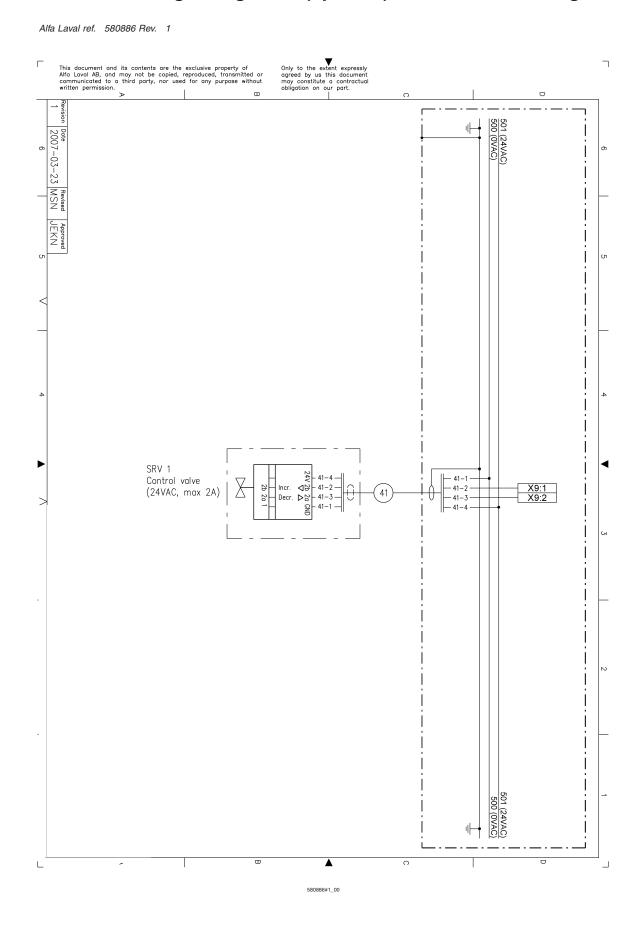




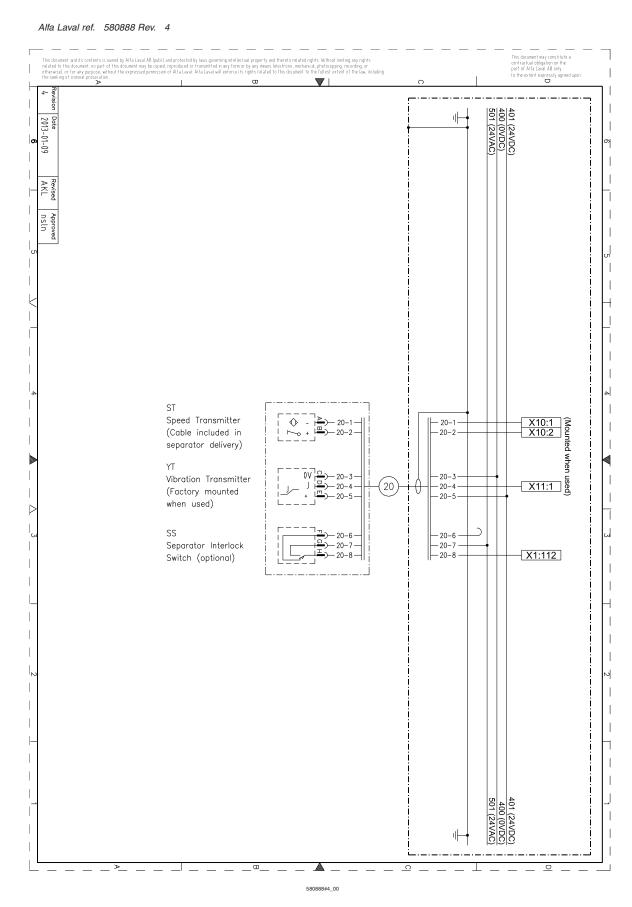
#### Alfa Laval ref. 580906 Rev. 6



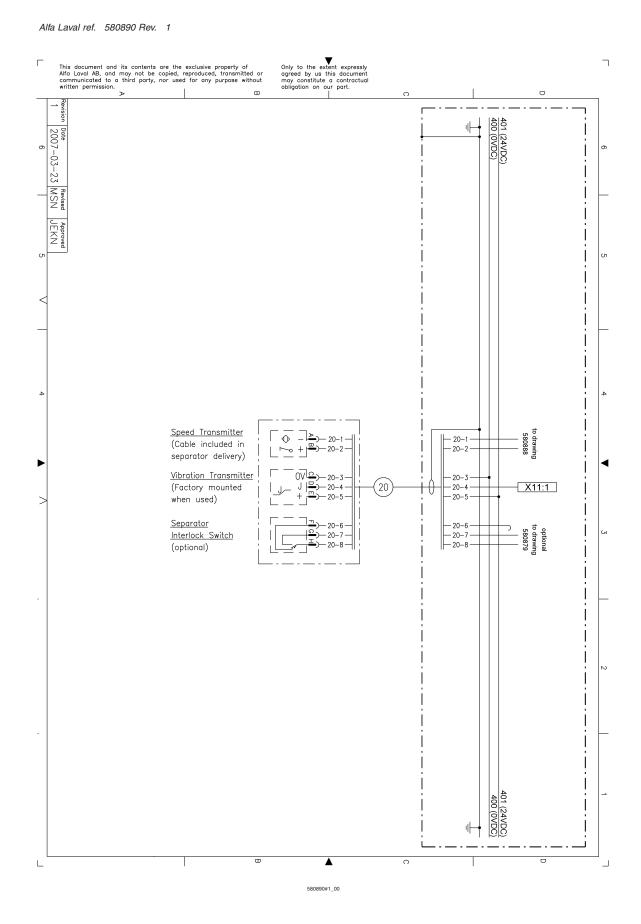
## 4.2.3 Steam Regulating Valve (optional) Interconnection Diagram



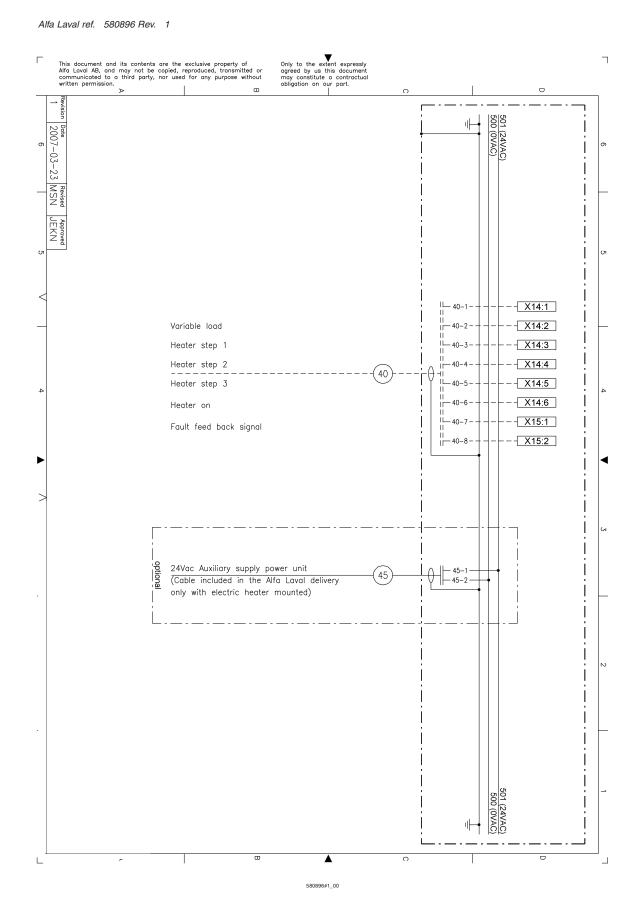
## 4.2.4 Speed Transmitter (optional) Interconnection Diagram



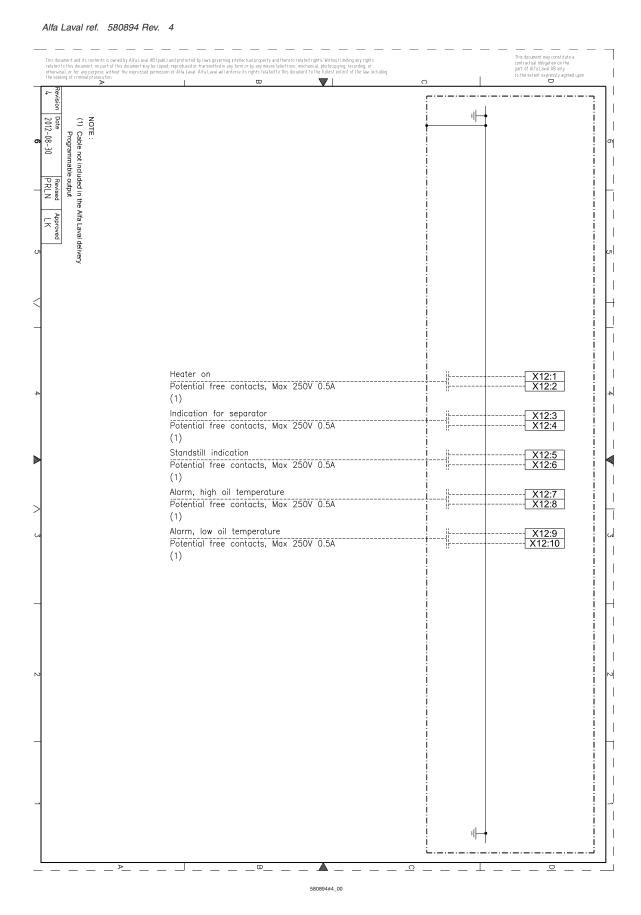
## 4.2.5 Vibration Transmitter (optional) Interconnection Diagram



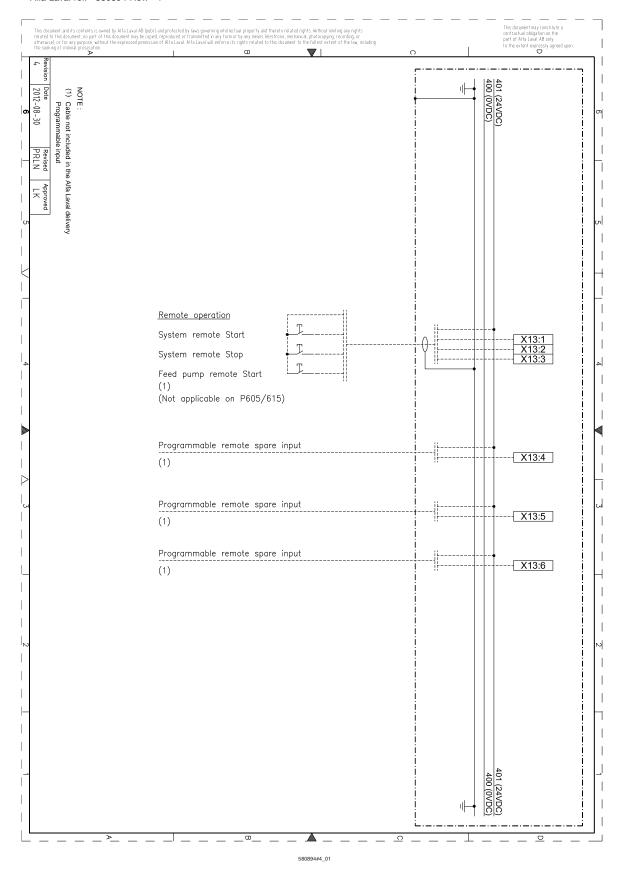
#### 4.2.6 Electric Heater (optional) Interconnection Diagram



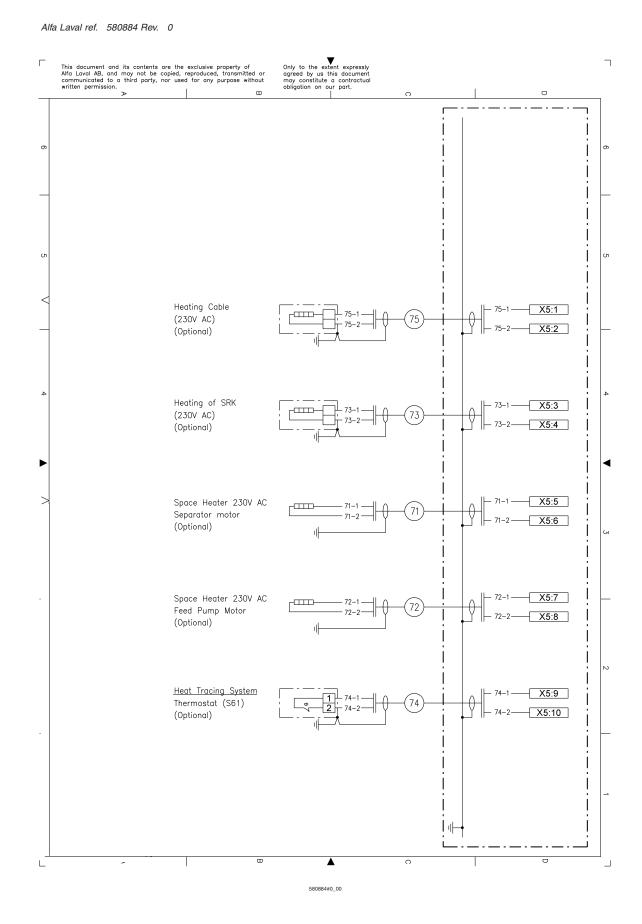
#### 4.2.7 I/O (optional) Interconnection Diagram



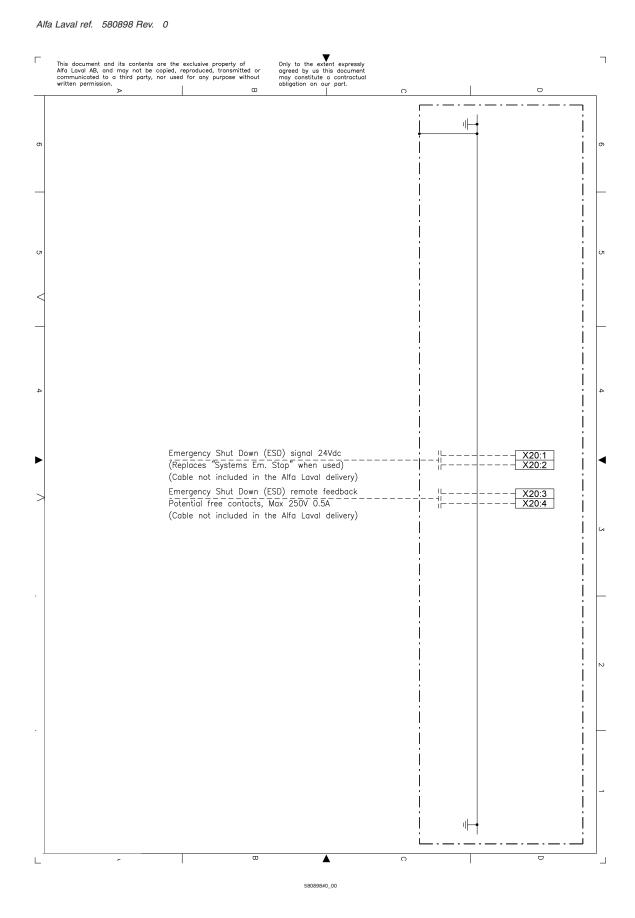
Alfa Laval ref. 580894 Rev. 4



#### 4.2.8 Heat Tracing (optional) Interconnection Diagram

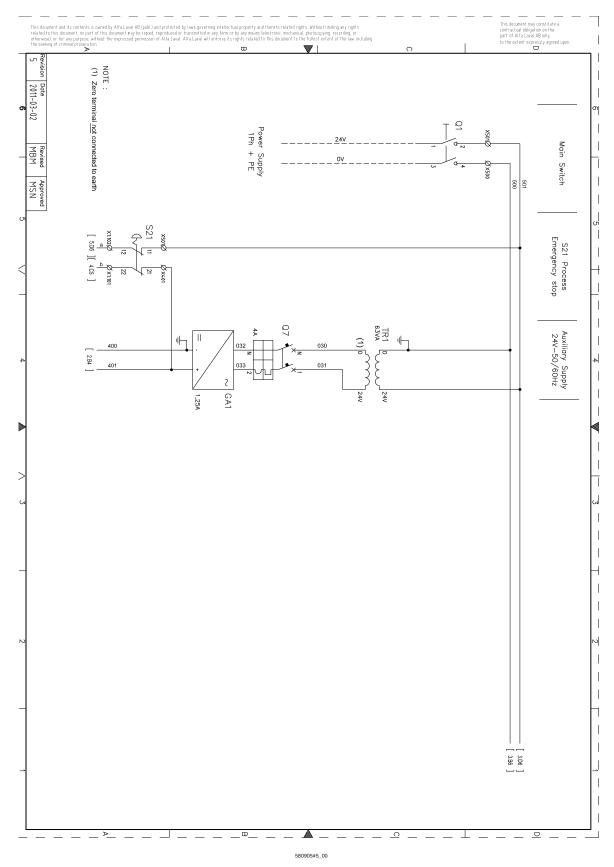


#### 4.2.9 Emergency Shutdown Interconnection Diagram

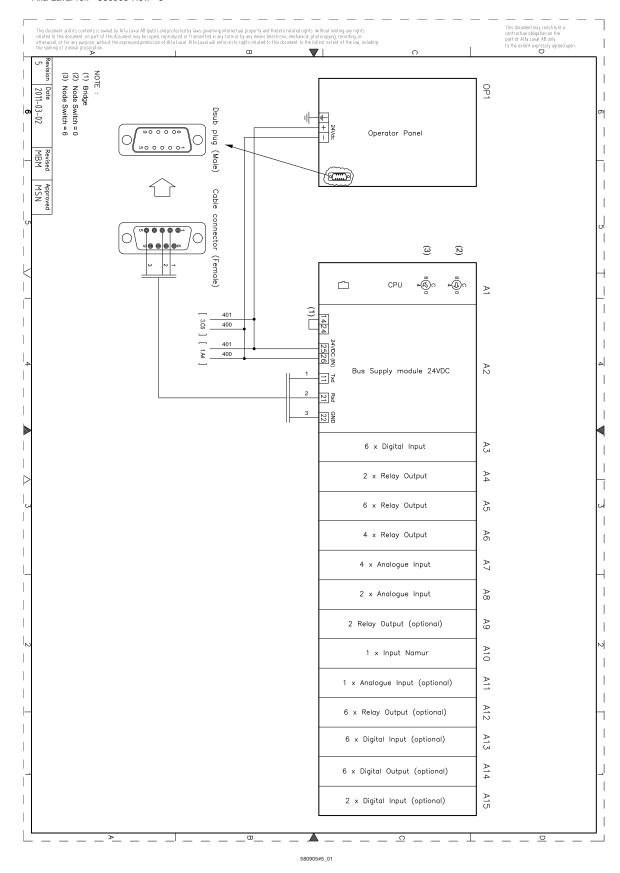


## 4.2.10 Circuit Diagram

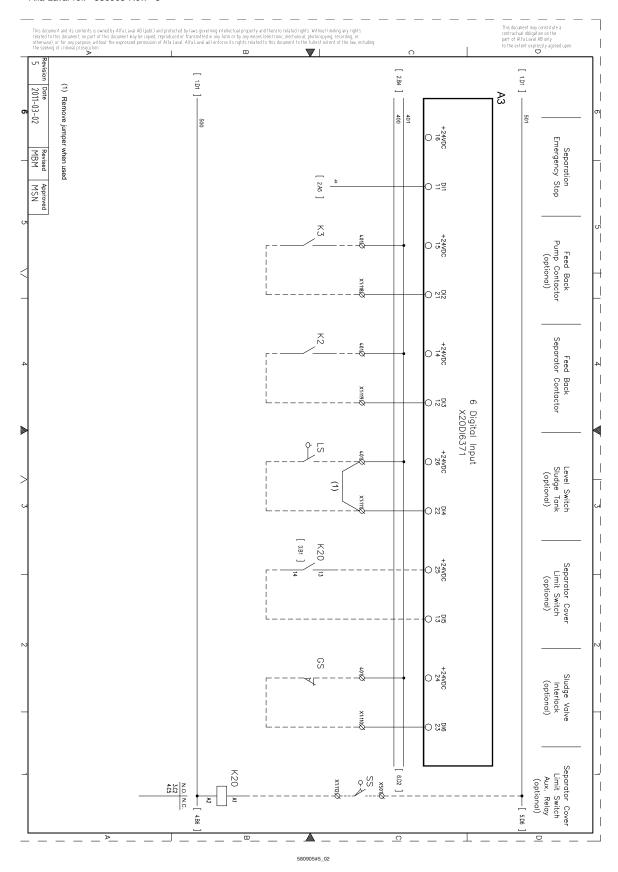


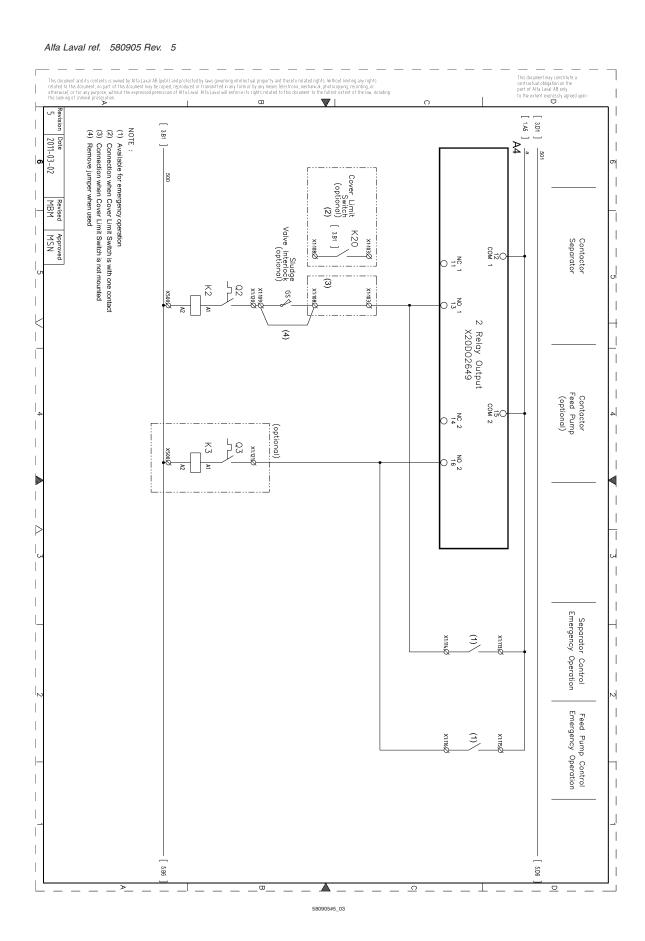


Alfa Laval ref. 580905 Rev. 5

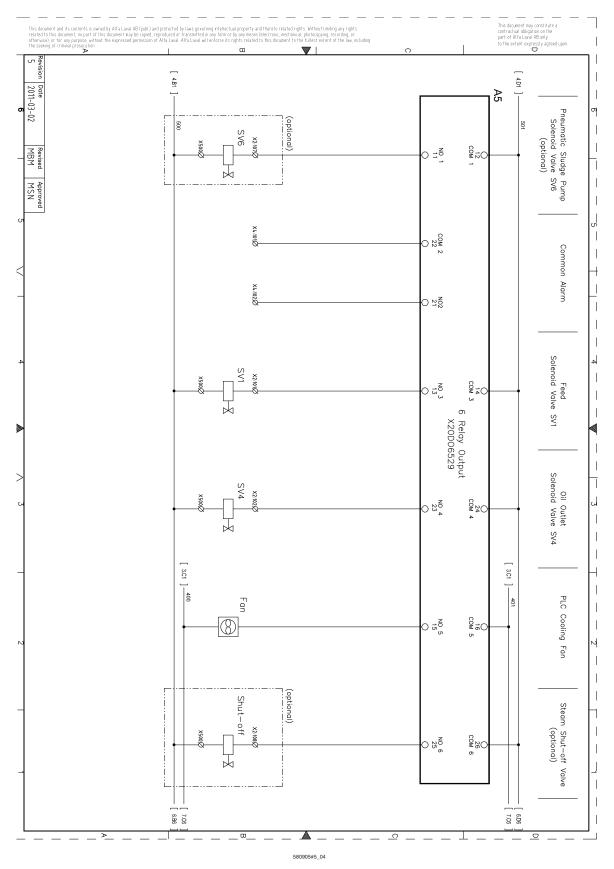




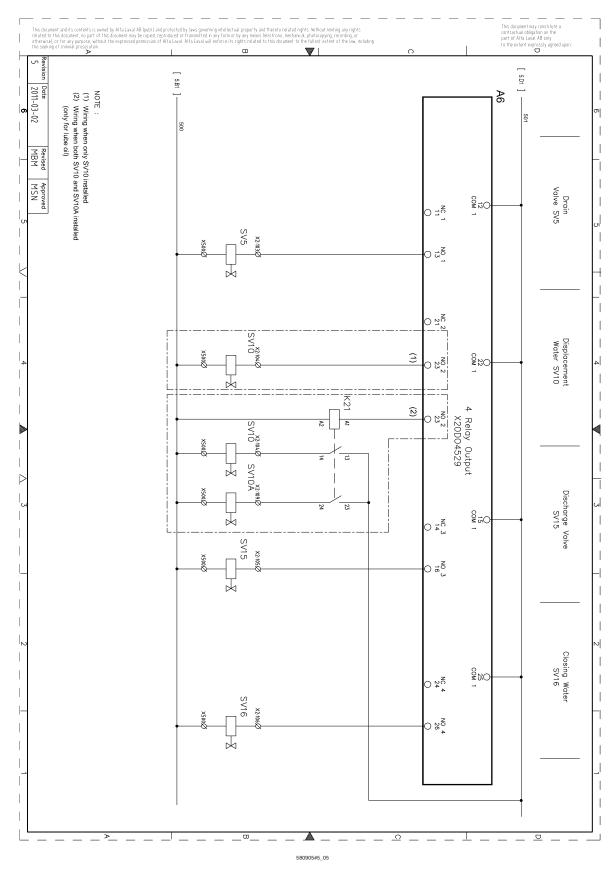




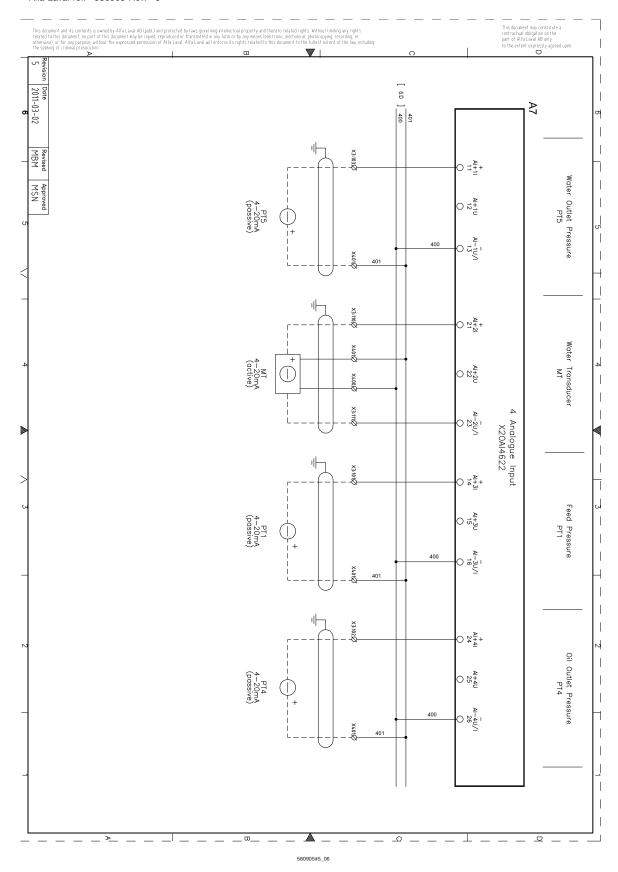
#### Alfa Laval ref. 580905 Rev. 5



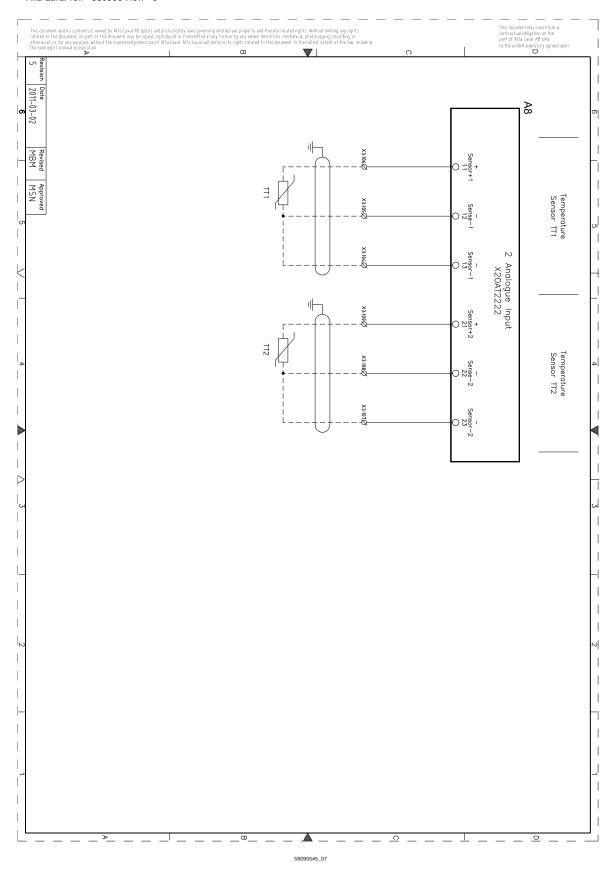




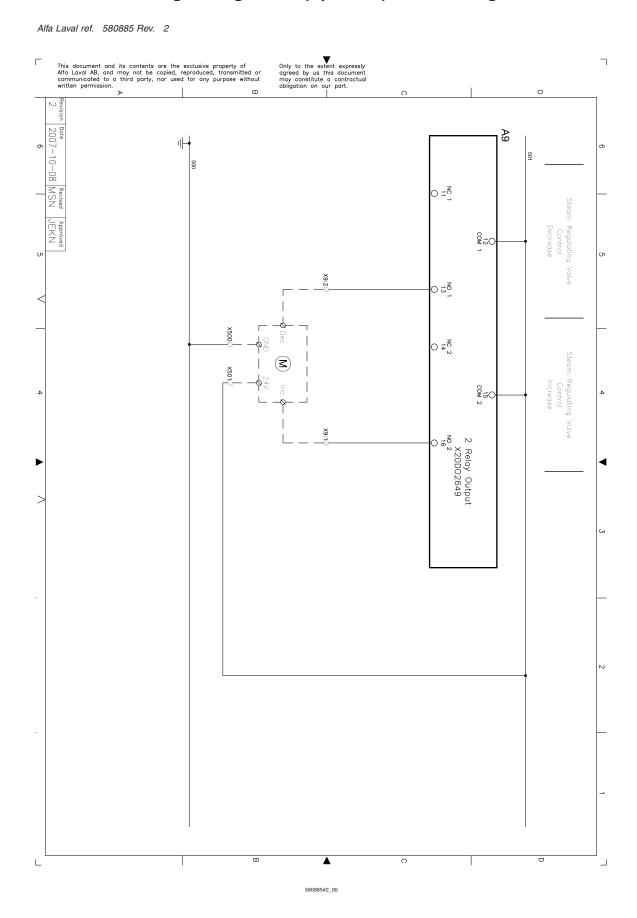




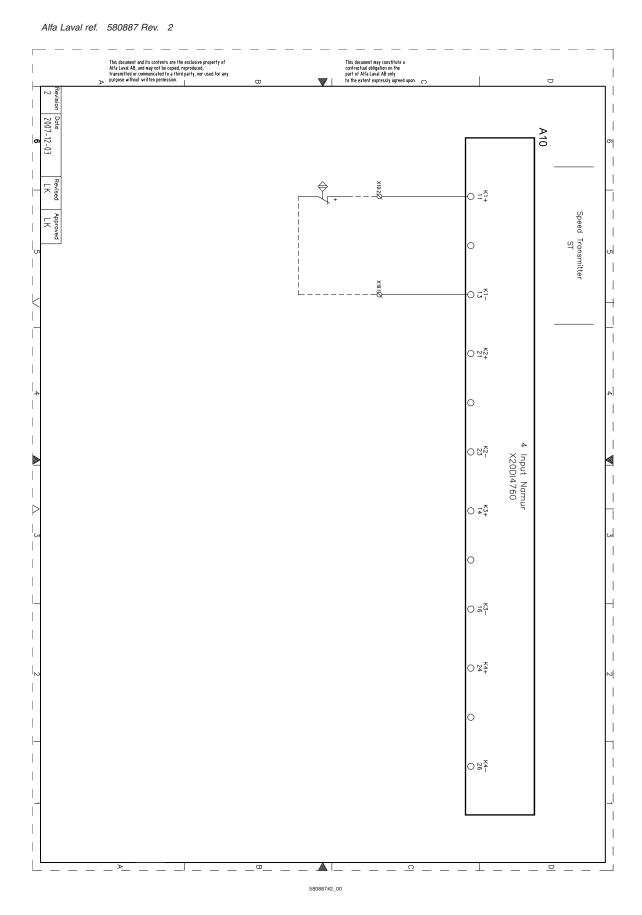
#### Alfa Laval ref. 580905 Rev. 5



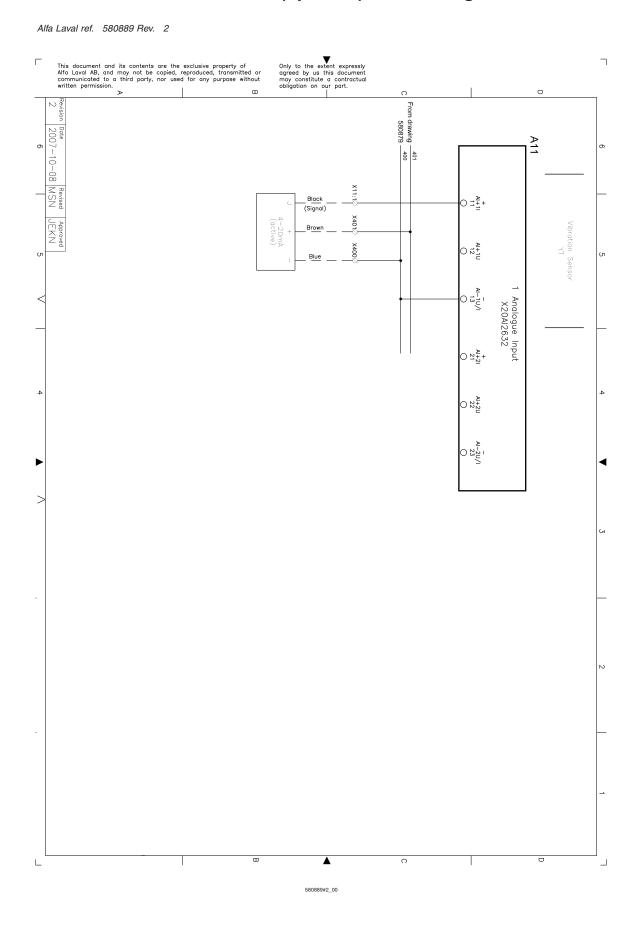
## 4.2.11 Steam Regulating Valve (optional) Circuit Diagram



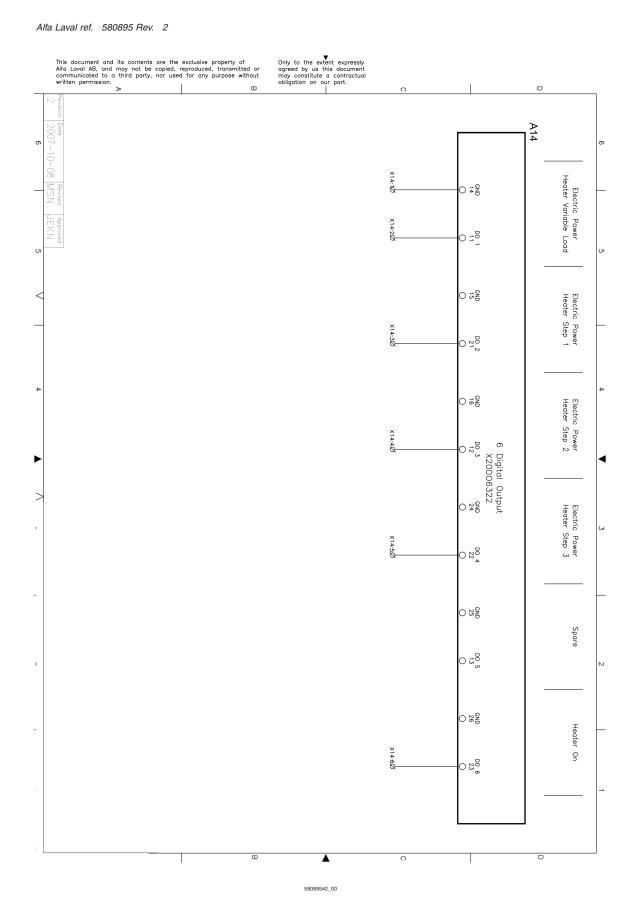
## 4.2.12 Speed Transmitter (optional) Circuit Diagram



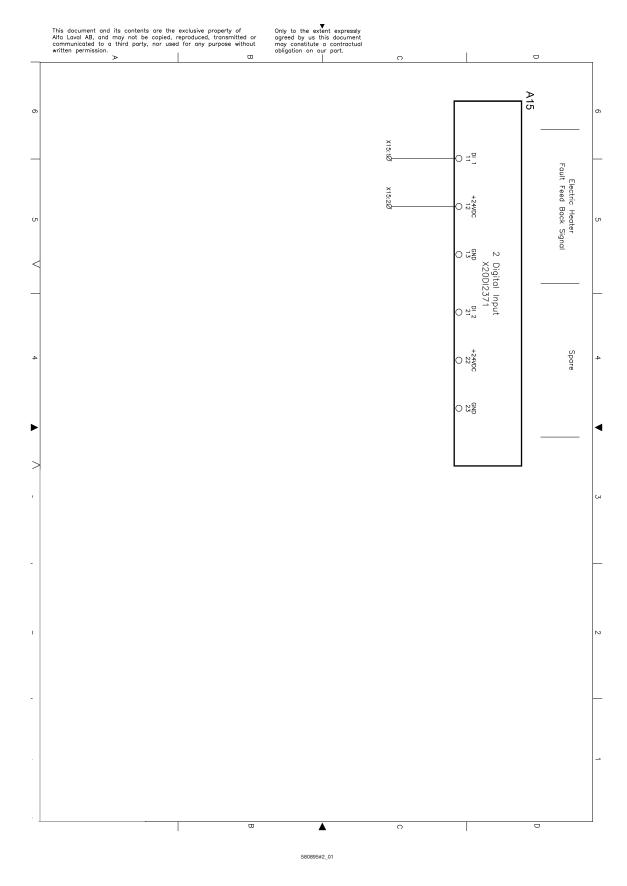
## 4.2.13 Vibration Transmitter (optional) Circuit Diagram



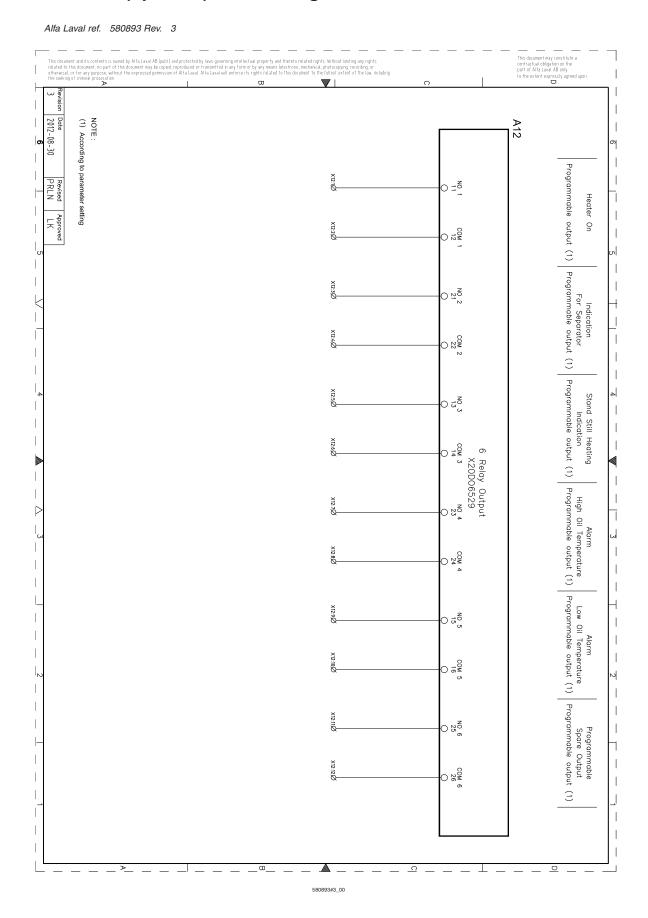
#### 4.2.14 Electric Heater (optional) Circuit Diagram

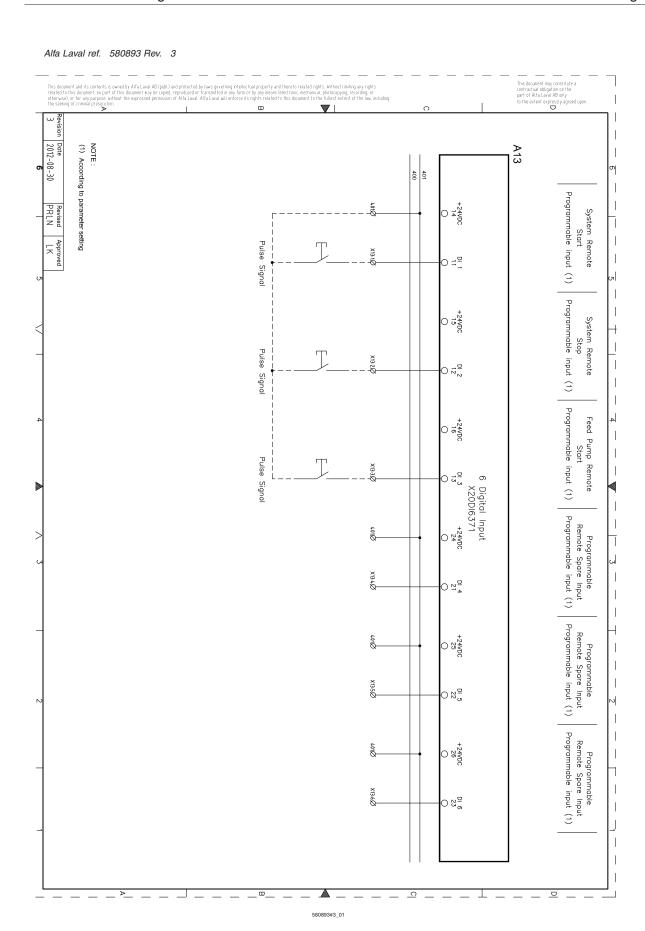


Alfa Laval ref. 580895 Rev. 2

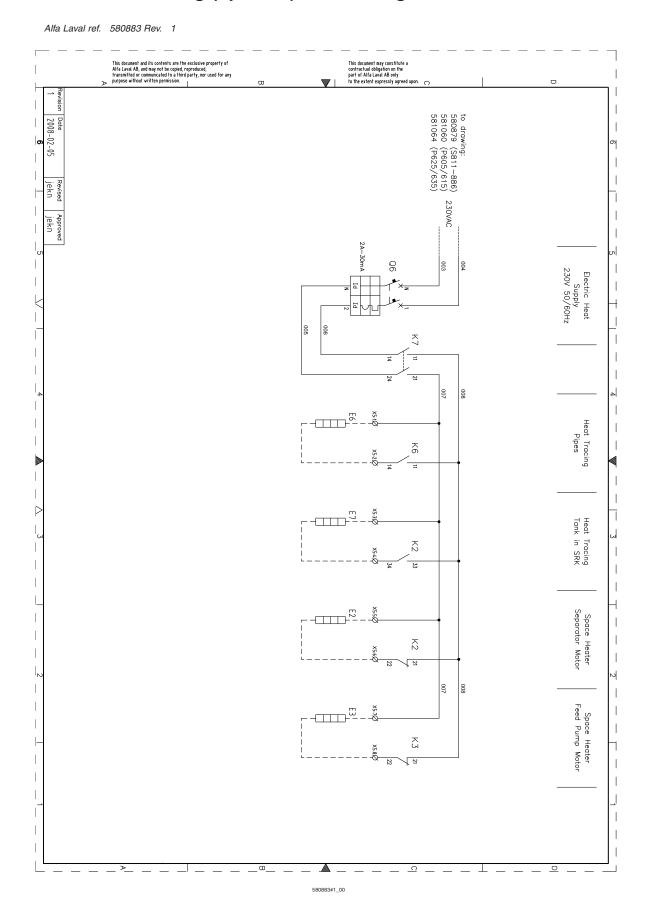


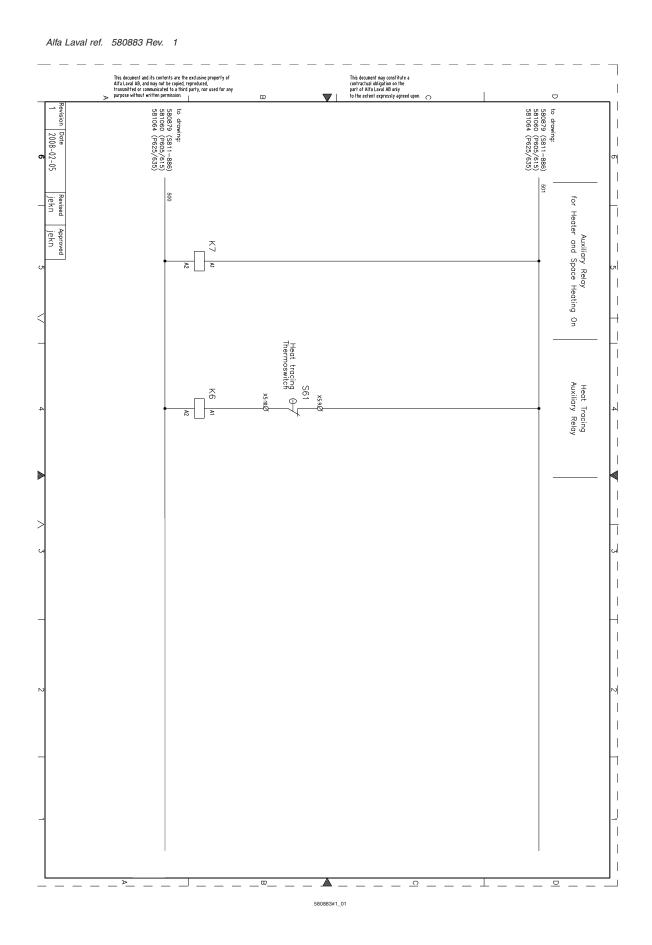
#### 4.2.15 I/O (optional) Circuit Diagram



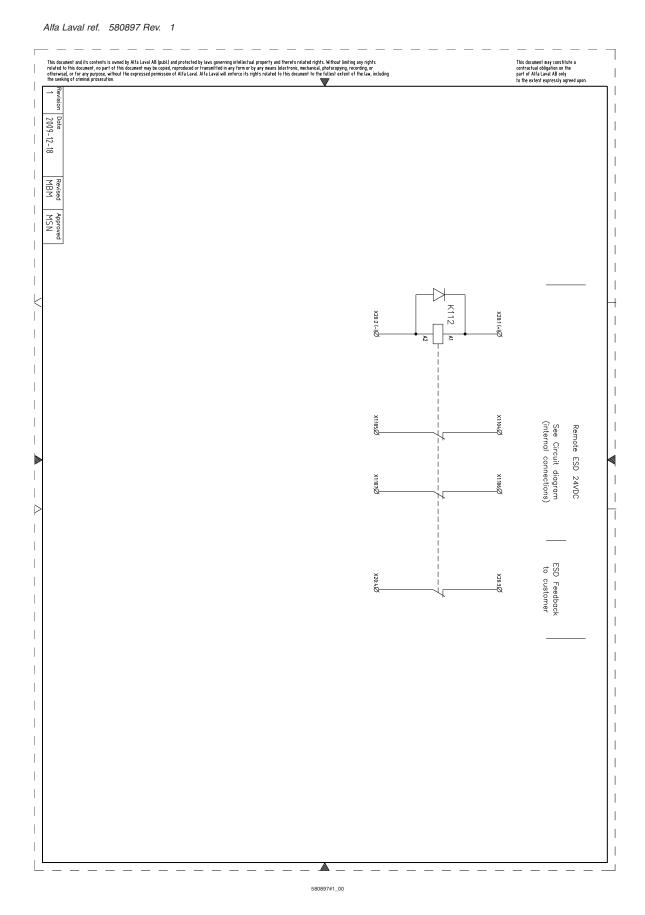


## 4.2.16 Heat Tracing (optional) Circuit Diagram





#### 4.2.17 Emergency Shutdown Circuit Diagram



# 5 Electrical Drawings P 605/615

# 5.1 Electrical System Layout P 605/615

Alfa Laval ref. 580909 Rev. 5 ESD kit (b) (d) CONTROL ٩ Cable included in ALFA LAVAL delivery Optional Alfa .<u>\_</u>-----Feed Approved MSN NOTE: (1) Only used in Lube Oil application Revised Date 2010-06-04

# 5.2 Control and Starter Electrical Diagrams

#### 5.2.1 Starter cable list

Alfa Laval ref. 580881 Rev. 8

|   | Туре   |              | Connection point A | Instruction | Connection point B  | Remarks                    |  |  |  |  |
|---|--------|--------------|--------------------|-------------|---------------------|----------------------------|--|--|--|--|
| Basic design (currents according to order)        |        |              |                    |             |                     |                            |  |  |  |  |
| 1   | MPRXCX | 3x4          | Mains supply       |             | Starter             | 1) Fuse 20 A               |  |  |  |  |
| 1   | MPRXCX | 3x10         | Mains supply       |             | Starter             | 1) Fuse 35A                |  |  |  |  |
| 1   | MPRXCX | 3x16         | Mains supply       |             | Starter             | 1) Fuse 50 A               |  |  |  |  |
| 1   | MPRXCX | 3x25         | Mains supply       |             | Starter             | 1) Fuse 63 A               |  |  |  |  |
| 1   | MPRXCX | 3x35         | Mains supply       |             | Starter             | 1) Fuse 80 A               |  |  |  |  |
| 2   | MPRXCX | 2x2m5        | Supply             |             | Starter             | 1) Fuse 16 A               |  |  |  |  |
| 3   | MPRXCX | 3x1,5        | Starter            | Marked 3A   | Separator motor     | 4,0 - 6,3 A                |  |  |  |  |
| 3   | MPRXCX | 3x2,5        | Starter            | Marked 3B   | Separator motor     | 6,3 – 16 A                 |  |  |  |  |
| 3   | MPRXCX | 3x4          | Starter            | Marked 3C   | Separator motor     | 16 – 20 A                  |  |  |  |  |
| 3   | MPRXCX | 3x6          | Starter            | Marked 3D   | Separator motor     | 20 – 25 A                  |  |  |  |  |
| 3   | MPRXCX | 3x10         | Starter            | Marked 3E   | Separator motor     | 25 – 32 A                  |  |  |  |  |
| 3   | MPRXCX | 3x16         | Starter            | Marked 3F   | Separator motor     | 32 – 45 A                  |  |  |  |  |
| 3   | MPRXCX | 3x25         | Starter            | Marked 3G   | Separator motor     | 45 – 63 A                  |  |  |  |  |
| Optional or customer's own feed pump (as ordered) |        |              |                    |             |                     |                            |  |  |  |  |
| 4   | MPRXCX | 3x25         | Starter            |             | Feed pump           | 2)                         |  |  |  |  |
| Optional sludge handling (as ordered)             |        |              |                    |             |                     |                            |  |  |  |  |
|   | RFE-HF | 1x4x0,7<br>5 | Starter            |             | GS, Valve switch    |                            |  |  |  |  |
|   | RFE-HF | 1x2x0,7<br>5 | Starter            |             | LS, Sludge level    |                            |  |  |  |  |
| 37  | RFE-HF | 1x2x0,7<br>5 | Starter            |             | SV6, Solenoid valve | For pneumatic sludge pump  |  |  |  |  |
| 73  | RFE-HF | 2x0,75       | Starter            |             | Heatpac on tank     | Included in heater element |  |  |  |  |
| Optional space heating (as ordered)               |        |              |                    |             |                     |                            |  |  |  |  |
| 71  | MPRXCX | 2x1,5        | Starter            |             | Separator pump      |                            |  |  |  |  |
| 73  | MPRXCX | 2x1,5        | Starter            |             | Feed pump           | 2)                         |  |  |  |  |
| Optional heat tracing (as ordered)                |        |              |                    |             |                     |                            |  |  |  |  |
| 74  | MPRXCX | 2x1,5        | Starter            |             | Thermostat          |                            |  |  |  |  |
| 75  |        | 3x1,5        | Starter            |             | Heating cable       |                            |  |  |  |  |

<sup>1)</sup> Cable not included in Alfa Laval delivery.

<sup>2)</sup> Cable only included in the Alfa Laval delivery when Feed Pump is delivered mounted on Module

| No  | Туре                 |              | Connection | Instruction | Connection point                 | Domarko   |  |  |  |  |
|---|----------------------|--------------|------------|-------------|----------------------------------|---|--|--|--|--|
| 140.  | Туре                 |              | point A    | instruction | B                                | nemarks   |  |  |  |  |
| Signal cables (currents according to order) |                      |              |            |             |                                  |   |  |  |  |  |
| 11  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV1                              |   |  |  |  |  |
| 12  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV4                              |   |  |  |  |  |
| 13  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV5                              | S-type only   |  |  |  |  |
| 14  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV10                             |   |  |  |  |  |
| 14<br>A                                     | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV10A                            | Lube oil only                                       |  |  |  |  |
| 15  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV15                             |   |  |  |  |  |
| 16  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV16                             |   |  |  |  |  |
| 17  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | PT1                              | 1)  |  |  |  |  |
| 18  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | PT4                              |   |  |  |  |  |
| 19  | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | MT                               | S-type only   |  |  |  |  |
| 20  | RFE-HF               | 4x2x0,7<br>5 | EPC 60     |             | ST, (YT, SS)                     | Not for P605,<br>P615, S805,<br>S815                |  |  |  |  |
| 21  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | PT5                              | S-type only   |  |  |  |  |
| 22  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | Common alarm                     | 2)  |  |  |  |  |
| 23  | RFE-HF               | 4x2x0,7<br>5 | EPC 60     |             | TT1/TT2                          | 3)  |  |  |  |  |
| Opti  | Options (as ordered) |              |            |             |                                  |   |  |  |  |  |
|   | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | SS                               | <sup>2)</sup> Only for P605,<br>P615, S805,<br>S815 |  |  |  |  |
| 30  | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | YS                               | S815  2) Only for P605, P615, S805, S815  2) 4)     |  |  |  |  |
| 38  | MPRXCX               | 4x1,5        | EPC 60     |             | Syst. Emergency                  |   |  |  |  |  |
|   | MPRXCX               | 4x1,5        | EPC 60     |             | Sep. Emergency stop              | 2) 4)   |  |  |  |  |
|   | onal Electric H      | leater (as   | ordered)   |             |                                  |   |  |  |  |  |
| 40  | RFE-HF               | 4x2x0,7<br>5 | Starter    |             | Power unit                       |   |  |  |  |  |
| 45  | RFE-HF               | 1x2x0,7<br>5 | Starter    |             | Power unit                       |   |  |  |  |  |
| Optional heat tracing (as ordered)          |                      |              |            |             |                                  |   |  |  |  |  |
| 41  | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | Steam reg. valve                 |   |  |  |  |  |
| 44  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | Shut-off valve                   |   |  |  |  |  |
| 50  | RJ45 Cat 5e          |              | EPC 60 CPU |             | Client remote data communication | 2), 5)  |  |  |  |  |

- 1) Cable not included in Alfa Laval delivery
- 2) Cable only included in the Alfa Laval delivery when PT1 is delivered mounted on Module.
- 3 )Cable only included in the Alfa Laval delivery when Electric Heater is delivered mounted on Module.
- 4) This cable cannot be longer than 25 m to avoid voltage drop.
- 5) Crossconnection cable only included in Alfa Laval delivery when multiple modules is delivered.

Other equivalent and approved cables may be used.

Cable areas are calculated with correction factor 0.7.

Cables used are Shipboard Cables, designed according to IEC 60092-3.

Flame retardant according to IEC 60332-1-2 and IEC 60332-3-22.

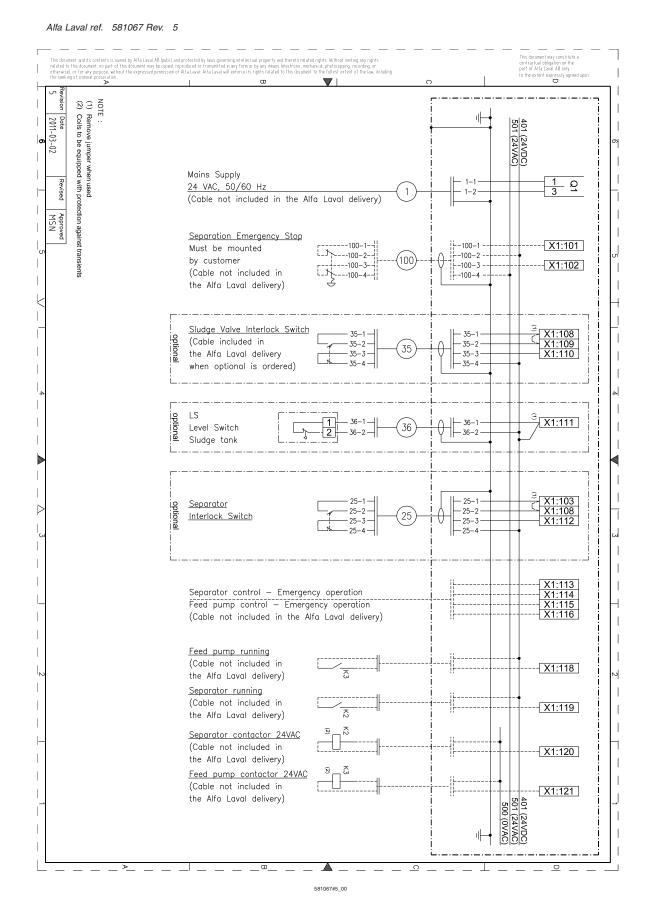
Halogen-free according to IEC 60754 series.

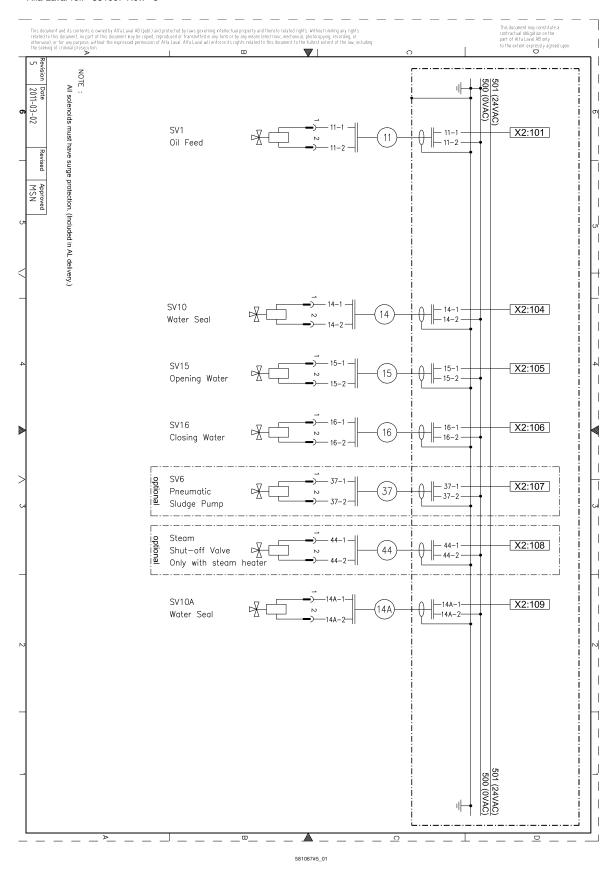
Smoke emission according to IEC 61034 series.

All power cables should be Signal Shielded Cables with the shield properly connected to earth as shown in the electrical drawings.

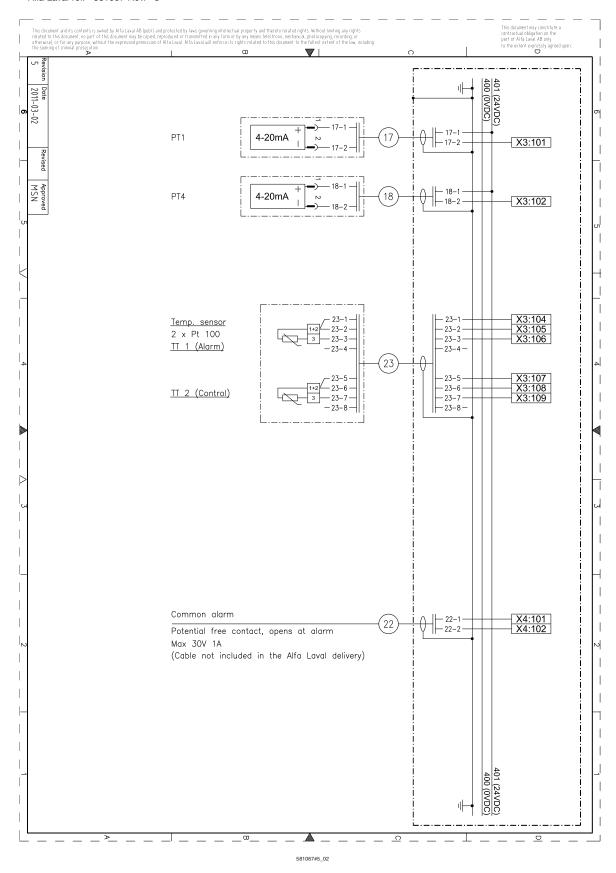
For armoured power cables, the armour must be connected to earth, as shown in the electrical drawings, and must give sufficient EMI protection. Copper wire armouring is normally used.

#### 5.2.2 Separator Interconnection Diagram

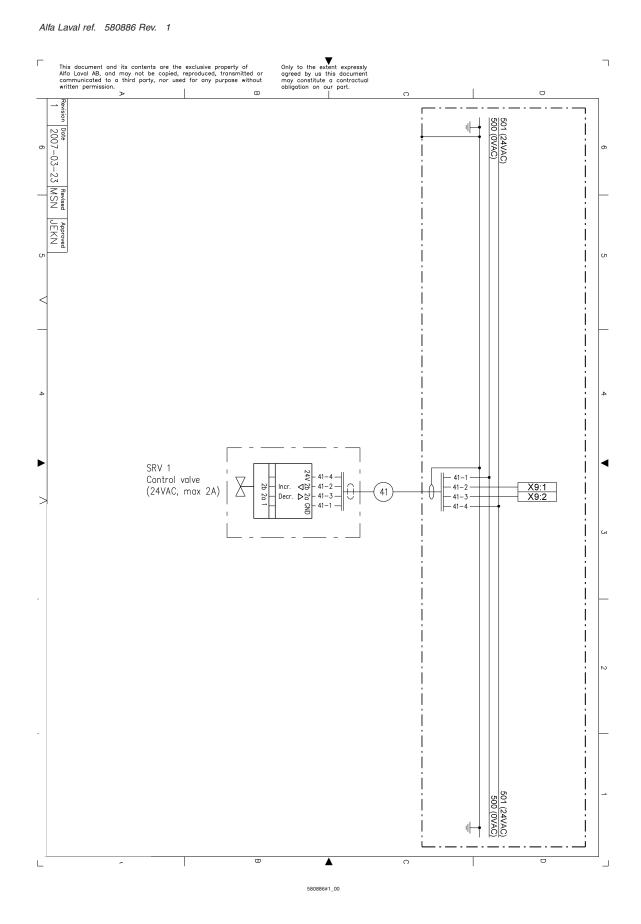




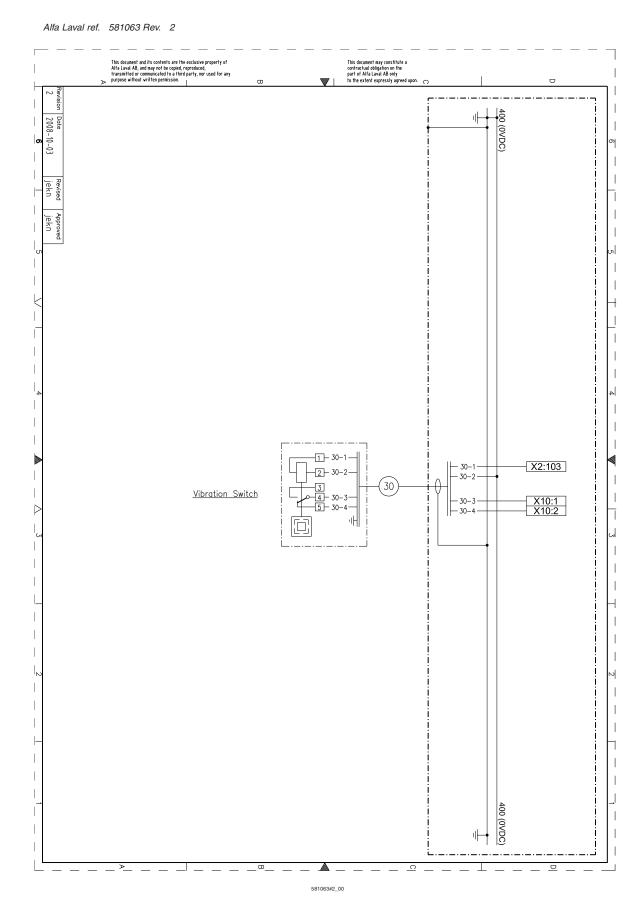
#### Alfa Laval ref. 581067 Rev. 5



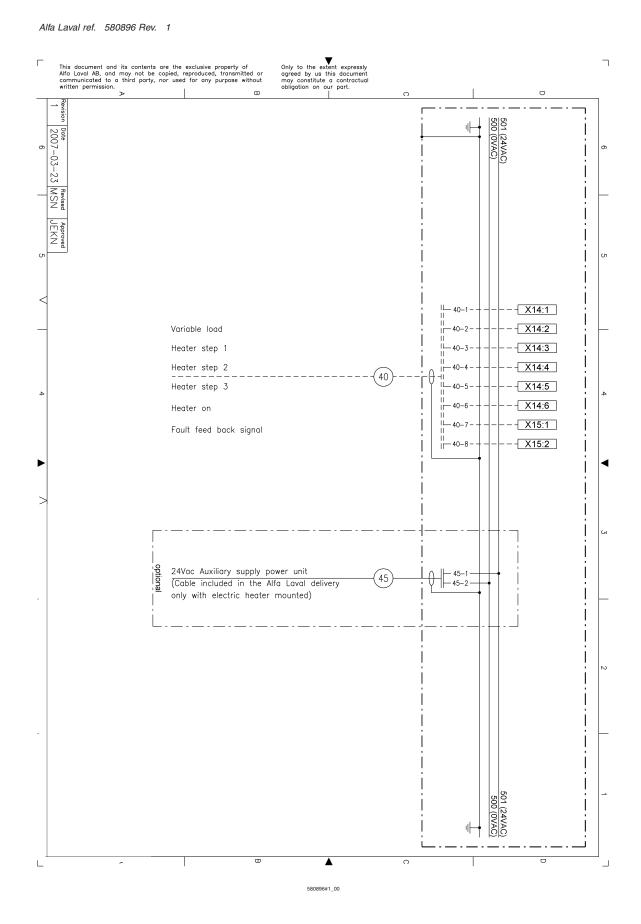
## 5.2.3 Steam Regulating Valve (optional) Interconnection Diagram



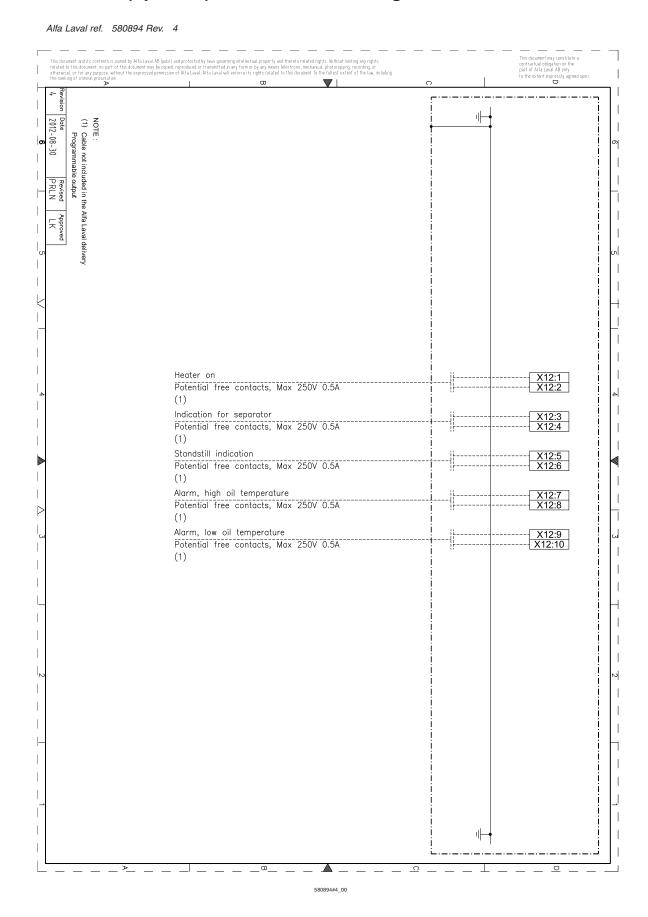
## 5.2.4 Vibration Switch (optional) Interconnection Diagram

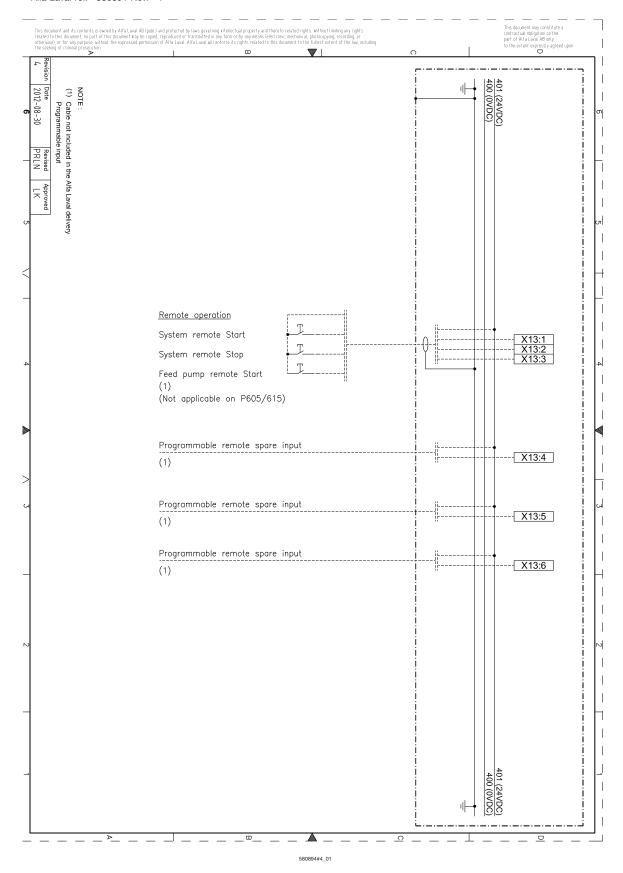


#### 5.2.5 Electric Heater (optional) Interconnection Diagram

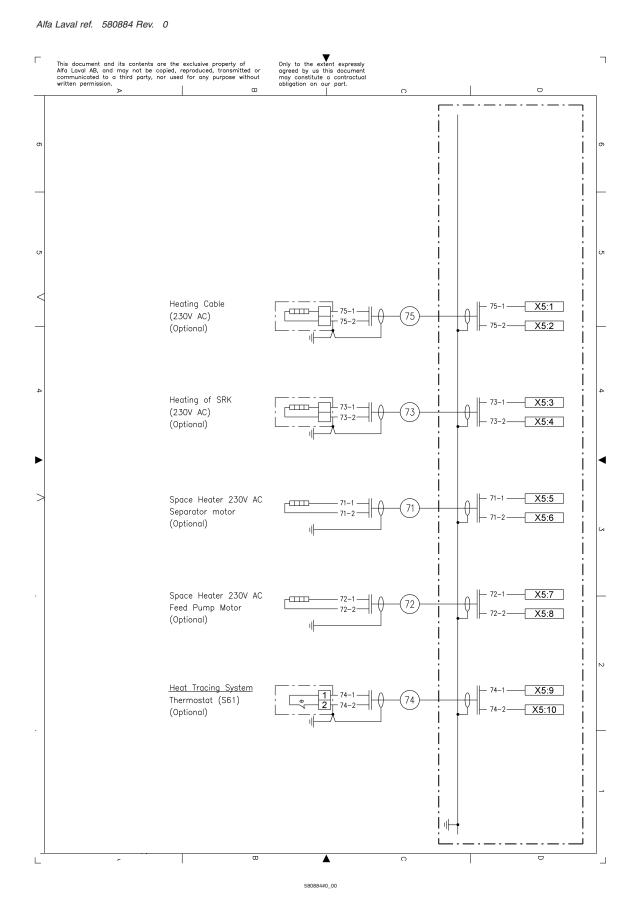


#### 5.2.6 I/O (optional) Interconnection Diagram





### 5.2.7 Heat Tracing (optional) Interconnection Diagram



#### 5.2.8 Emergency Shutdown Interconnection Diagram

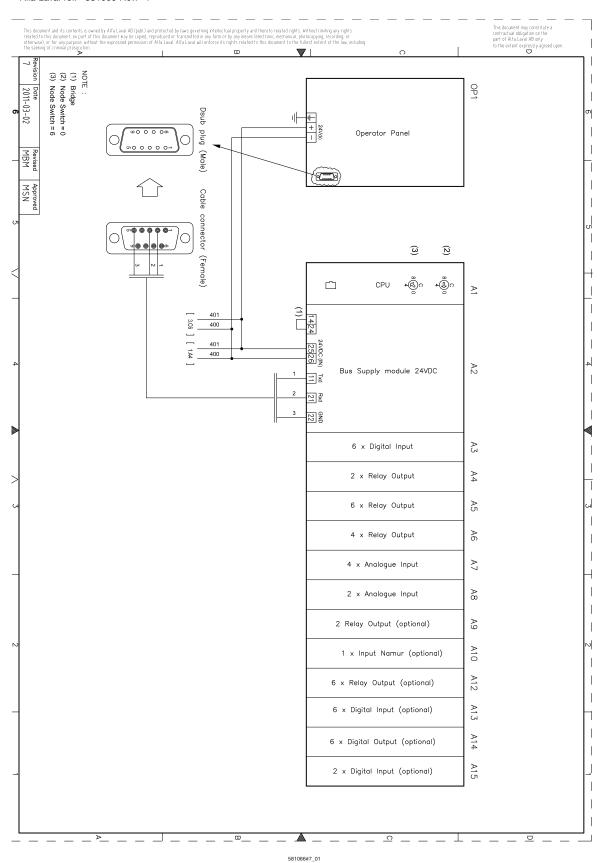
Alfa Laval ref. 580898 Rev. 0 Only to the extent expressly agreed by us this document may constitute a contractual obligation on our part. This document and its contents are the exclusive property of Alfa Laval AB, and may not be copied, reproduced, transmitted or communicated to a third party, nor used for any purpose without written permission. Emergency Shut Down (ESD) signal 24Vdc (Replaces "Systems Em. Stop" when used) (Cable not included in the Alfa Laval delivery) Emergency Shut Down (ESD) remote feedback Potential free contacts, Max 250V 0.5A (Cable not included in the Alfa Laval delivery)

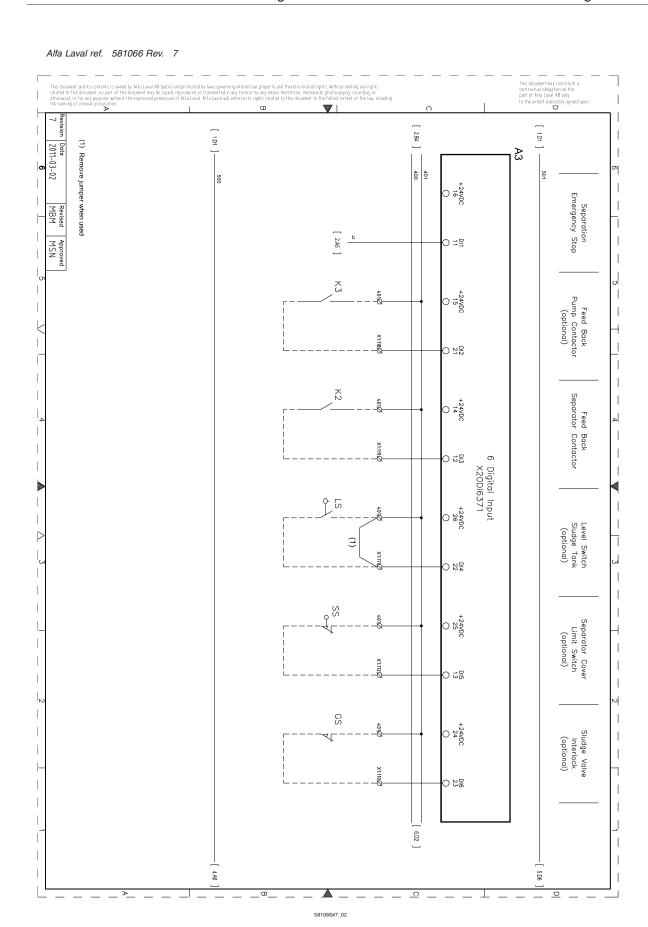
580898#0\_00

## 5.2.9 Circuit Diagram

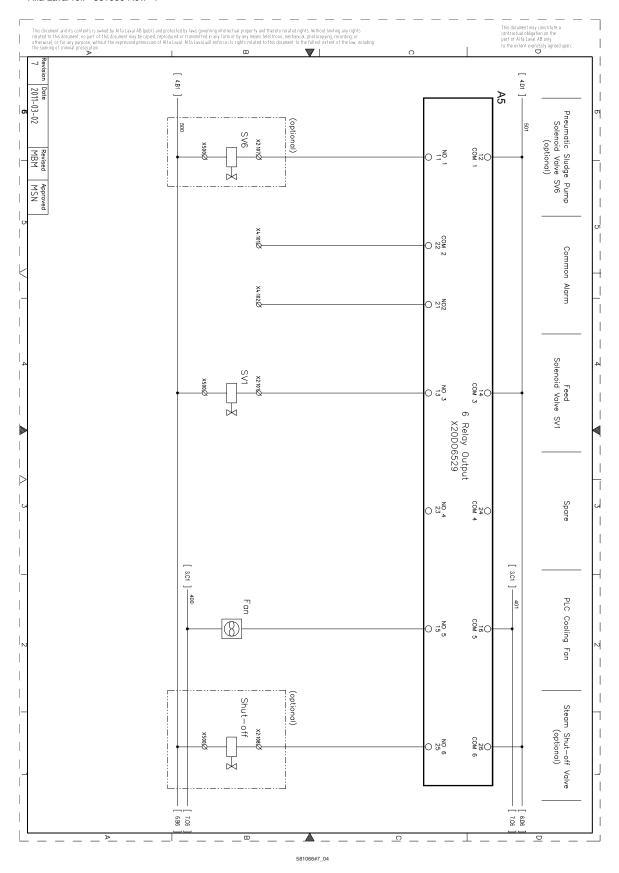
Alfa Laval ref. 581066 Rev. 7 NOTE:
(1) Zero terminal <u>not</u> connected to earth Main GA1

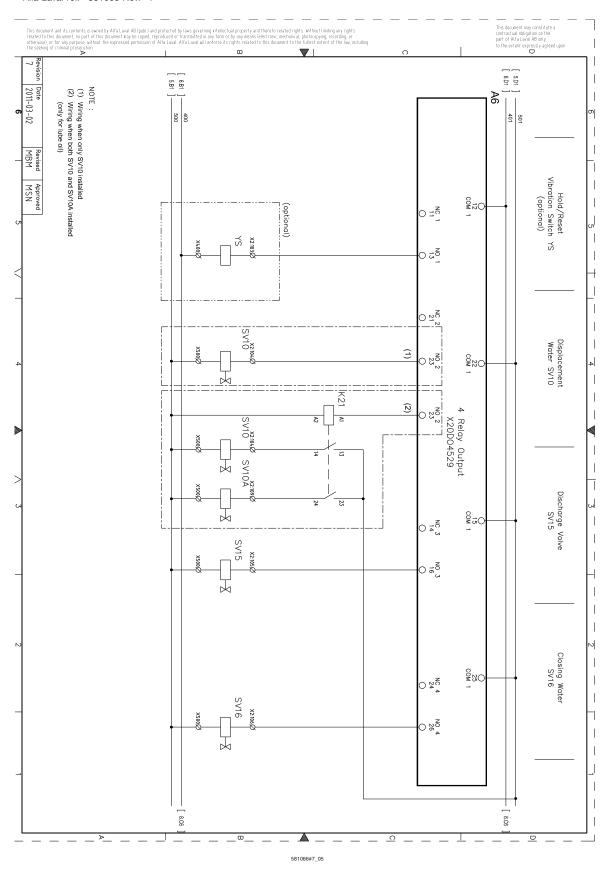
581066#7\_00



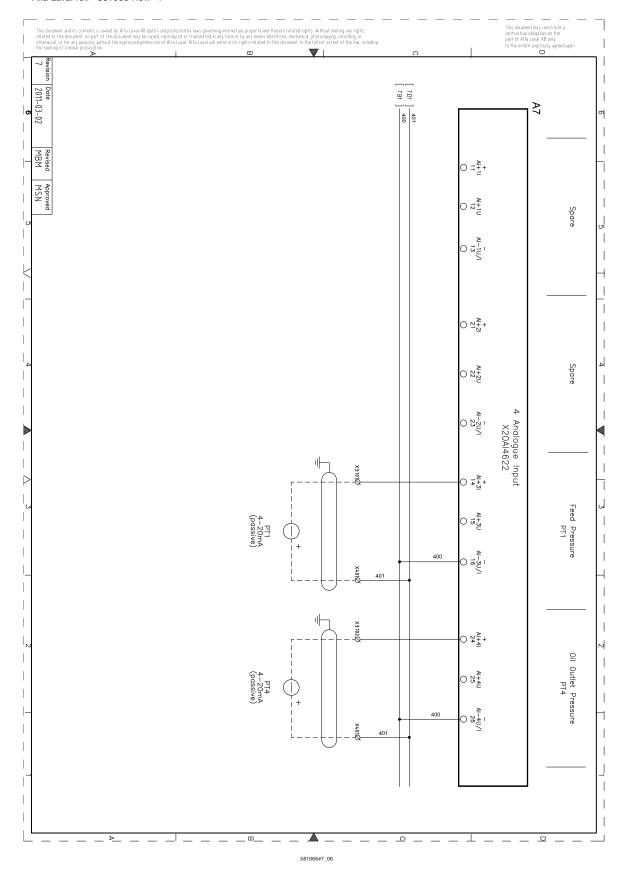


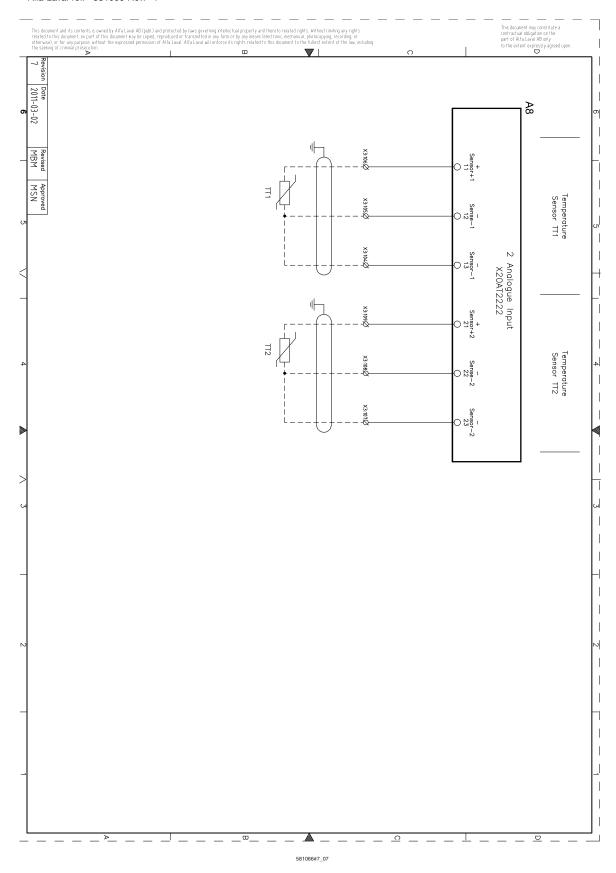
#### Alfa Laval ref. 581066 Rev. 7



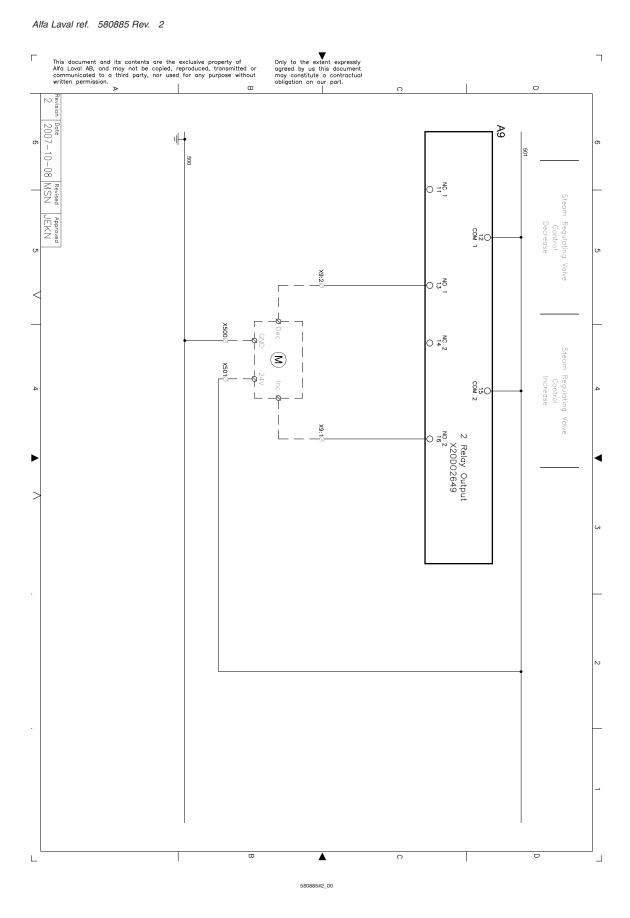


#### Alfa Laval ref. 581066 Rev. 7

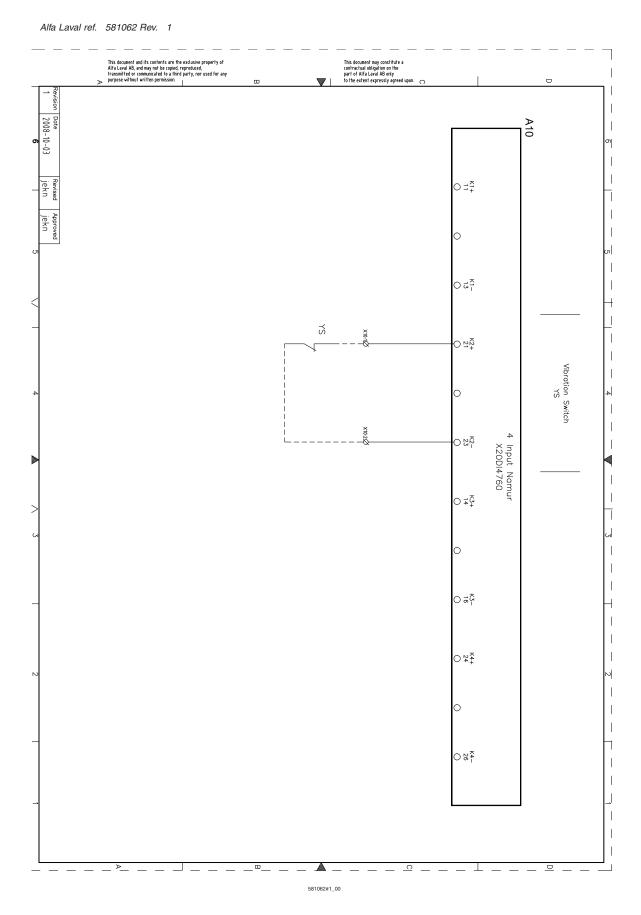




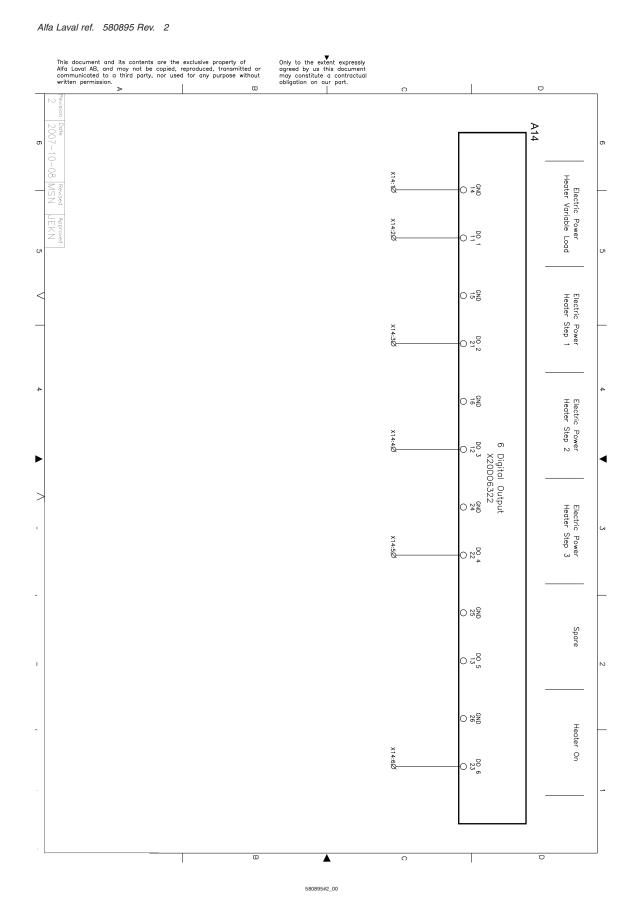
## 5.2.10 Steam Regulating Valve (optional) Circuit Diagram



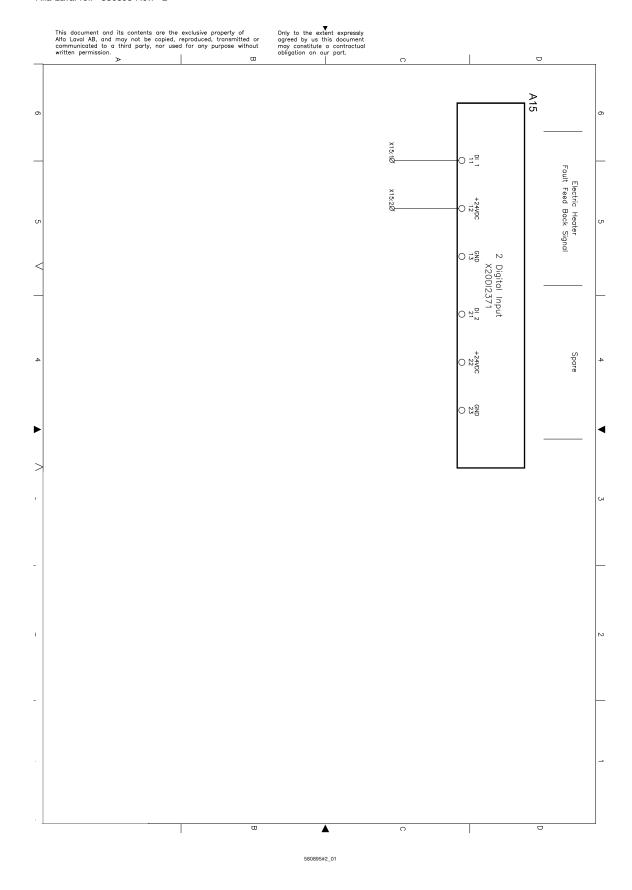
## 5.2.11 Vibration Switch (optional) Circuit Diagram



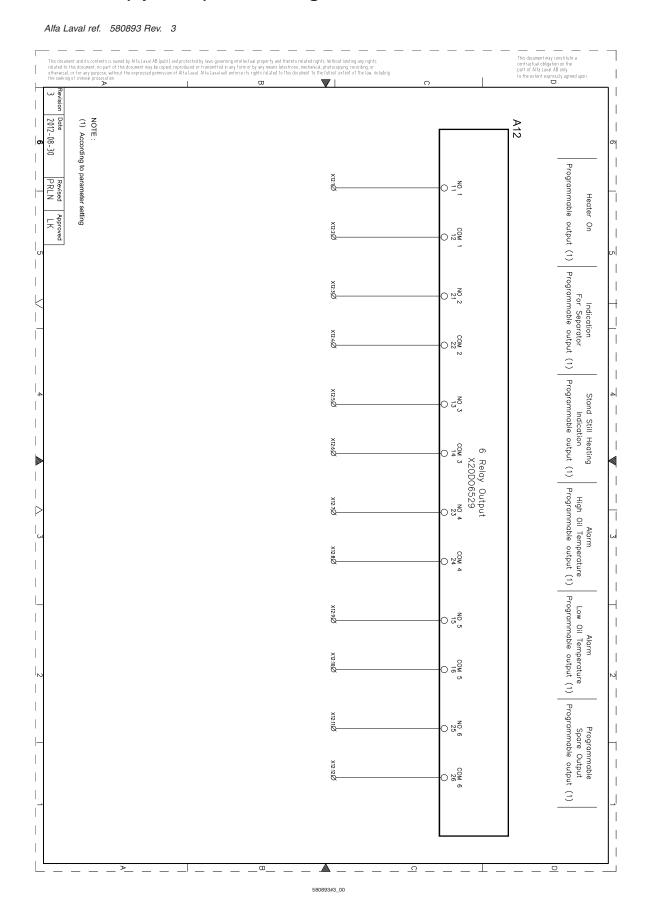
## 5.2.12 Electric Heater (optional) Circuit Diagram

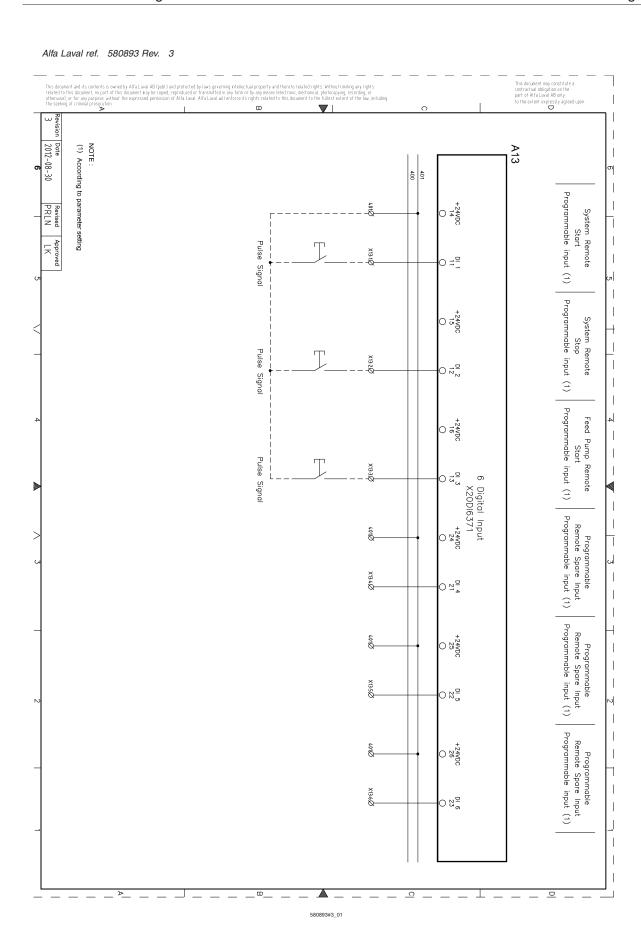




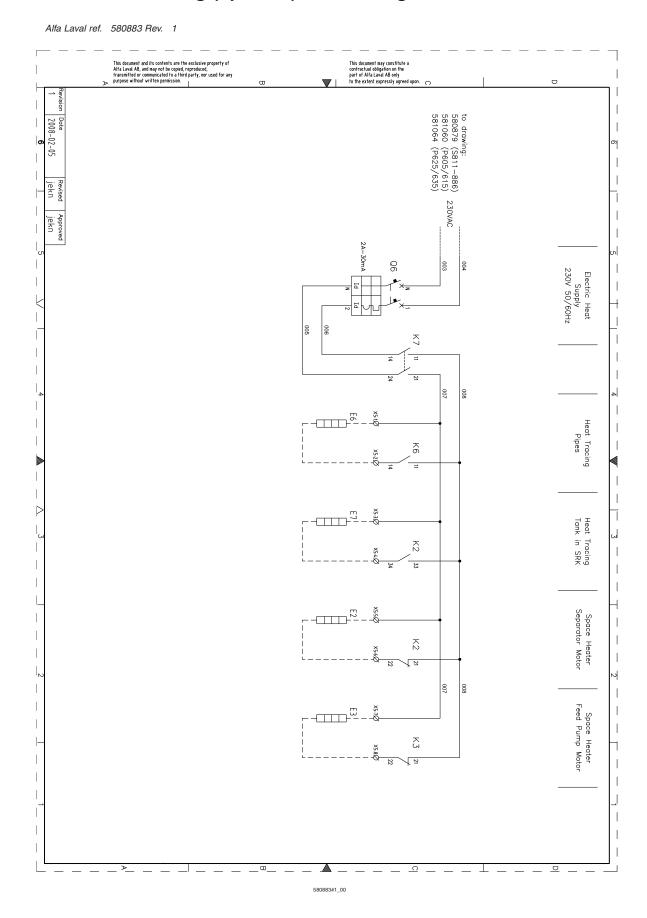


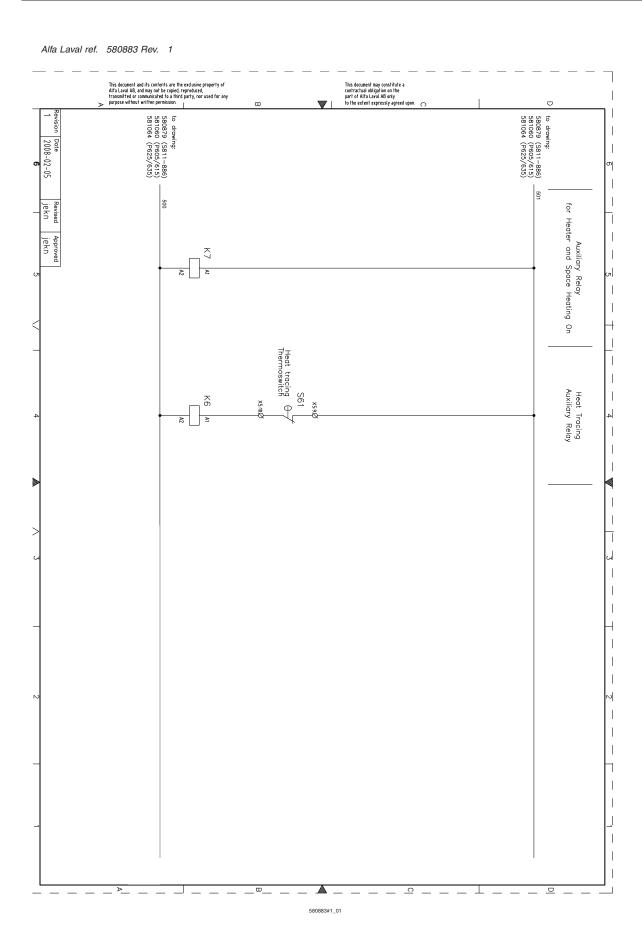
### 5.2.13 I/O (optional) Circuit Diagram



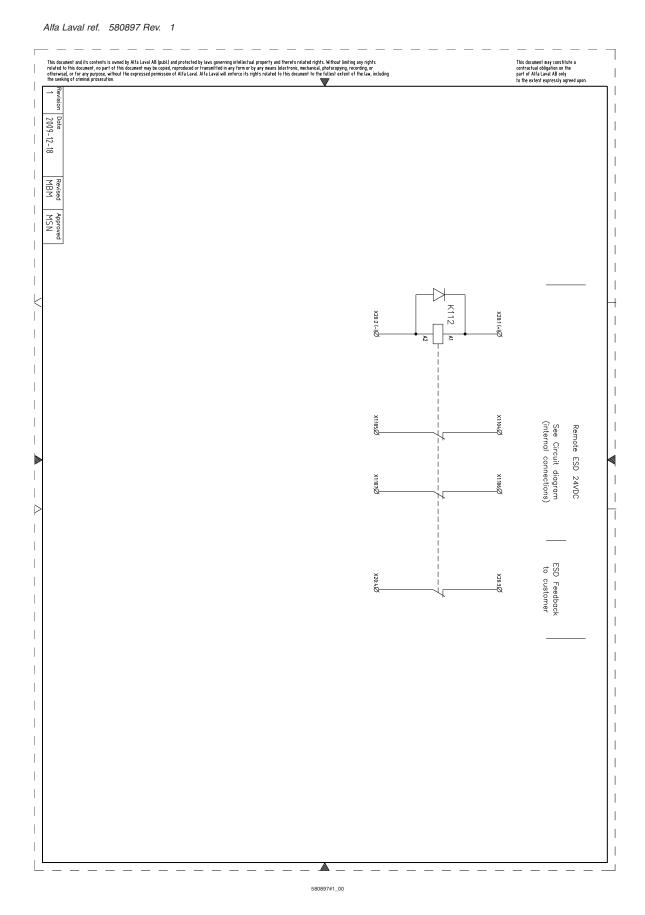


## 5.2.14 Heat Tracing (optional) Circuit Diagram





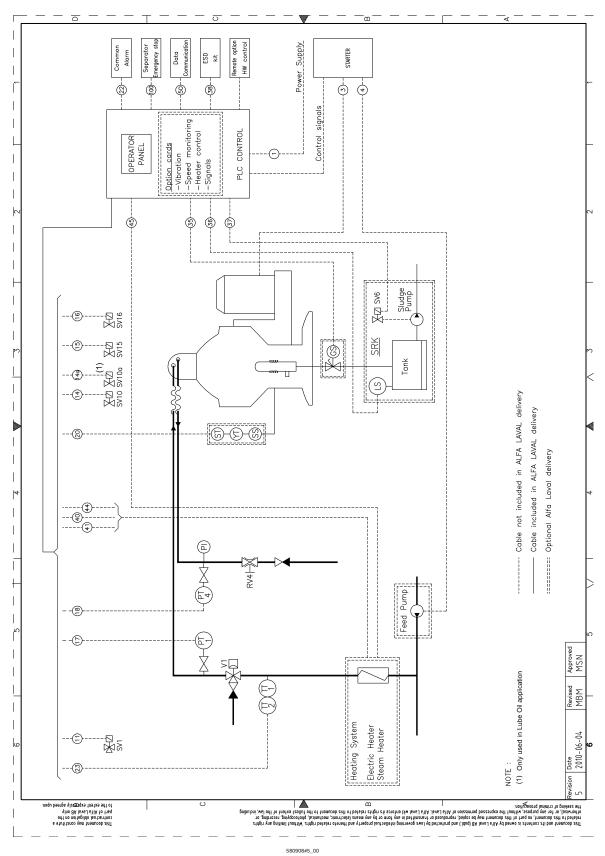
### 5.2.15 Emergency Shutdown Circuit Diagram



# 6 Electrical Drawings P 625/626

## 6.1 Electrical System Layout P 625/626

Alfa Laval ref. 580908 Rev. 5



## 6.2 Control and Starter Electrical Diagrams

#### 6.2.1 Starter cable list

Alfa Laval ref. 580881 Rev. 8

| No.  | Туре  |              | Connection   | Instruction | Connection point    | Remarks                    |  |  |  |  |  |
|--|---|--------------|--------------|-------------|---------------------|----------------------------|--|--|--|--|--|
| _  |   |              | point A      |             | В                   |                            |  |  |  |  |  |
| Basic design (currents according to order) |   |              |              |             |                     |                            |  |  |  |  |  |
| 1  | MPRXCX  | 3x4          | Mains supply |             | Starter             | 1) Fuse 20 A               |  |  |  |  |  |
| 1  | MPRXCX  | 3x10         | Mains supply |             | Starter             | 1) Fuse 35A                |  |  |  |  |  |
| 1  | MPRXCX  | 3x16         | Mains supply |             | Starter             | <sup>1)</sup> Fuse 50 A    |  |  |  |  |  |
| 1  | MPRXCX  | 3x25         | Mains supply |             | Starter             | 1) Fuse 63 A               |  |  |  |  |  |
| 1  | MPRXCX  | 3x35         | Mains supply |             | Starter             | 1) Fuse 80 A               |  |  |  |  |  |
| 2  | MPRXCX  | 2x2m5        | Supply       |             | Starter             | 1) Fuse 16 A               |  |  |  |  |  |
| 3  | MPRXCX  | 3x1,5        | Starter      | Marked 3A   | Separator motor     | 4,0 – 6,3 A                |  |  |  |  |  |
| 3  | MPRXCX  | 3x2,5        | Starter      | Marked 3B   | Separator motor     | 6,3 – 16 A                 |  |  |  |  |  |
| 3  | MPRXCX  | 3x4          | Starter      | Marked 3C   | Separator motor     | 16 – 20 A                  |  |  |  |  |  |
| 3  | MPRXCX  | 3x6          | Starter      | Marked 3D   | Separator motor     | 20 – 25 A                  |  |  |  |  |  |
| 3  | MPRXCX  | 3x10         | Starter      | Marked 3E   | Separator motor     | 25 – 32 A                  |  |  |  |  |  |
| 3  | MPRXCX  | 3x16         | Starter      | Marked 3F   | Separator motor     | 32 – 45 A                  |  |  |  |  |  |
| 3  | MPRXCX  | 3x25         | Starter      | Marked 3G   | Separator motor     | 45 – 63 A                  |  |  |  |  |  |
| Opt  | Optional or customer's own feed pump (as ordered) |              |              |             |                     |                            |  |  |  |  |  |
| 4  | MPRXCX  | 3x25         | Starter      |             | Feed pump           | 2)                         |  |  |  |  |  |
| Optional sludge handling (as ordered)      |   |              |              |             |                     |                            |  |  |  |  |  |
| 35   | RFE-HF  | 1x4x0,7<br>5 | Starter      |             | GS, Valve switch    |                            |  |  |  |  |  |
| 36   | RFE-HF  | 1x2x0,7<br>5 | Starter      |             | LS, Sludge level    |                            |  |  |  |  |  |
| 37   | RFE-HF  | 1x2x0,7<br>5 | Starter      |             | SV6, Solenoid valve | For pneumatic sludge pump  |  |  |  |  |  |
| 73   | RFE-HF  | 2x0,75       | Starter      |             | Heatpac on tank     | Included in heater element |  |  |  |  |  |
| Opt  | Optional space heating (as ordered)               |              |              |             |                     |                            |  |  |  |  |  |
| 71   | MPRXCX  | 2x1,5        | Starter      |             | Separator pump      |                            |  |  |  |  |  |
| 73   | MPRXCX  | 2x1,5        | Starter      |             | Feed pump           | 2)                         |  |  |  |  |  |
| Optional heat tracing (as ordered)         |   |              |              |             |                     |                            |  |  |  |  |  |
| 74   | MPRXCX  | 2x1,5        | Starter      |             | Thermostat          |                            |  |  |  |  |  |
| 75   |   | 3x1,5        | Starter      |             | Heating cable       |                            |  |  |  |  |  |
|  |   |              |              |             |                     |                            |  |  |  |  |  |

<sup>1)</sup> Cable not included in Alfa Laval delivery.

<sup>2)</sup> Cable only included in the Alfa Laval delivery when Feed Pump is delivered mounted on Module

| No  | Туре                 |              | Connection | Instruction | Connection point                 | Domarko   |  |  |  |  |
|---|----------------------|--------------|------------|-------------|----------------------------------|---|--|--|--|--|
| 140.  | Туре                 |              | point A    | instruction | B                                | nemarks   |  |  |  |  |
| Signal cables (currents according to order) |                      |              |            |             |                                  |   |  |  |  |  |
| 11  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV1                              |   |  |  |  |  |
| 12  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV4                              |   |  |  |  |  |
| 13  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV5                              | S-type only   |  |  |  |  |
| 14  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV10                             |   |  |  |  |  |
| 14<br>A                                     | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV10A                            | Lube oil only                                       |  |  |  |  |
| 15  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV15                             |   |  |  |  |  |
| 16  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | SV16                             |   |  |  |  |  |
| 17  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | PT1                              | 1)  |  |  |  |  |
| 18  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | PT4                              |   |  |  |  |  |
| 19  | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | MT                               | S-type only   |  |  |  |  |
| 20  | RFE-HF               | 4x2x0,7<br>5 | EPC 60     |             | ST, (YT, SS)                     | Not for P605,<br>P615, S805,<br>S815                |  |  |  |  |
| 21  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | PT5                              | S-type only   |  |  |  |  |
| 22  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | Common alarm                     | 2)  |  |  |  |  |
| 23  | RFE-HF               | 4x2x0,7<br>5 | EPC 60     |             | TT1/TT2                          | 3)  |  |  |  |  |
| Opti  | Options (as ordered) |              |            |             |                                  |   |  |  |  |  |
|   | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | SS                               | <sup>2)</sup> Only for P605,<br>P615, S805,<br>S815 |  |  |  |  |
| 30  | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | YS                               | S815  2) Only for P605, P615, S805, S815  2) 4)     |  |  |  |  |
| 38  | MPRXCX               | 4x1,5        | EPC 60     |             | Syst. Emergency                  |   |  |  |  |  |
|   | MPRXCX               | 4x1,5        | EPC 60     |             | Sep. Emergency stop              | 2) 4)   |  |  |  |  |
|   | onal Electric H      | leater (as   | ordered)   |             |                                  |   |  |  |  |  |
| 40  | RFE-HF               | 4x2x0,7<br>5 | Starter    |             | Power unit                       |   |  |  |  |  |
| 45  | RFE-HF               | 1x2x0,7<br>5 | Starter    |             | Power unit                       |   |  |  |  |  |
| Optional heat tracing (as ordered)          |                      |              |            |             |                                  |   |  |  |  |  |
| 41  | RFE-HF               | 1x4x0,7<br>5 | EPC 60     |             | Steam reg. valve                 |   |  |  |  |  |
| 44  | RFE-HF               | 1x2x0,7<br>5 | EPC 60     |             | Shut-off valve                   |   |  |  |  |  |
| 50  | RJ45 Cat 5e          |              | EPC 60 CPU |             | Client remote data communication | 2), 5)  |  |  |  |  |

- 1) Cable not included in Alfa Laval delivery
- 2) Cable only included in the Alfa Laval delivery when PT1 is delivered mounted on Module.
- 3 )Cable only included in the Alfa Laval delivery when Electric Heater is delivered mounted on Module.
- 4) This cable cannot be longer than 25 m to avoid voltage drop.
- 5) Crossconnection cable only included in Alfa Laval delivery when multiple modules is delivered.

Other equivalent and approved cables may be used.

Cable areas are calculated with correction factor 0.7.

Cables used are Shipboard Cables, designed according to IEC 60092-3.

Flame retardant according to IEC 60332-1-2 and IEC 60332-3-22.

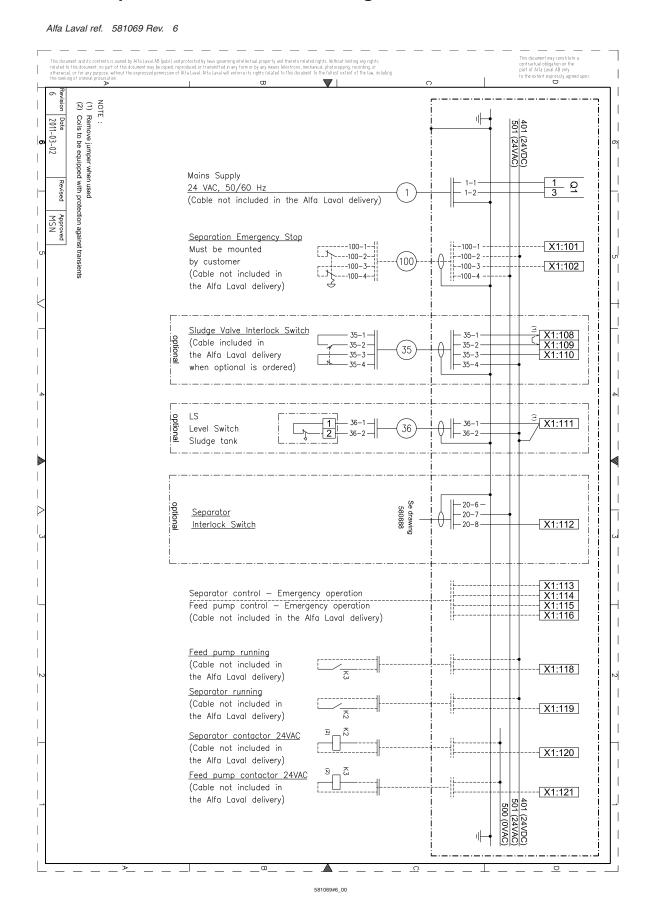
Halogen-free according to IEC 60754 series.

Smoke emission according to IEC 61034 series.

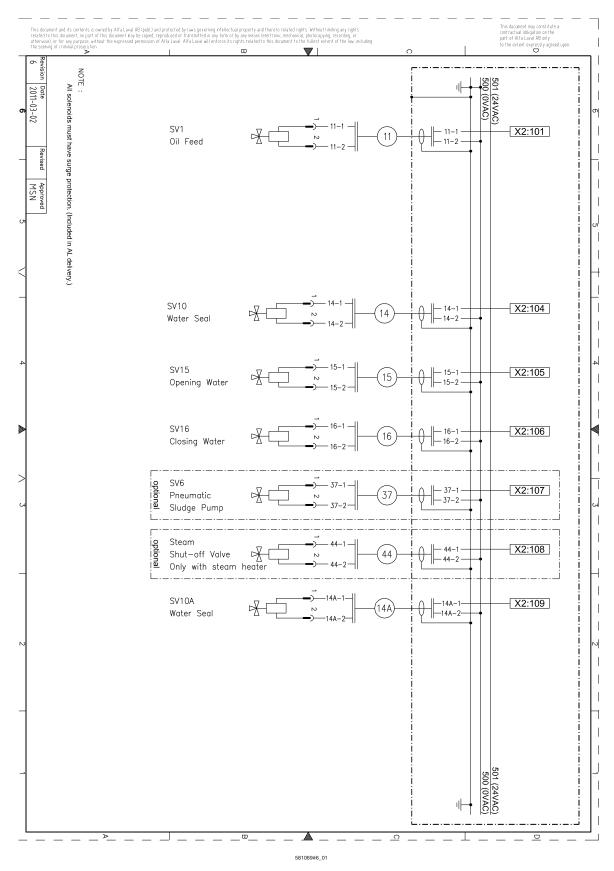
All power cables should be Signal Shielded Cables with the shield properly connected to earth as shown in the electrical drawings.

For armoured power cables, the armour must be connected to earth, as shown in the electrical drawings, and must give sufficient EMI protection. Copper wire armouring is normally used.

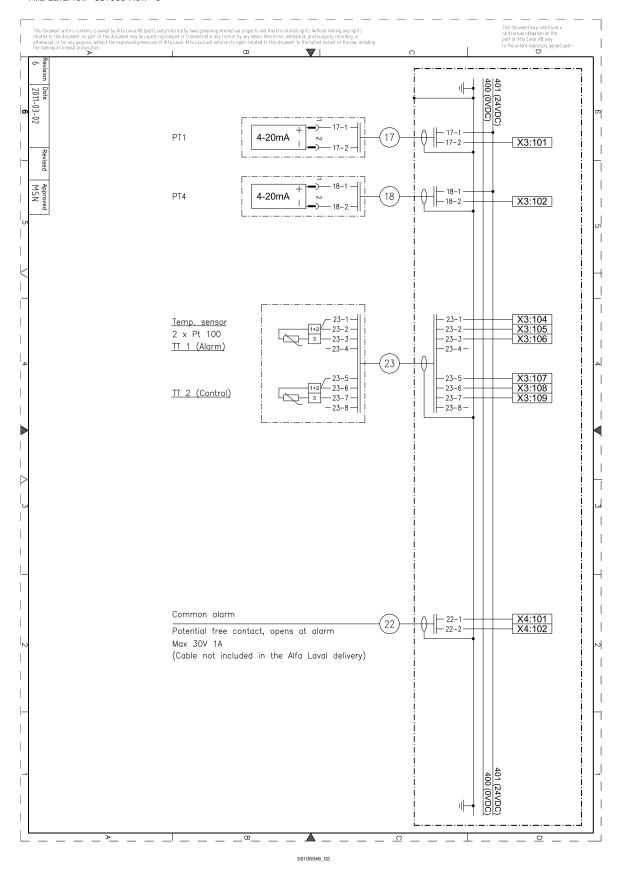
#### 6.2.2 Separator Interconnection Diagram



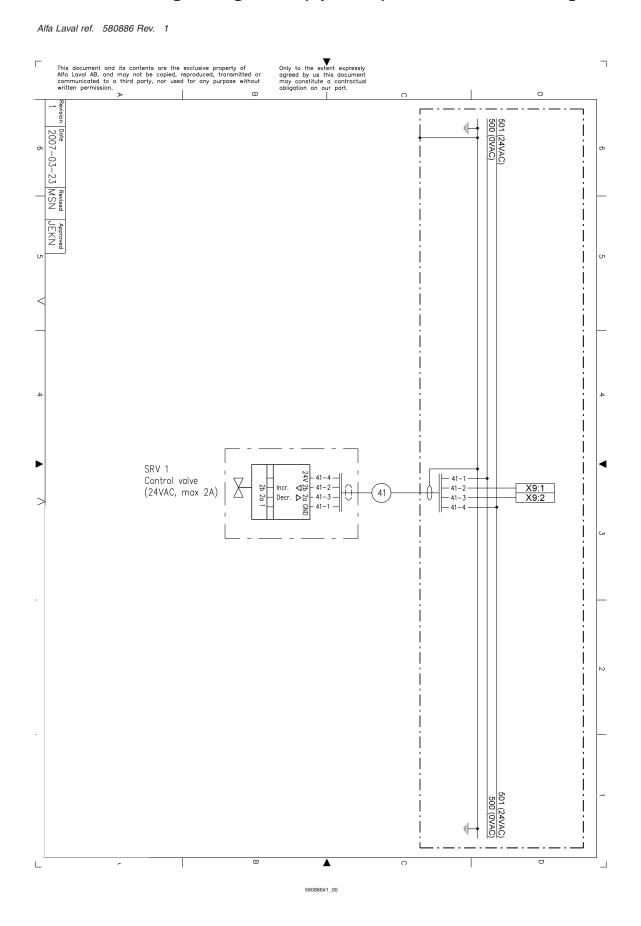




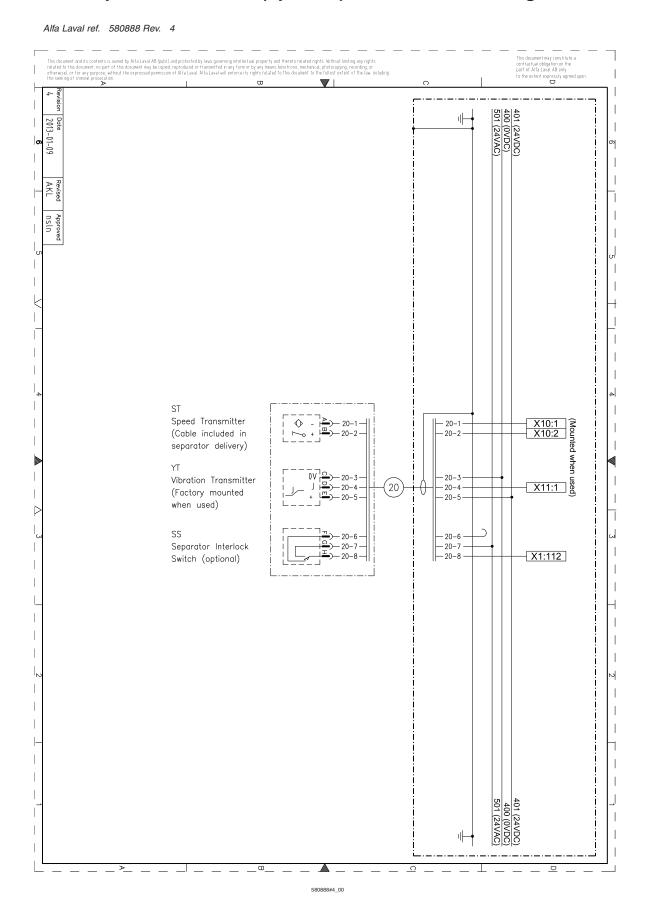
#### Alfa Laval ref. 581069 Rev. 6



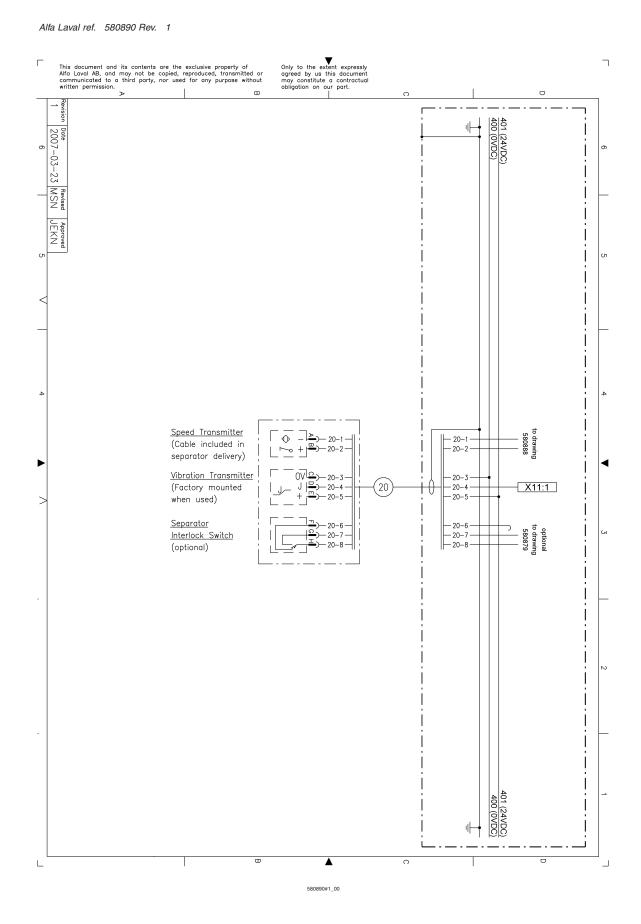
## 6.2.3 Steam Regulating Valve (optional) Interconnection Diagram



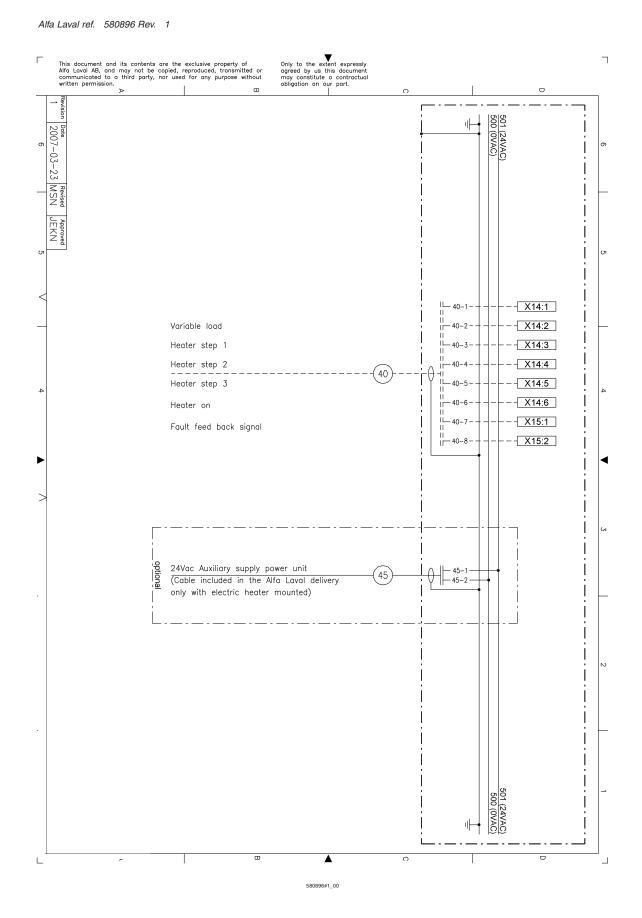
## 6.2.4 Speed Transmitter (optional) Interconnection Diagram



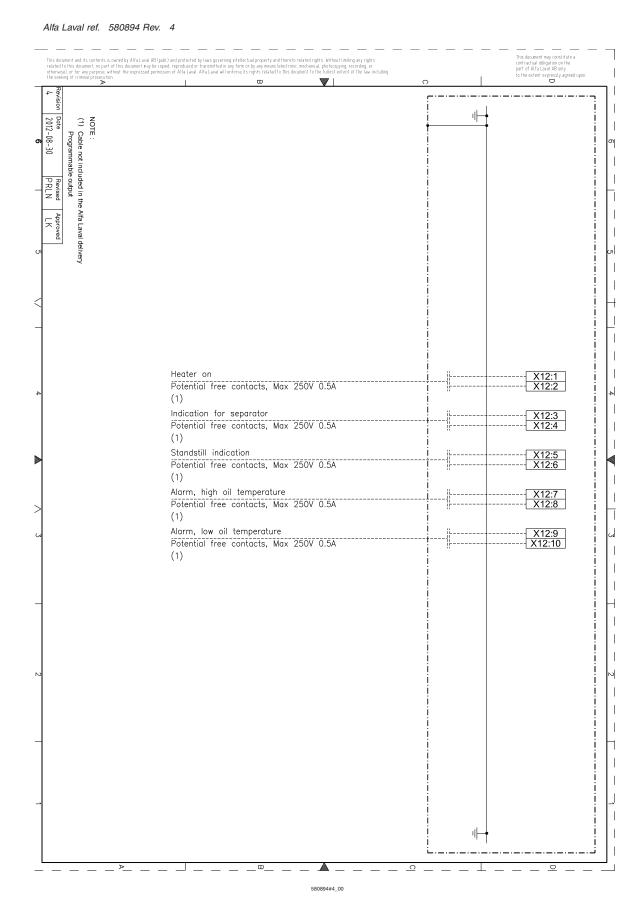
## 6.2.5 Vibration Transmitter (optional) Interconnection Diagram

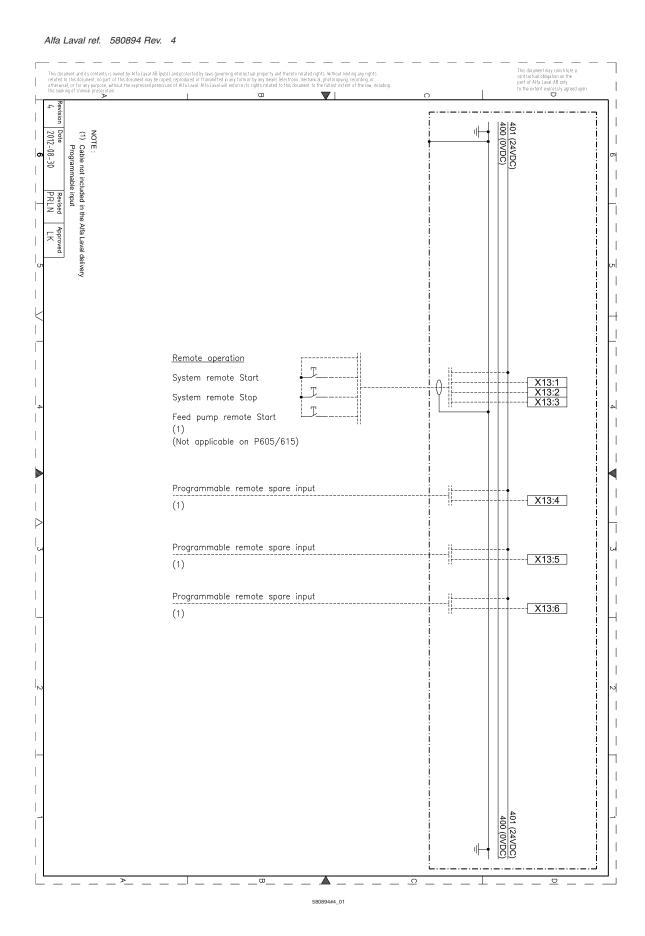


### 6.2.6 Electric Heater (optional) Interconnection Diagram



### 6.2.7 I/O (optional) Interconnection Diagram



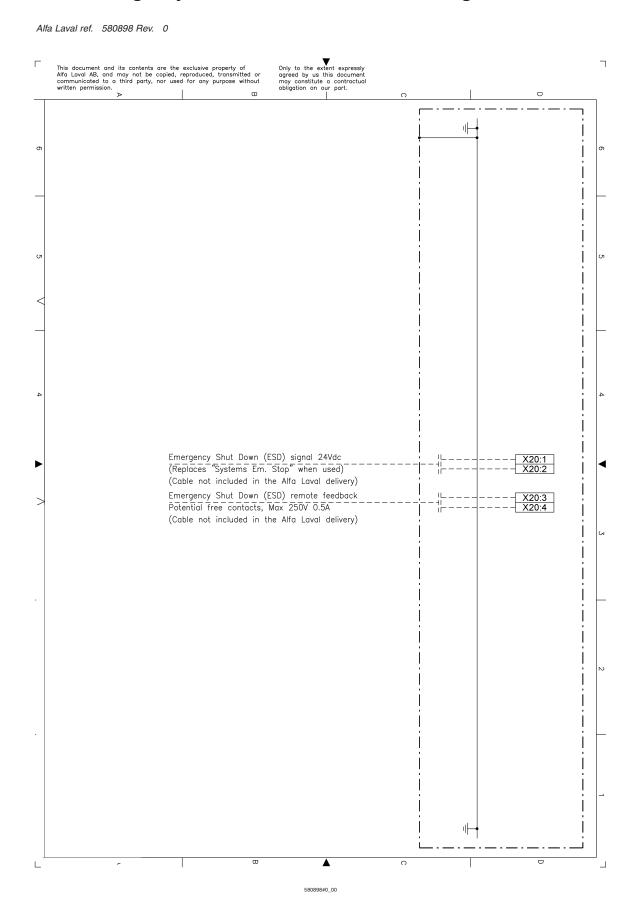


Alfa Laval ref. 580884 Rev. 0

### 6.2.8 Heat Tracing (optional) Interconnection Diagram

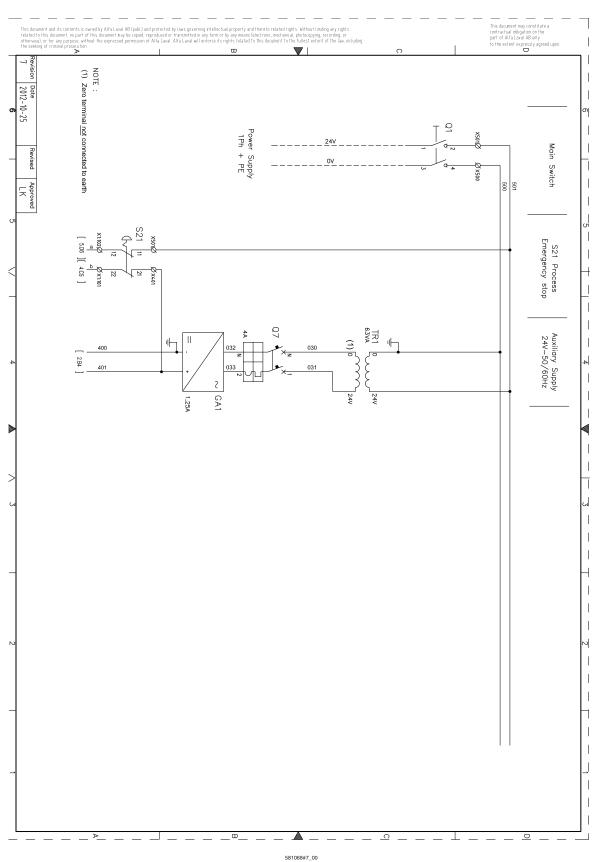
Only to the extent expressly agreed by us this document may constitute a contractual obligation on our part. This document and its contents are the exclusive property of Alfa Laval AB, and may not be copied, reproduced, transmitted or communicated to a third party, nor used for any purpose without written permission. Heating Cable (230V AC) (Optional) Heating of SRK (230V AC) <del>|</del> 73−2− (Optional) Space Heater 230V AC Separator motor (Optional) Space Heater 230V AC Feed Pump Motor (Optional) <u>Heat Tracing System</u> X5:9 Thermostat (S61) (Optional) 580884#0\_00

### 6.2.9 Emergency Shutdown Interconnection Diagram

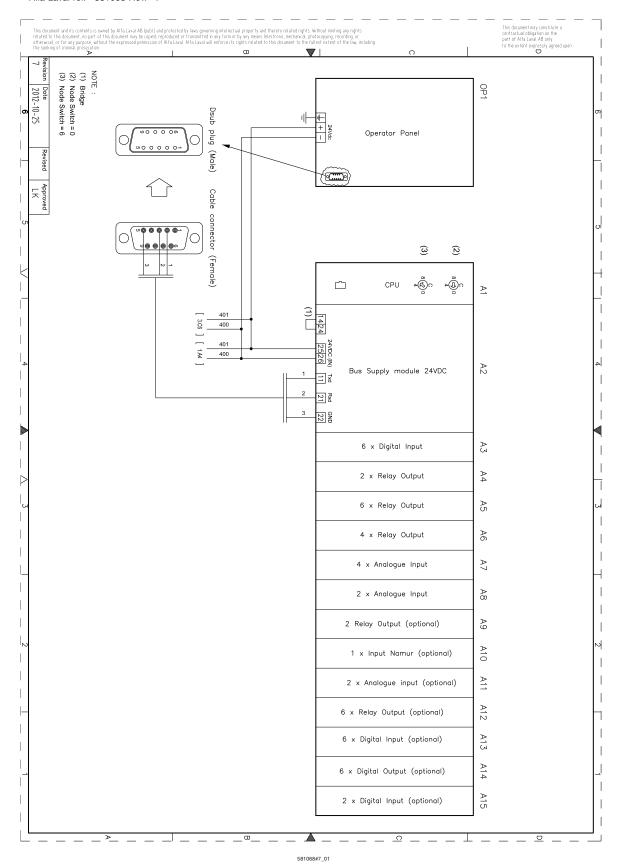


## 6.2.10 Circuit Diagram



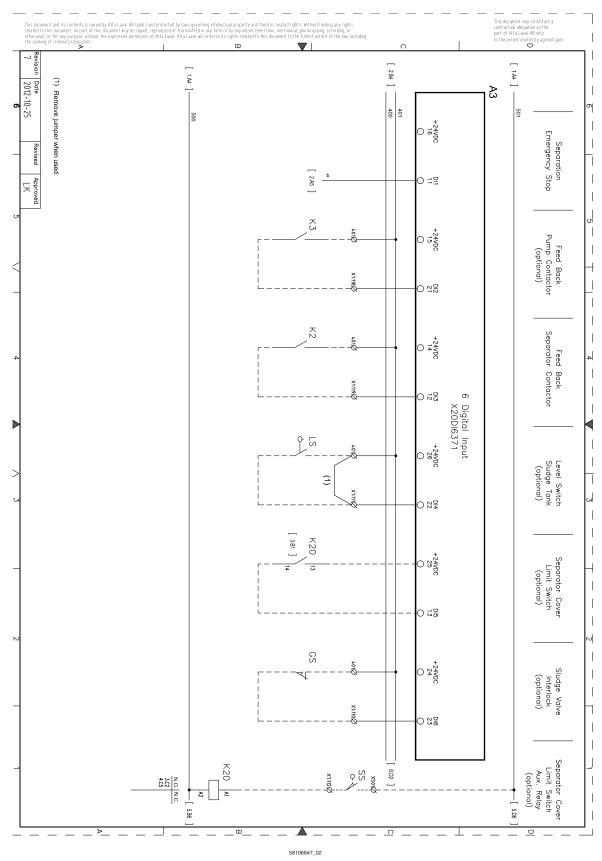




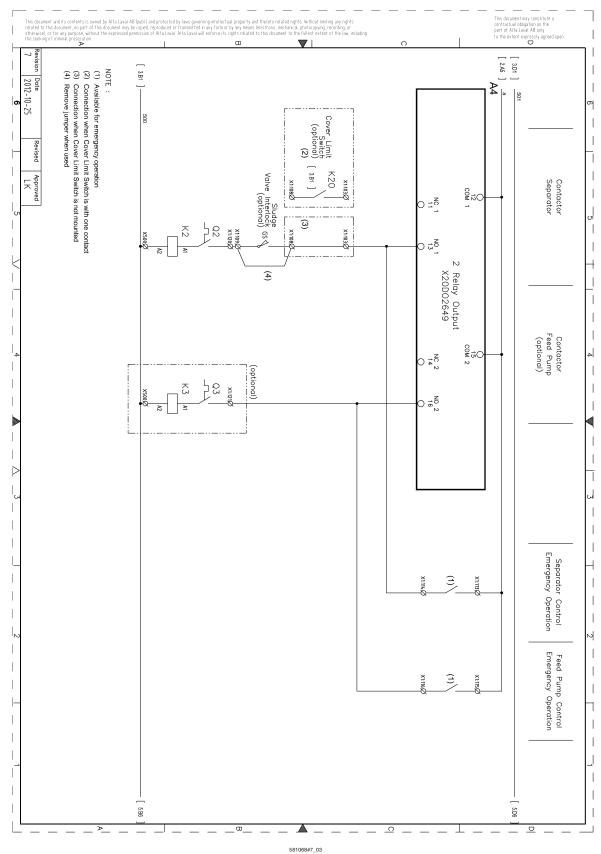


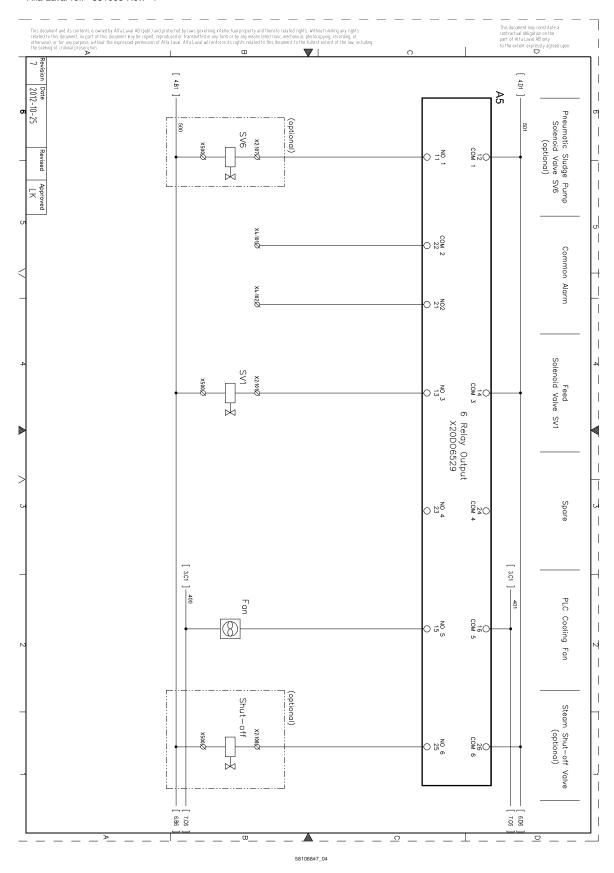
164

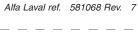


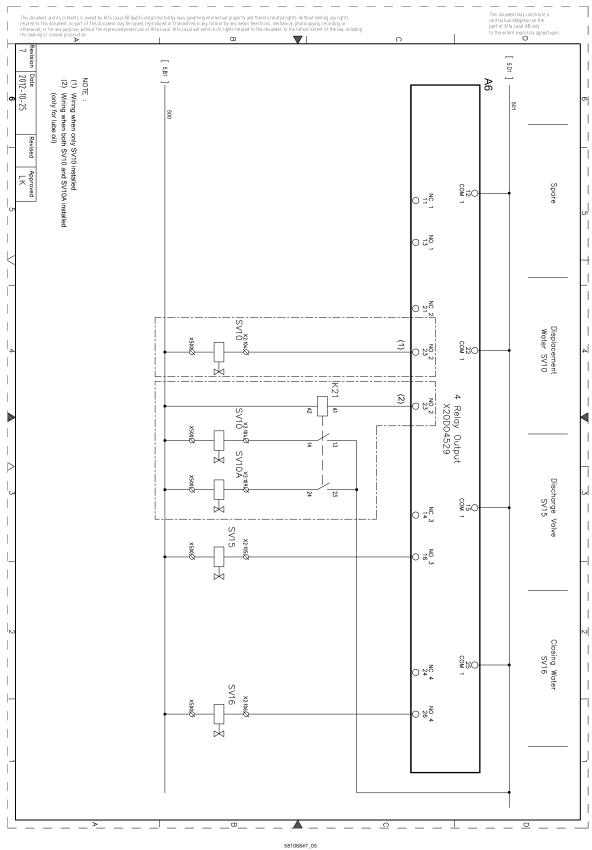


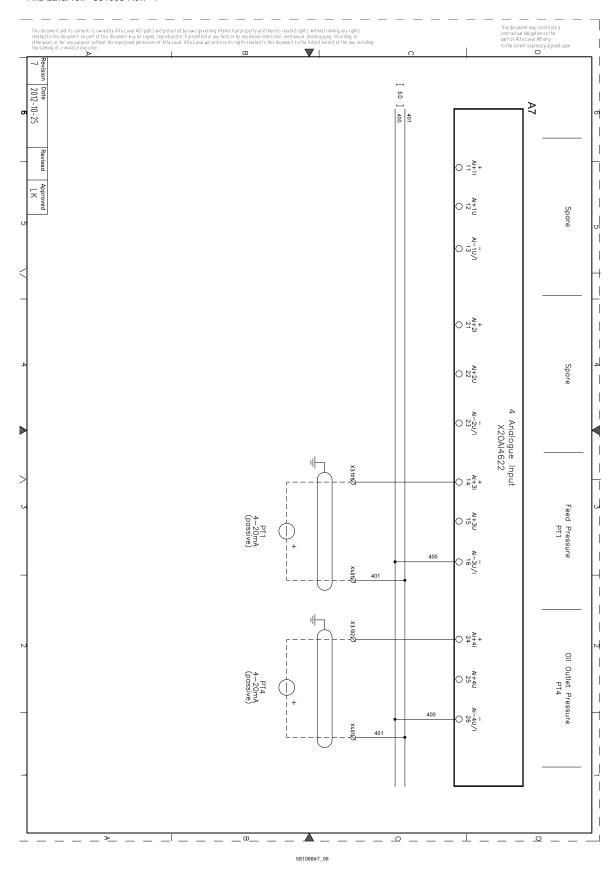




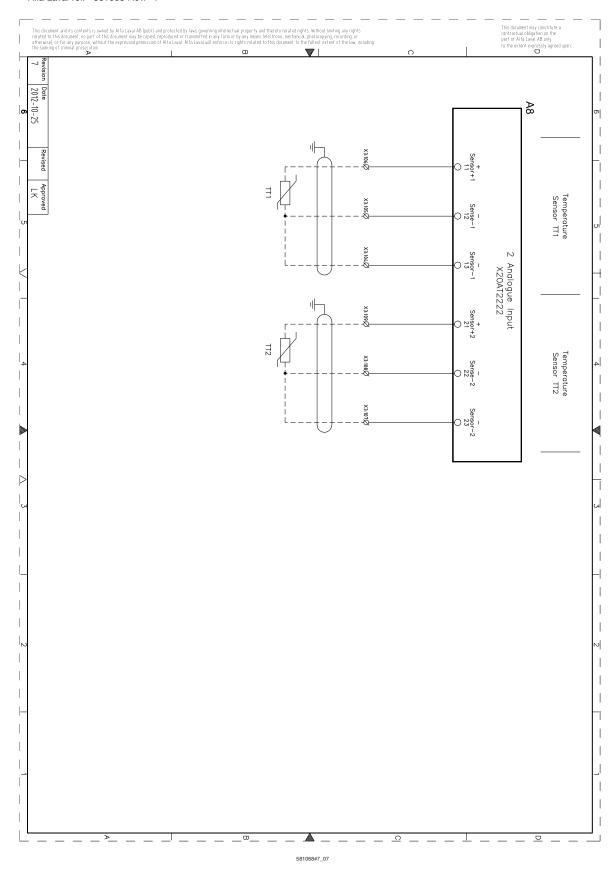




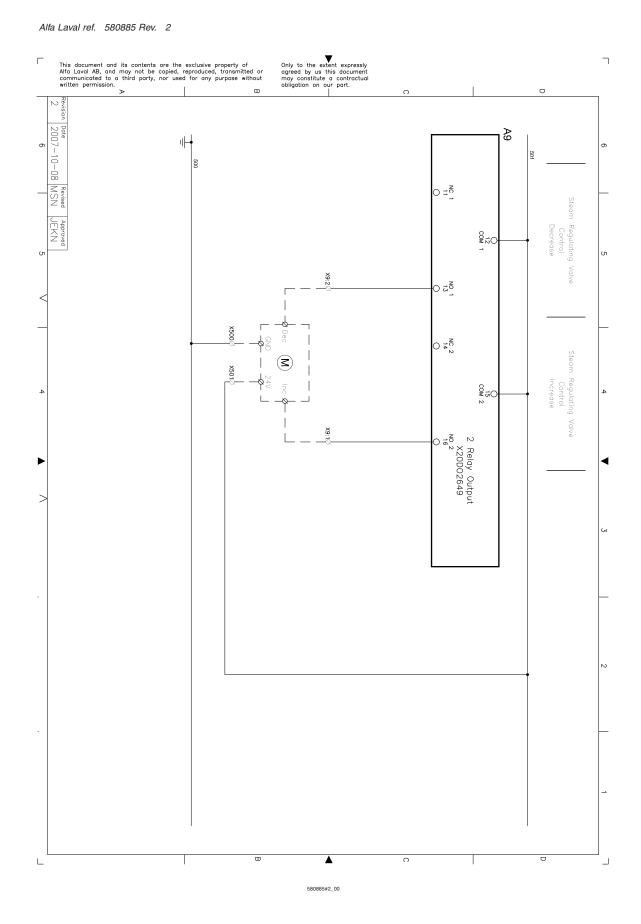




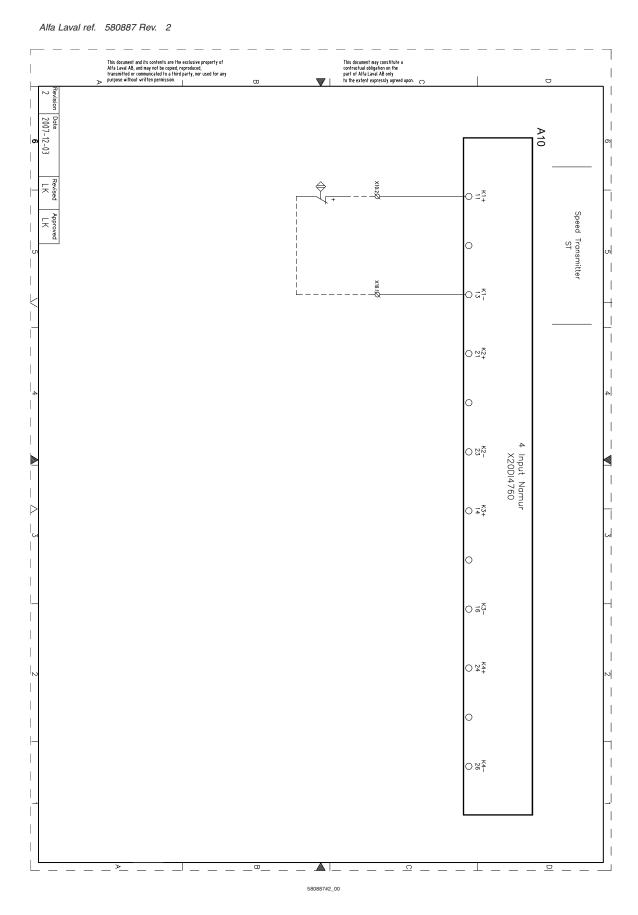
#### Alfa Laval ref. 581068 Rev. 7



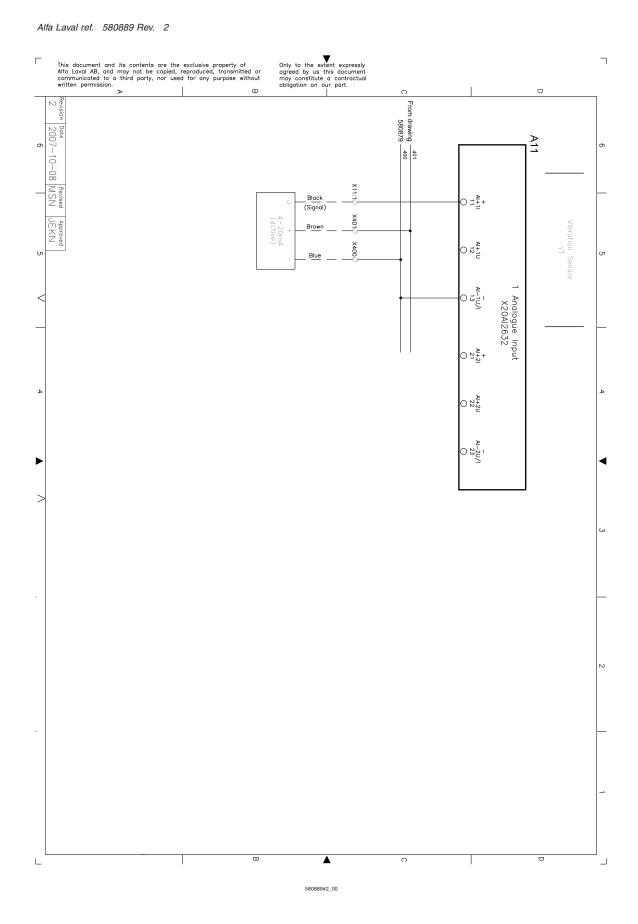
### 6.2.11 Steam Regulating Valve (optional) Circuit Diagram



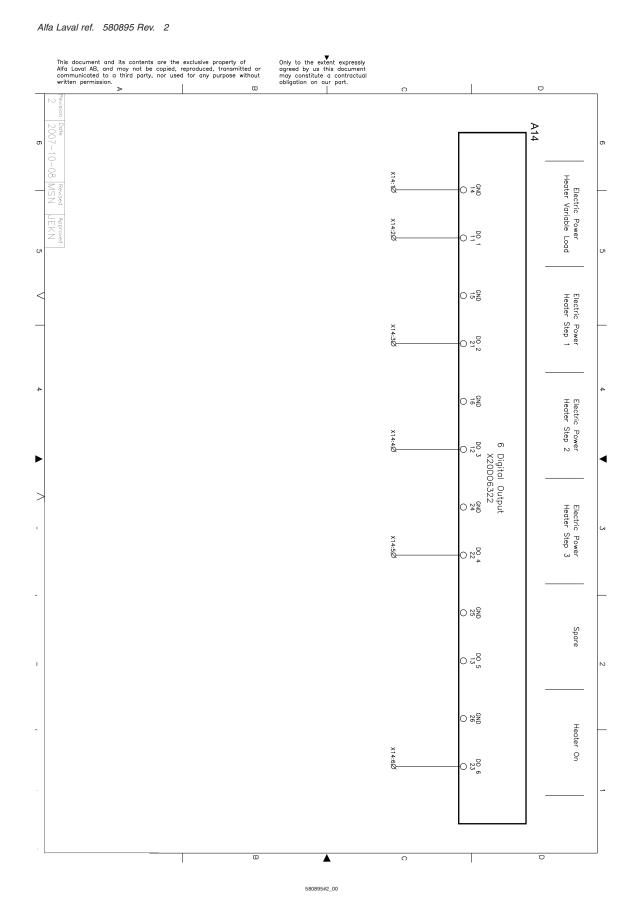
### 6.2.12 Speed Transmitter (optional) Circuit Diagram



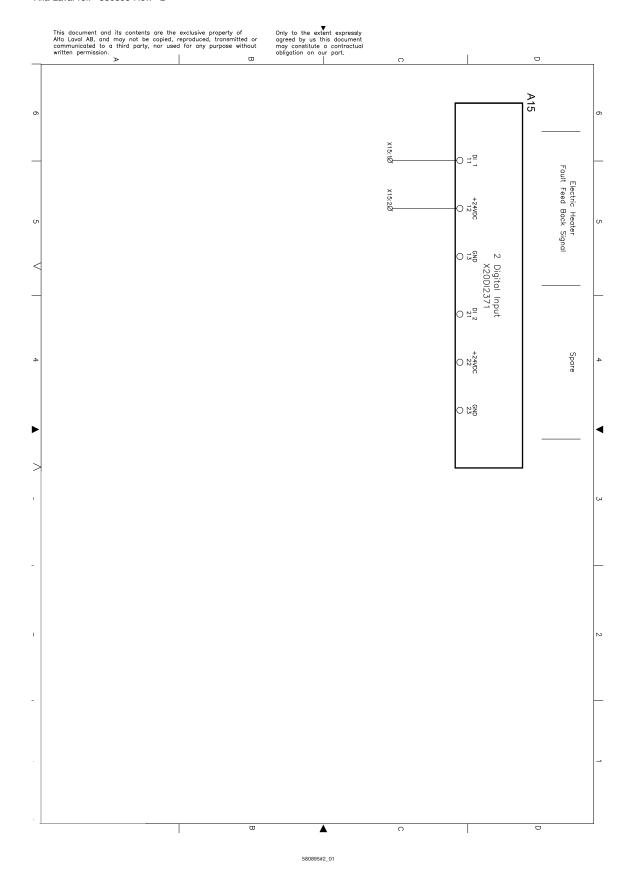
### 6.2.13 Vibration Transmitter (optional) Circuit Diagram



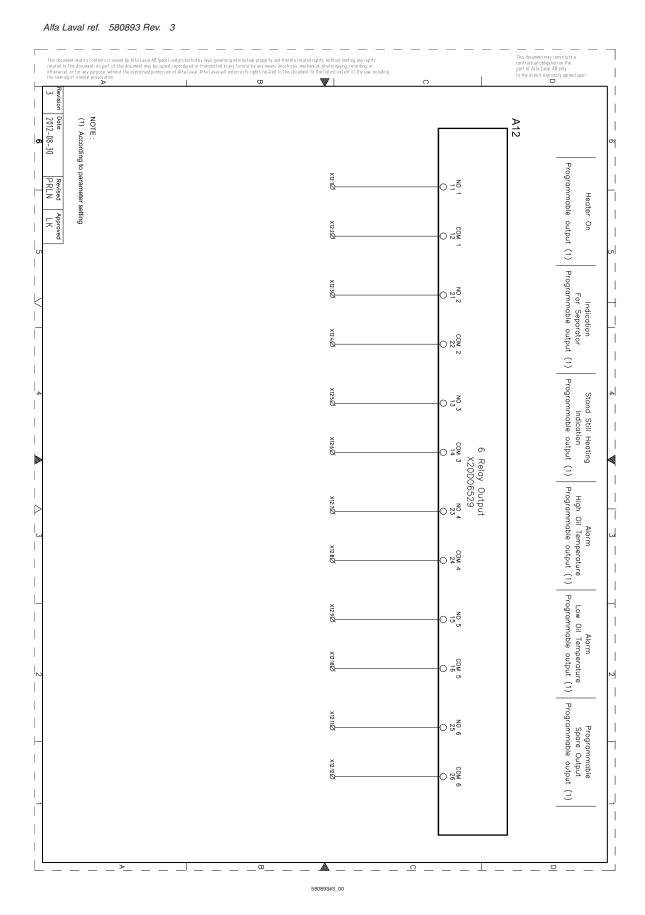
### 6.2.14 Electric Heater (optional) Circuit Diagram

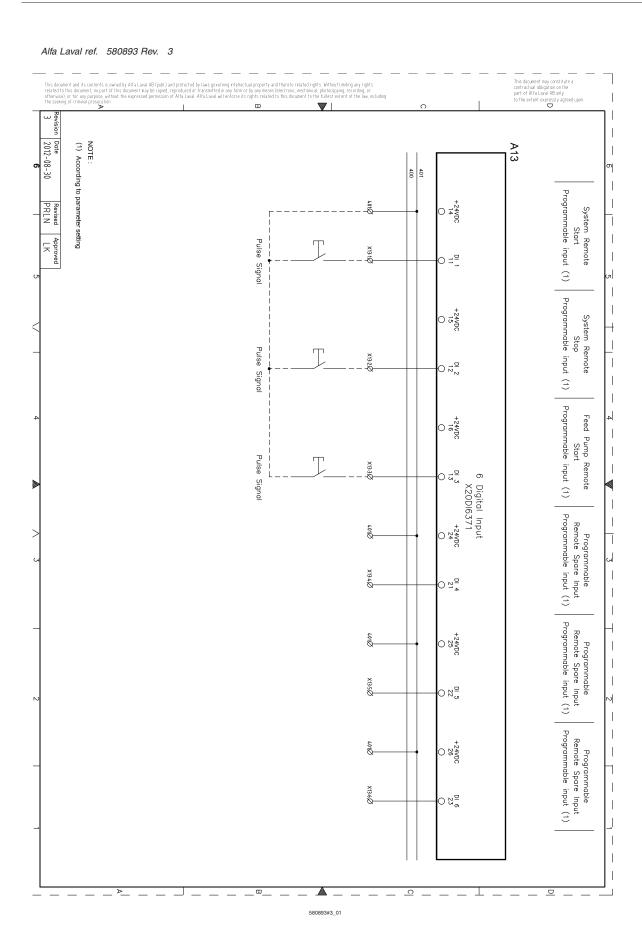




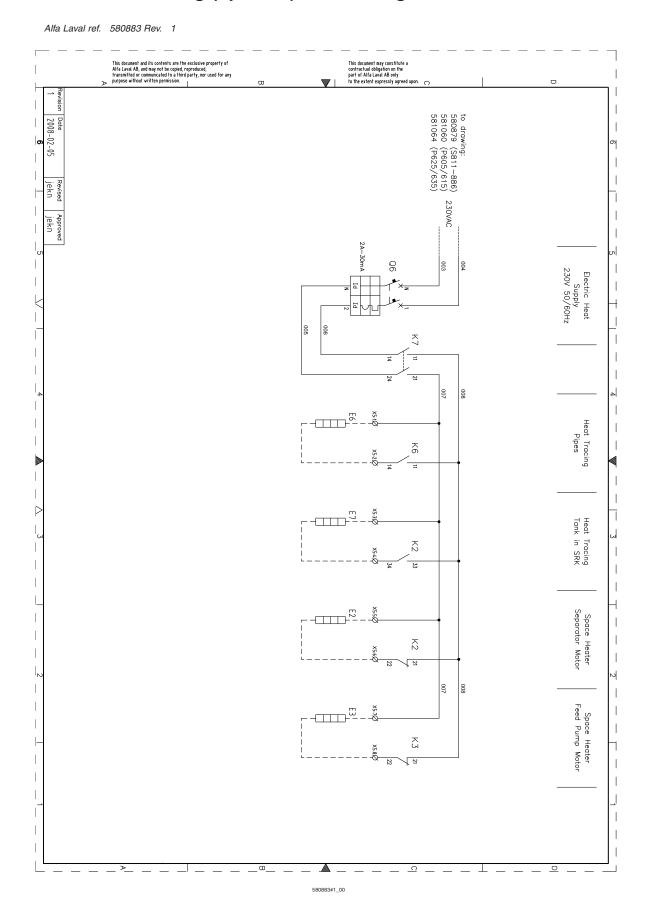


### 6.2.15 I/O (optional) Circuit Diagram

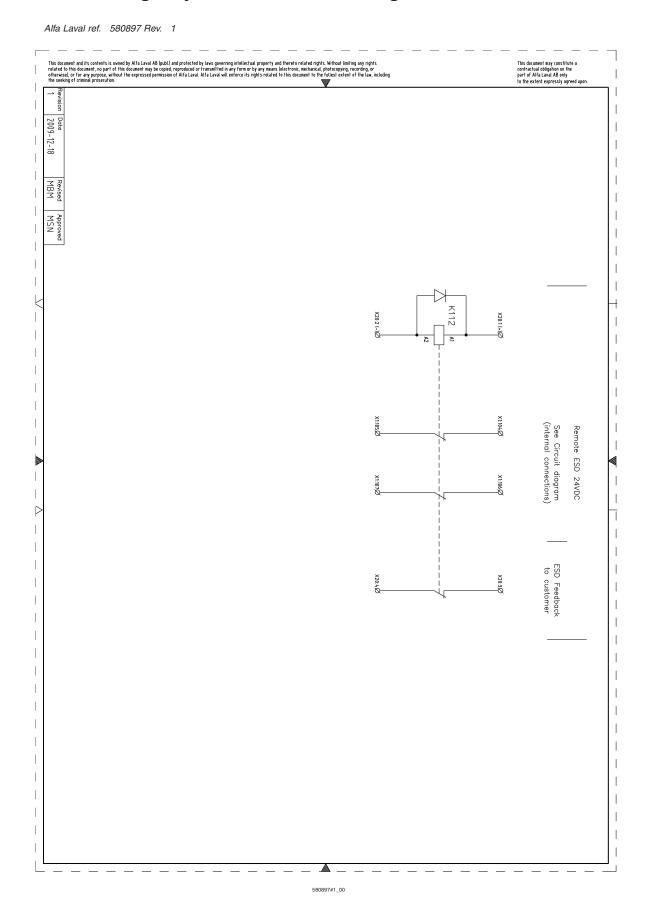




### 6.2.16 Heat Tracing (optional) Circuit Diagram



### 6.2.17 Emergency Shutdown Circuit Diagram



## 7 Specifications

- Only qualified personnel are allowed to work with lifting of the module.
- Use only the lifting lugs as shown in the illustrations.
- Slings or wires used for lifting the Module must be adjusted so that the beam is located above the centre of gravity.
- Slings or wires used for lifting the Double Module must be of the same length to avoid instability.
- Slings/wires must be dimensioned locally depending on equipment used.
- For information on how to lift the separator, see the Separator Manual booklet.



#### Crush hazard

When lifting the Module, use only the lifting eyes specifically for this purpose. Always use a lifting beam.

7.1 Cables 7 Specifications

### 7.1 Cables

#### **Cable Identification**

All cables are marked to simplify identification and fault finding.

### **Specifications**

The following specifications apply to cables connected to and from Alfa Laval equipment. Follow the instructions given in the cable list. Examples of cable types that can be used:

• Steel armoured cable.

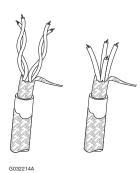


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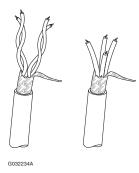
Copper armoured cable with a separate earth core.



 Steel armoured and shielded signal cable; pair twisted or parallel.



• Shielded signal cable; pair twisted or parallel.



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7 Specifications 7.2 Cable Routing

### 7.2 Cable Routing

#### Recommendations

Power cables carry the power supply to motors, heaters, etc.

Any distance between signal and power cables reduces electrical noise transfer.

Examples of recommended routing of various cable types.

- Power cables and signal cables routed on a cable rack should be separated.
- Sattbus cables should be routed away from power cables.







G032273A

Left: Power Cables / Right: Signal cable

If the space is limited, cables can be routed in tubes.

### 7.3 Oil, Water, Steam, and Condensate Piping

For piping to and from Alfa Laval equipment, see the specifications below.

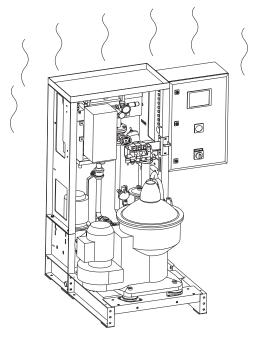
#### **Specifications**

- The correct pipe size must be used in the oil system.
- The number of bends in the oil pipes must be minimized.
- The suction height must be as low as possible.
- The oil feed pump must be of positive displacement type.
- The pump must be positioned close to the oil tank.
- The heater must be installed close to the separation module to maintain correct feed oil temperature.
- The recirculation line should be connected either directly to the settling tank (HFO) or to the oil outlet line from the separator (LO).
- The oil outlet line from the separator must be connected to the system tank for lube oil, or the service tank for fuel oil.

### 7.4 Ambient Temperature Limitation

#### **Specification**

Leading classification societies state in their regulations for engine room equipment that the maximum ambient temperature permissible is +55 °C. To meet this regulation, it is essential that electrical and electronic components have good ventilation, and temperature control.



X024675A

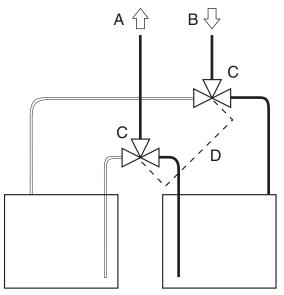
# 7.5 Heat Tracing and Insulation of Fuel Oil, Sludge, and Steam Pipes

Alfa Laval can, on request, supply modules which are heat traced and insulated, as optional equipment.

### 7.6 More than one Oil Tank

#### Recommendation

When one separator serves more than one oil tank, both the suction and the outlet lines should be fitted with change-over valves. To avoid oil transfer from one tank to another, these valves must be interlinked.



P000062B

- A. Unprocessed oil
- B. Clean oil
- C. Change over valve
- D. Interlink

### 7.7 Sludge Removal Kit (Optional Equipment)

If you have a Sludge Removal Kit, this must be connected to a ventilation pipe.



The sludge removal pump must be set to the correct speed – circa 60 strokes/min, otherwise the lifetime of the diaphragm, valve balls, and air motor will be severely shortened.



#### **Health Risk**

Oil mist and vaporized oil constituents from hot oily sludge may be dangerous to health and must not be inhaled.

A pipe or hose must be drawn from the flange to the nearest oil tank ventilation pipe.

The pipe/hose must have the same diameter as the flange opening.

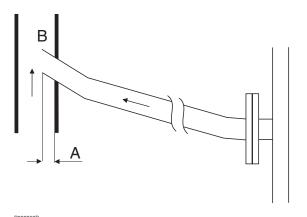
The pipe/hose must be as straight as possible, with a steady upward incline.

The connection to the oil tank ventilation pipe must point upwards as shown.



For HFO separation, it is not recommended to make the connection to the separator room ventilation system.

For LO separation, connection to the separator room ventilation system should be made **only** if the separator room ventilation is adequate. Use the optional connection hose (part no. 568023-80, -81, or -82) for this purpose. This hose is designed to entrap oil drops in the vent hose, and lead the oil back to the Sludge Removal Kit tank.



A. ~5 mm

B. Oil tank ventilation pipe



Impurities gather in the Sludge Removal Kit tank. Regularly check the tank and level switch. See instructions below.

#### Proceed as follows:

- From the Control Panel, run the sludge pump manually for a few seconds.
- Undo the four screws connecting the sludge pump to the sludge tank and remove the sludge pump.
- If necessary, clean the level switch and the inside of the tank using diesel oil.
- Check the seals and gaskets, and change if necessary.
- Loosen the hose clip and check the inside of the ventilation hose. Clean if necessary.

To avoid breakdown of the Sludge Removal system, the sludge pump must be regularly overhauled as follows using spare parts kit specified in the spare parts catalogue.

- Replace the diaphragms and the O-rings with those delivered in the spare parts kit.
- Perform a 4000 hour Inspection Service.

For Service and Overhaul intervals, see 1.3 System Data on page 9.

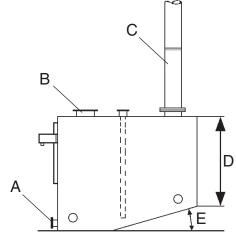
7.8 Sludge Tank 7 Specifications

### 7.8 Sludge Tank

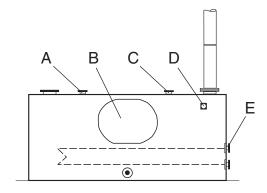
It is not necessary to have a sludge tank together with a Separation Module with sludge removal kit (for lube oil). If a sludge tank is required, follow the recommendations below:

#### Recommendations

- Sludge tank volume per Separation Module should cover approximately up to 2 days storage at a discharge interval of 2 hours (for discharge volumes see technical data).
- A manhole should be installed for inspection and cleaning.
- The tank should be fitted with a sounding pipe.
- The tank floor, or most of it, should have a slope (B) of minimum 15°.
- The sludge outlet pump connection should be positioned in the lowest part of the tank.
- A high level alarm switch, connected to the sludge pump, should be installed.
- A heating coil should be used to keep the sludge warm and fluid while being pumped out.
- Tank ventilation must follow the classification rules for evacuation of gases.
- There should be a ventilation pipe to fresh air.
- The ventilation pipe should be straight. If this is not possible, any bends must be gradual.
- The ventilation pipe must not extend below the tank top.
- A sludge tank with partition walls must have ventilation pipes in all compartments, or cutouts in the upper edge, to allow vapours to travel through the tank.



- G004273B
- A. Sludge outlet pump connection
- B. Sludge pipe connection
- C. Ventilation pipe
- D. Min. height 400 mm
- E. Min. slope 15°



- G004270B
- A. Bowl casing drain connection
- B. Manhole
- C. Water drain connection
- D. High level alarm switch
- E. Heating coil

In retrofit applications, where an Alfa Laval Separation Module will share a common separator sludge tank with existing separators, it is recommended to install a Sludge Removal Kit. 7 Specifications 7.8 Sludge Tank

The number of ventilation pipes, and their minimum dimension, depend on the size and number of separators connected to the same tank. See table below.

| Туре                    | 1 module    | 2/3 modules | 4 modules    |
|-------------------------|-------------|-------------|--------------|
| S805-S927,<br>P605-P626 | 1 x Ø 60 mm | 1 x Ø 75 mm | 1 x Ø 100 mm |

The Module generates almost no air during operation. At any discharge, the maximum volume of air produced is the same as the bowl volume (see technical data).

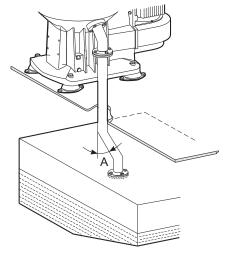
7.9 Sludge Piping 7 Specifications

### 7.9 Sludge Piping

#### **Specification**

 The sludge pipe from the separator to the sludge tank should be vertical.

If a vertical pipe is not possible, the deviation (A) from the vertical line must not exceed 30°.

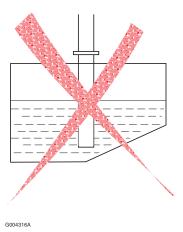


A 10 N N 0 0 2

 The sludge pipe must not extend below the tank top.



An extended sludge pipe will obstruct ventilation and create back pressure that could cause separator problems.



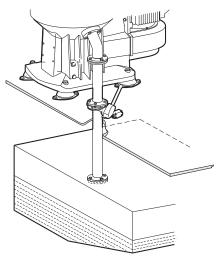
#### Recommendation

In cases where sludge tank ventilation is not adequate, and more than one separator is connected to the same sludge tank, we recommend that a butterfly valve is installed in each sludge pipe.



If a butterfly valve is not used, the bowl and the operating system may be affected by corrosive fumes and sludge from the sludge tank.

 If a butterfly valve is used, it should be equipped with an interlocking switch (connected to the separator starter) to prevent the separator from being started when the valve is not fully open.



G004411A

## 8 Commissioning and Initial Start

### 8.1 Completion Check List

It is essential *before* starting up the separation system that all modules are in good operating condition and that all pipelines and control equipment are properly connected to assure correct operation.

Use this check list as a guide for completing the system installation:



#### Breakdown hazard

Check that the power frequency is in agreement with the machine plate. If incorrect, resulting overspeed may cause breakdown.

- Check that transport seals are removed from all pipes.
- 2. Use flushing filters to prevent pipe work debris from being pumped into the separation module.



The flushing filters must be removed after initial flushing.

- Check that all separators are in proper working condition. Follow the manufacturer's instructions.
- Make sure that separators are lubricated in accordance with instructions.



Make sure that the spindle bearings are prelubricated



g08687t1

Drop some frame oil onto the bearings

5. Separators are delivered without oil in the oil sump. For information on oil filling and oil type, see the *Separator Manual booklet*.



Too much, or too little oil may result in damage to separator bearings.

Neglecting an oil change may result in damage to separator bearings.

- 6. Power on.
- 7. Check that the separator rotation direction corresponds with the arrow on the frame by doing a quick start/stop (1–2 seconds.) and looking at the motor fan rotation.



If power cables have been installed incorrectly, the separator will rotate in reverse, and vital rotating parts can unscrew.

- 8. Check the pump function and direction.
- If a Sludge Removal Kit is used, check that the sludge pump speed is set to circa 60 strokes/min.If necessary, adjust the throttling valve (positioned after solenoid valve SV 6).

### 8.2 Initial Start-up



After every start the separator must always be run continuously for a minimum of 1 hour to ensure proper lubrication.

Use this check list for initial system start up:

- 1. Check that there is oil in the feed oil tank.
- 2. Check water and air supply. See 1.3 System Data.
- Check power supplies to the control unit and that the voltage is in accordance with data in 1.3 System Data.

- Check all parameter settings in the control unit.
   See Installation Parameters in the Parameter List booklet.
- 5. Check the separator.



Always lubricate the bearings before start-up.



The Separation module is supplied with standard configuration parameters. You may have to make some changes to suit your installation.

- 6. Start the separation system as described in the *Operating Instructions* booklet.
- Start up step by step, checking that the machine and module function properly.
- 8. Establish system pressures. The delivery height pressure is the pressure in the oil pipe work down stream from the separation module, due to the pipe bends and the height (head) to the cleaned oil tank. If the cleaned oil tank is below the separation module the delivery height pressure may be very low. The oil paring disc pressure will have to be greater than the delivery height pressure for any oil to flow. Proceed as follows:
  - Ensure the valves in the oil system are in the
  - The oil should be at separation temperature.

For S-type separators:

correct positions.

- The paring tube should be able to move freely.
- Ensure that V5 is closed.
- Fully open the back pressure regulating valve RV4.
- The shut off valve V4 should be open.
- Open SV15 for 3 seconds to prime the operating slide.
- Open SV16 for 15 seconds to close the bowl.
- Open SV10 for 1 minute to put water into the bowl.
- Feed oil to the separator at the normal flow rate by opening SV1.

- Note the pressure in the oil outlet PT4, both on the pressure gauge and in the EPC 60 display. This pressure is P min.
- Gradually close the back pressure regulating valve RV4. The pressure on PT4 will increase. The water pressure (PT5) decreases slightly as the paring tube moves inwards. The water pressure will suddenly drop when oil passes from the oil paring chamber to the water paring chamber. Note the pressure of PT4 both on the pressure gauge and in the EPC 60 display. This pressure is P max.
- Open RV4.
- Stop the oil feed to the separator and note the pressure in the oil outlet. This is the delivery height pressure P del.
- Stop the heater.
- Stop the separator.
- Stop the feed pump when the heater has cooled.

#### For P-type separators:

- Fully open the back pressure regulating valve RV4
- Open SV15 for 5 seconds to prime the operating slide.
- Open SV16 for 15 seconds to close the bowl.
- Open SV10 for 5 seconds to put water into the bowl.
- Feed oil to the separator at the normal flow rate by opening SV1.
- Note the pressure in the oil outlet PT4, both on the pressure gauge and in the EPC 60 display. This pressure is P min.
- Gradually close the back pressure regulating valve RV4. The pressure on PT4 will increase. The oil pressure will suddenly drop when oil passes over to the water outlet. Note the pressure of PT4 both on the pressure gauge and in the EPC 60 display. This pressure is P max.
- Open RV4.
- Stop the oil feed to the separator and note the pressure in the oil outlet. This is the delivery height pressure P del.
- Stop the heater.
- Stop the separator.
- Stop the feed pump when the heater has cooled.

### 8.2.1 Calculating Operating Pressure

Calculate the normal back pressure level during operation as follows:

$$\frac{P_{min} + P_{max}}{2} = P_{normal}$$

 Calculate the value for low pressure alarm setting (Pr 11) as follows:

$$\frac{P_{min} + P_{normal}}{2} = P_{low press.}$$

 Calculate the value for high pressure alarm setting (Pr 10) as follows:

$$\frac{P_{normal} + P_{max}}{2} = P_{high press.}$$

Adjust the back pressure to Pnormal

Set P154 to give alarm at pressure *decreasing* below the P<sub>low press.</sub> value.

Set P153 to give alarm at pressure *increasing* above the  $P_{high\ press.}$  value.

## 9 Shut-down and Storage

#### Storage before Installation

If the separation system is stored before installation, the following safeguards must be taken:

| Storage period                       | 1 < 6 months | ≥6 months | See            |
|--------------------------------------|--------------|-----------|----------------|
| Action before storage                |              |           |                |
| Protect from dust, dirt, water, etc. | X            | Х         | This chapter   |
| Protect with anti-rust oil           | Х            | X         | This chapter   |
| Action before installation           |              |           |                |
| Inspection service                   |              | X         | Service manual |
| Overhaul service                     |              | X         | Service manual |

### 9.1 Shut-down after Use

If the separation system is going to be shut down for a period of time, the following safeguards must be taken:

| Shut-down period                     | 1 < 6 months<br>(stand-by) | 6 – 18 months | > 18 months | See  |
|--------------------------------------|----------------------------|---------------|-------------|--|
| Action before storage                |                            |               |             |  |
| Remove bowl                          | X                          | Х             | X           | Dismantling and<br>Assembly in the<br>Service Manual |
| Protect from dust, dirt, water, etc. | X                          | X             | Х           | This chapter   |
| Protect with anti-rust oil           | Х                          | Х             | Х           | This chapter   |
| Inspection service                   |                            | X             | Х           | Service manual                                       |
| Overhaul service                     |                            |               | Х           | Service manual                                       |

### 9.2 Protection and Storage

All system equipment, both the separator and the ancillary equipment, must be stored indoors at  $5-55^{\circ}$ C, if not delivered in water-resistant box for outdoor storage.

If there is a risk for condensation of water, the equipment must be protected by ventilation and heating above dew point.

The following protection products are recommended:

- Anti-rust oil with long lasting effective treatment for external surfaces. The oil should prevent corrosion attacks and give a waxy surface.
- Anti-rust oil (Dinitrol 40 or equivalent) thin and lubricating for inside protection. It gives a lubricating transparent oil film.
- Solvent, e.g. white spirit, to remove the anti-rust oil after the shut-down.
- Moist remover to be packed together with separator equipment.
- If the storage time exceeds 12 months, the equipment must be inspected every 6 months and, if necessary, the protection be renewed.

#### **Modules**

- Clean unpainted steel parts with solvent and treat external surfaces with anti-rust oil (type 112).
- If necessary, clean other equipment on the module with solvent.
- Treat the equipment with anti-rust oil by following the description above accordingly.
- Bolts, nuts and other external steel components should be treated with anti-rust oil (type 112).

### **Rubber Parts**

 Gaskets, O-rings and other rubber parts should not be stored for more than two years. After this time, they should be replaced.

#### Separator

Dismantle the separator bowl and take out the O-rings. Clean the bowl with oil and reassemble without the O-rings. Place in a plastic bag with silica dessicant bags and seal the plastic bag.

Grease the spindle.

#### Valves, Pipes and Similar Equipment

- Components such as valves need to be cleaned with solvent and treated with anti-rust oil (type 112).
- Water pipes should be drained and treated with anti-rust oil (type 112).
- Articles made of rubber or plastics (e.g. seals) must not be treated with anti-rust oil.

#### **Electric Heater**

- Fill the heater with a non-corrosive lubricating oil.
- Place a number of bags of silica gel inside the connection box to absorb humidity. Steam Heater •Drain the condensed water from the steam valve and the steam trap.
- Drain all condensed water from the heater.
- Fill the oil part of the heater with a non-corrosive lubricating oil.

#### **Pump**

- Clean the pump housing outside from oil and grease with solvent.
- Protect the pump by filling it with non-corrosive lubricating oil.
- Apply anti-rust oil on the pump housing outside.
- Fill the pump screws with lubricating oil to prevent rust.

# 9.3 Reassembly and Start up

- Clean away the anti-rust oil with white spirit.
- Remove the silica gel bags from all modules.
- Pre-lubricate the separator spindle bearings
- If stored for 6 months or longer, perform an inspection service (including change of oil in the separator sump).
- Follow all relevant instructions in this booklet and in the Separator Manual.
- Before operating the heater:
  - Check by lifting the safety valve handle that it functions correctly.
  - Follow the start-up check list for the heater in the manufacturer's instructions.
  - For plate heat exchangers: check the bolt connections to ensure that all gaskets are tight.



Always lubricate the bearings before start-up.

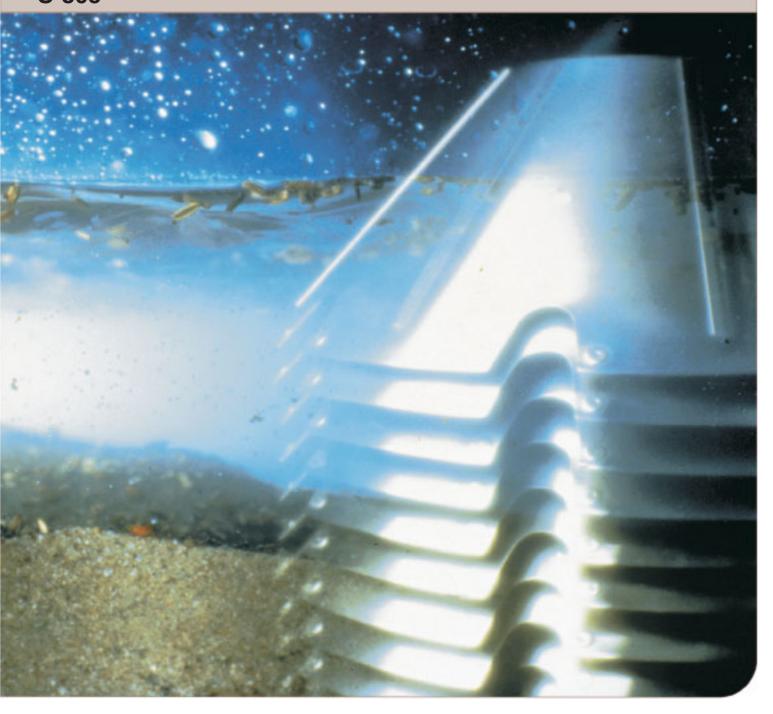


After every start the separator must always be run continuously for a minimum of 1 hour to ensure proper lubrication.



# Separator Manual High Speed Separator

S 805



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Telephone: +46 8 530 650 00 Telefax: +46 8 530 310 40

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Study instruction manuals and observe the warnings before installation, operation, service and maintenance.

Not following the instructions can result in serious accidents.

In order to make the information clear only foreseeable conditions have been considered. No warnings are given, therefore, for situations arising from the unintended usage of the machine and its tools.



# 1 Read this first

This manual is designed for operators, maintenance personnel and service engineers working with the Alfa Laval separator

If the separator has been delivered and installed by Alfa Laval as a part of a processing system, this manual should be viewed as part of the System Documentation. Study carefully all instructions in any System Documentation.

In addition to this Separator Manual a Spare Parts Catalogue, SPC is supplied.

The Separator Manual consists of:

#### Safety instructions

Pay special attention to the safety instructions for the separator. Accidents causing damage to equipment and/or serious injury to persons or personnel can result if the safety instructions are not followed.

#### Basic principles of separation

This chapter describes the purpose of separation and separation principles.

#### **Design and function**

This chapter contains a description of the separator.

#### **Operating instructions**

This chapter contains operating instructions for the separator only.

#### Service, dismantling, assembly

This chapter gives instructions for the maintenance procedures. It also contains step-by-step instructions for dismantling and assembly of the separator for service and repair.

#### **Fault finding**

Refer to this chapter if the separator functions abnormally.

If the separator has been installed as a part of a processing system, always refer to the trouble-tracing instructions, in the System Documentation.

#### **Technical reference**

This chapter contains technical data concerning the separator and drawings.

#### Installation

This chapter contains specifications and recommendations concerning separator installation.



A complete reading of this manual by personnel in contact with the machine is essential to safety. Do not allow personnel to clean, assemble, operate or maintain the separator until they have read and fully understood this manual.

Ensure that all personnel who operate and service the separator are well-trained and knowledgeable concerning the machine and the work to be carried out.

# 2 Safety instructions



The centrifuge includes parts that rotate at high speed. This means that:

- Kinetic energy is high
- · Great forces are generated
- Stopping time is long

Manufacturing tolerances are extremely fine. Rotating parts are carefully balanced to reduce undesired vibrations that can cause a breakdown. Material properties have been considered carefully during design to withstand stress and fatigue.

The separator is designed and supplied for a specific separation duty (type of liquid, rotational speed, temperature, density etc.) and must not be used for any other purpose.

Incorrect operation and maintenance can result in unbalance due to build-up of sediment, reduction of material strength, etc., that subsequently could lead to serious damage and/or injury.

The following basic safety instructions therefore apply:

- Use the separator only for the purpose and parameter range specified by Alfa Laval.
   Applies not only to the process but also to cleaning and service liquids.
- Strictly follow the instructions for installation, operation and maintenance.
- Ensure that personnel are competent and have sufficient knowledge of maintenance and operation, especially concerning emergency stopping procedures.
- Use only Alfa Laval genuine spare parts and the special tools supplied.







#### **Disintegration hazards**

 When power cables are connected, always check direction of motor rotation. If incorrect, vital rotating parts could unscrew.



 If excessive vibration occurs, stop separator and keep bowl filled with liquid during rundown.



 Use the separator only for the purpose and parameter range specified by Alfa Laval.



 Check that the gear/pulley ratio is correct for power frequency used. If incorrect, subsequent overspeed may result in a serious break down.



 Welding or heating of parts that rotate can seriously affect material strength.



 Inspect regularly for corrosion and erosion damage. Inspect frequently if process or cleaning liquid is corrosive or erosive.



#### **Entrapment hazards**

 Make sure that rotating parts have come to a complete standstill before accessing parts inside the machine or starting any dismantling work. If there is no braking function the run down time can exceed two hours.



To avoid accidental start, switch off and lock power supply before starting **any** dismantling work.



Assemble the machine **completely** before start. **All** covers, connections and guards must be in place.



#### **Electrical hazard**

- Follow local regulations for electrical installation and earthing (grounding).
- To avoid accidental start, switch off and lock power supply before starting any dismantling work



#### Crush hazards

Use correct lifting tools and follow lifting instructions.



Do not work under a hanging load.



#### Noise hazards

Use ear protection in noisy environments.



#### **Burn hazards**

 Lubrication oil, machine parts and various machine surfaces can be hot and cause burns. Wear protective gloves.



#### Skin irritation hazards

 When using chemical cleaning agents, make sure you follow the general rules and suppliers recommendation regarding ventilation, personnel protection etc.



Use of lubricants in various situations.

#### **Cut hazards**

 Sharp edges, especially on bowl discs and threads, can cause cuts. Wear protective gloves.





## Flying objects

 Risk for accidental release of snap rings and springs when dismantling and assembly. Wear safety goggles.



#### **Health hazards**

 Risk for unhealthy dust when handling friction blocks/pads. Use a dust mask to make sure not to inhale any dust





# 2.1 Warning signs in text

Pay attention to the safety instructions in this manual. Below are definitions of the three grades of warning signs used in the text where there is a risk for injury to personnel.



DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



NOTE indicates a potentially hazardous situation which, if not avoided, may result in property damage.



# 2.2 Environmental issues

#### Unpacking

Packing material consists of wood, plastics, cardboard boxes and in some cases metal straps.

Wood and cardboard boxes can be reused, recycled or used for energy recovery.

Plastics should be recycled or burnt at a licensed waste incineration plant.

Metal straps should be sent for material recycling.

#### Maintenance

During maintenance oil and wear parts in the machine are replaced.

Oil must be taken care of in agreement with local regulations.

Rubber and plastics should be burnt at a licensed waste incineration plant. If not available they should be disposed to a suitable licensed land fill site.

Bearings and other metal parts should be sent to a licensed handler for material recycling.

Seal rings and friction linings should be disposed to a licensed land fill site. Check your local regulations.

Worn out or defected electronic parts should be sent to a licensed handler for material recycling.



## 2.3 Requirements of personnel

Only **skilled** or **instructed** persons are allowed to operate the machine, e.g. operating and maintenance staff.

- Skilled person: A person with technical knowledge or sufficient experience to enable him or her to perceive risks and to avoid hazards which electricity/mechanics can create.
- Instructed person: A person adequately advised or supervised by a skilled person to enable him or her to perceive risks and to avoid hazards which electricity/mechanics can create.

In some cases special skilled personnel may need to be hired, like electricians and others. In some of these cases the personnel has to be certified according to local regulations with experience of similar types of work.

### 2.4 Remote start

If the separator is operated from a remote position where the separator cannot be seen or heard the power isolation device shall be equipped with an interlock device to prevent that a remote start command could result in liquid being fed to the separator when it is shut down for service.

The first start after the separator has been taken apart or been standing still for a long time shall always be manually supervised locally.



# 3 Basic principles of separation

## 3.1 Introduction

The purpose of separation can be:

- to free a liquid of solid particles,
- to separate two mutually insoluble liquids with different densities while removing any solids presents at the same time,
- to separate and concentrate solid particles from a liquid.

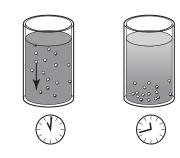
# 3.2 Separation by gravity

A liquid mixture in a stationary bowl will clear slowly as the heavy particles in the liquid mixture sink to the bottom under the influence of gravity.

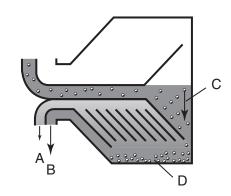
A lighter liquid rises while a heavier liquid and solids sink.

Continuous separation and sedimentation can be achieved in a settling tank having inlet and outlet arranged according to the illustration.

Heavier particles in the liquid mixture will settle and form a sediment layer on the tank bottom.



G0870111



- G0870221
- A. Lighter liquid
- B. Heavier liquid
- C. Gravity
- D. Sediment layer of heavier particles

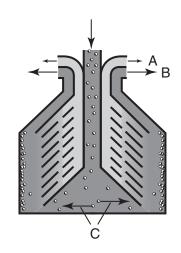
#### Centrifugal separation 3.3

In a rapidly rotating bowl, the force of gravity is replaced by centrifugal force, which can be thousands of times greater.

Separation and sedimentation is continuous and happens very quickly.

The centrifugal force in the separator bowl can achieve in a few seconds what takes many hours in a tank under influence of gravity.

The separation efficiency is influenced by changes in the viscosity, separating temperatures and in throughput.



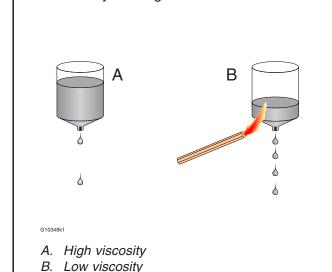
- A. Lighter liquid
- B. Heavier liquid
- C. Centrifugal force

#### Separating temperatures 3.4

For some types of process liquids a high separating temperature will normally increase the separation capacity. The temperature influences viscosity and density and should be kept constant throughout the separation.

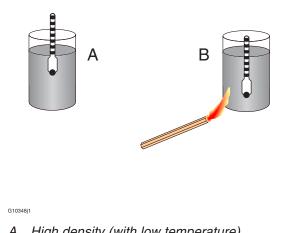
#### Viscosity

Viscosity is a fluids resistance against movement. Low viscosity facilitates separation. Viscosity can be reduced by heating.



#### **Density difference**

Density is mass per volume unit. The greater the density difference between the two liquids, the easier the separation. The density difference can be increased by heating.



- A. High density (with low temperature)
- B. Low density (with high temperature)

# 4 Separator basics

# 4.1 Design and function

## 4.1.1 Application

The separator is a high-speed centrifugal separator intended for marine and land applications. It is specifically designed for cleaning of mineral oils from water and solid particles (sludge). The cleaned oil is discharged continuously, while the sludge is discharged at intervals. The separator handles the following types of lubricating oils and low viscosity fuel oils:

- Distillate, viscosity 1,5 5,5 cSt/40 °C
- Marine diesel oil, viscosity 13 cSt/40 °C
- Intermediate fuel oil and heavy fuel oil (viscosity 30-700 cSt/50 °C)
- Lubricating oil of R & O type, detergent or steam turbine.

The separator is operated as an ALCAP type of separator but can, in Emergency operation, be operated as a purifier.

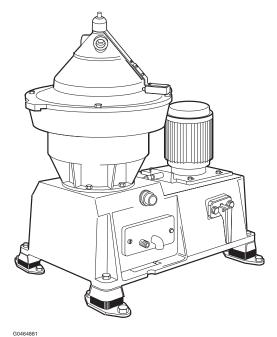
The separator has to be installed together with devices for control of its operation.



#### Disintegration hazard

Use the separator only for the purpose and parameters (type of liquid, rotational speed, temperature, density etc.) specified in chapter 7 Technical Reference on page 135 and in the Purchase Order documents.

Consult your Alfa Laval representative before any changes outside these parameters are made.



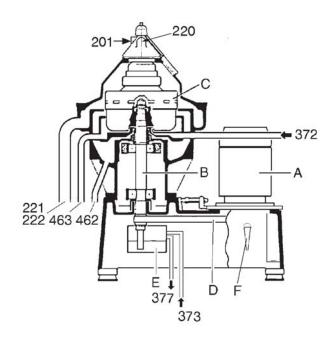
### 4.1.2 Design

The separator comprises a frame consisting of the frame lower part, the intermediate part and the frame top part with a frame hood.

The separator bowl (C) is driven by an electric motor (A) via a flat-belt power transmission (D) and bowl spindle (B). The motor drive is equipped with a friction coupling to prevent overload.

The bowl is of disc type and hydraulically operated at sludge discharges. The hollow bowl spindle (B) features an impeller which pumps closing water from a built-in tank to the operating system for sludge discharge.

The main inlets and outlets are shown with their connection numbers in the illustration. The connections are listed in chapter Technical Reference where the basic size drawing also can be found.



G0739541

- A. Electric motor
- B. Bowl spindle
- C. Bowl
- D. Flat belt
- E. Closing water tank
- F. Brake handle
- 201.Oil inlet
- 220.Oil outlet
- 221/222. Water/sludge outlet
- 372.Opening water inlet
- 373.Bowl closing water
- 377.Overflow
- 462.Drain
- 463.Drain

### 4.1.3 Outline of function

The separation process takes place in the rotating bowl. Unseparated oil is fed into the bowl through the inlet (201). The oil is cleaned in the bowl and leaves the separator through the outlet (220) via a paring chamber.

Impurities heavier than the oil are collected in the sludge space at the bowl periphery and removed automatically at regular intervals.

Permissible pressures and operating conditions are specified in chapter 7 Technical Reference on page 135.

The processing parts of the separator are shown in the illustration on next page.

There are no contacting surfaces between process rotating parts (the bowl) and stationary parts (inlet, outlet, feed devices), and the interfacing surfaces are not sealed. As the separation process is carefully balanced regarding pressures and fluid levels, any leakages will not occur as long as the correct running conditions are maintained.

## 4.1.4 Separating function

#### **ALCAP** TM concept

When the sludge space is filled up and water enters the disc stack, traces of water will escape with the cleaned oil. The increase of water content in the cleaned oil is the sign of reduced separation efficiency. This condition is monitored by the process control system, and water is removed from the bowl until minimal levels are recorded.

#### Liquid flow

Separation takes place in the separator bowl to which unseparated oil is fed through the inlet pipe (201). The oil is led by the distributor (T) towards the periphery of the bowl.

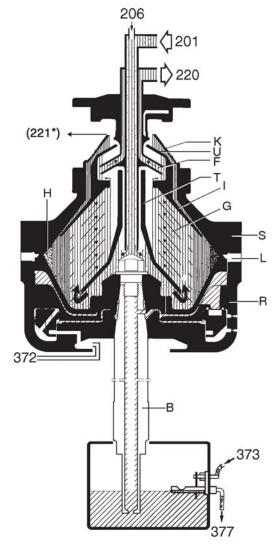
When the unseparated oil reaches the slots of the distributor, it will rise through the channels formed by the disc stack (G) where it is evenly distributed into the disc stack.

The oil is continuously separated from water and sludge as it will flow towards the center of the bowl. When the cleaned oil leaves the disc stack it rises upwards and enters the paring chamber. From there it is pumped by the paring disc (F) and leaves the bowl through the outlet (220).

Separated sludge and water move towards the bowl periphery.

Heavier impurities are collected in the sludge space (H) outside the disc stack and are discharged at intervals through the sludge ports (L).

In ALCAP mode, a disc (K) seals off the water outlet (221). In this case no water seal is required and consequently there is no oil/water interface in the bowl. The disc is the default disc at delivery. This disc is not shown in the nomograms.



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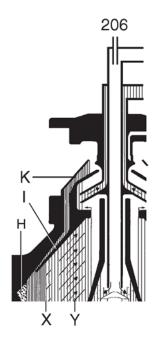
- F. Paring disc
- G. Disc stack
- H. Sludge space
- I. Top disc
- K. Disc
- L. Sludge ports
- R. Bowl body
- S. Bowl hood
- T. Distributor
- U. Paring chamber cover
- 201.Oil inlet
- 206. Water seal and displacement water inlet
- 220.Oil outlet
- 221\*.Water outlet (Only for Emergency operation)
- 372.Opening water inlet
- 373.Bowl closing water
- 377.Overflow

#### Displacement of oil

To avoid oil losses at sludge discharge, displacement water is fed to the bowl.

Prior to a discharge the oil feed is stopped and displacement water added through the water inlet (206). This water changes the balance in the bowl and the interface (X) moves inwards to a new position (Y), increasing the water volume in the sludge space. When the sludge discharge takes place sludge and water alone are discharged.

A new water seal will be established immediately afterwards. The oil feed is then turned on again.



G0112391

Principle of liquid seal and displacement water in purification

- H. Sludge
- I. Top disc
- K. Gravity disc
- X. Normal interface position
- Y. Interface position just before discharge 206. Water inlet

## 4.1.5 Separating function (emergency operation)



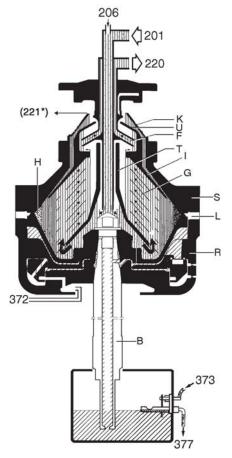
Emergency operation can be applied at e.g. extreme water contamination or when the automatic system is out of function. Although, this mode can only be used for densities below 991 kg/m<sup>3</sup>.

#### Liquid flow

As in ALCAP mode except:

In emergency operation separated water rises along the outside of the disc stack, passes from the top disc channels over the edge of the gravity disc (K) and leaves the bowl into the common sludge and water outlet (221) of the separator.

Heavier impurities are collected in the sludge space (H) outside the disc stack and are discharged at intervals through the sludge ports (L).



G0112381

- F. Paring disc
- G. Disc stack
- H. Sludge space
- I. Top disc
- K. Gravity disc
- L. Sludge ports
- R. Bowl body
- S. Bowl hood
- T. Distributor
- U. Paring chamber cover
- 201.Oil inlet
- 206. Water seal and displacement water inlet 220.Oil outlet
- 221\*. Water outlet (Only for Emergency operation)
- 372.Opening water inlet
- 373.Bowl closing water
- 377.Overflow

#### Water seal in purification

(Emergency operation)

To prevent the oil from passing the outer edge of the top disc (I) and escaping through the water outlet (221), a water seal must be provided in the bowl. This is done by filling the bowl with water through the water inlet (206), before unseparated oil is supplied. When oil feed is turned on the oil will force the water towards the bowl periphery and an interface (X) is formed between the water and the oil. The position of the interface is determined by the size of gravity disc (K).

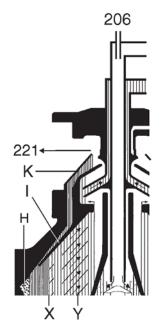
#### **Gravity disc**

(Emergency operation)

In the purification mode, the position of the interface (X) can be adjusted by replacing the gravity disc (K) for one of a larger or smaller size.

A gravity disc of a larger size will move the interface towards the bowl periphery, whereas a disc of a smaller size will place it closer to the bowl centre.

The correct gravity disc is selected from a nomogram, see 8.3.3 Gravity disc nomogram on page 175. The sizes of the gravity discs are normally stamped on the discs.



G0112371

Principle of liquid seal and displacement water in purification

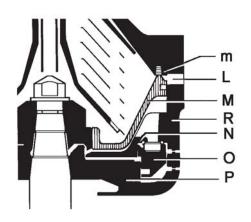
- H. Sludge
- I. Top disc
- K. Gravity disc
- X. Normal interface position
- Y. Interface position just before discharge
- 206.Water inlet
- 221.Water outlet
- 221. Water outlet (Only in Emergency operation)

### 4.1.6 Sludge discharge function

Sludge is discharged through a number of ports (L) in the bowl wall. Between discharges these ports are covered by the sliding bowl bottom (M), which forms an internal bottom in the separating space of the bowl. The sliding bowl bottom is pressed upwards against a sealing ring (m) by force of the closing water underneath.

The sliding bowl bottom is operated hydraulically by means of operating water supplied to the discharge mechanism from an external freshwater line. Opening water is supplied directly to the operating system in the bowl while closing water is supplied to the built-in closing water tank, and pumped to the operating system through the bowl spindle.

The opening and closing only takes a fraction of a second, therefore the discharge volume is limited to a certain percentage of the bowl volume. This action is achieved by the closing water filling space above the upper distributor ring and pushing the sliding bowl bottom upwards. Simultaneously, the water in the chamber below the operating slide is drained off through the nozzles in the bowl body.



Sludge discharge mechanism

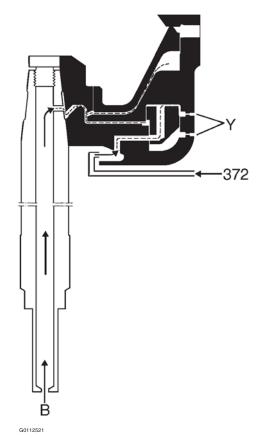
- L. Sludge ports
- M. Sliding bowl bottom
- m. Sealing ring
- N. Upper distributing ring
- O. Operating slide
- P. Lower distributing ring
- R. Bowl body

#### **Bowl opening**

The key event to start a sludge discharge is the downward movement of the operating slide. This is accomplished by supply of opening water (372) to the discharge mechanism. Water is drained off through nozzles (Y) in the bowl body. The sliding bowl bottom is rapidly pressed downwards by the force from the liquid in the bowl, opening the sludge ports.

#### **Bowl closing**

After the sludge is discharged the sliding bowl bottom is immediately pressed up and the sludge ports in the bowl wall are closed.



Supply of opening water and closing water

372.Opening water

B. Closing and make-up water through bowl spindle

Y. Nozzles

#### 4.1.7 Power transmission

#### **Bowl spindle**

In addition to its primary role in the power transmission system, the bowl spindle also serves as:

- pump for the closing water
- supply pipe for the closing water
- lubricator for spindle ball bearings

Closing water is pumped through the hollow spindle (B) to the discharge mechanism in the bowl. For this purpose a pump sleeve (b4) is fitted in the lower end.

The two spindle bearings are lubricated with oil mist. An oil pump (b3) creates the oil mist, which is sucked through the upper ball bearing by a fan (b1). Oil is supplied via an oil filling device, which also serves as a level indicator.

Two identical ring-shaped rubber buffers (b2) support the top bearing housing. The buffers are held in place by a buffer holder and form channels through which the re circulated oil passes.

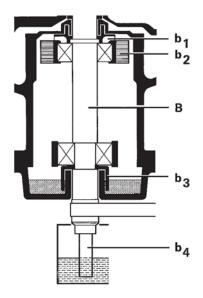
#### Belt drive

The bowl spindle is driven by a flat belt.

Procedure for change of belt will secure a fixed distance between spindle and motor belt pulley.

#### Friction coupling

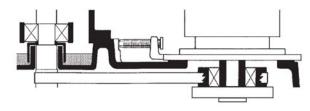
The friction coupling on the motor pulley ensures gentle start-up and prevents overload of the electric motor. Centrifugal force creates a torque that acts on the pulley through the friction elements.



G0112721

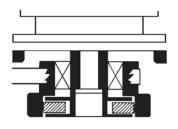
Bowl spindle assembly

- B. Bowl spindle
- b1. Fan
- b2. Rubber buffers
- b3. Oil pump
- b4. Sleeve



G0112841

Bowl spindle assembly



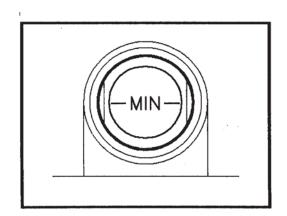
G0112911

Friction coupling

#### 4.1.8 Sensors and indicators

#### Sight glass

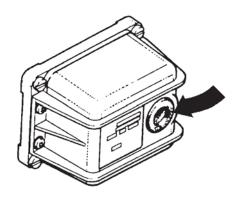
The sight glass shows the oil level in the oil sump.



#### Vibration switch (option)

The vibration switch, properly adjusted, trips on a relative increase in vibration.

The vibration switch is sensitive to vibration in a direction perpendicular to its base. It contains a vibration detecting mechanism that actuates a snap-action switch when the selected level of vibration is exceeded. After the switch has tripped it must be reset manually by pressing the button on the switch.



G054842

Reset push button on vibration switch

4 Separator basics 4.2 Definitions

# 4.2 **Definitions**

| Back pressure             | Pressure in the separator outlet.   |
|---------------------------|---|
|                           |   |
|                           |   |
| Counter pressure          | See Back pressure.  |
| Density                   | Mass per volume unit. Expressed in kg/m³ at a specified temperature, normally at 15 °C  |
| Disc (ALCAP mode)         | The disc seals off the heavy phase outlet in the bowl, thus no liquid seal exists.  |
| Gravity disc              | Disc in the bowl hood for positioning the interface between the disc stack and the outer edge of the top disc. This disc is only used in Emergency operation (purifier mode).   |
| Interface                 | Boundary layer between the heavy phase (water) and the light phase (oil) in a separator bowl.   |
| Intermediate Service (IS) | Overhaul of separator bowl and inlet/outlet. Renewal of seals in bowl and inlet/outlet.   |
| Major Service (MS)        | Overhaul of the complete separator, including bottom part (and activities included in an Intermediate Service). Renewal of seals and bearings in bottom part.   |
| Phase                     | Light phase: the lighter liquid separated, e.g. oil.<br>Heavy phase: the heavier liquid separated, e.g. water.  |
| Purification              | Liquid/liquid/solids separation with the intention of separating two intermixed and mutually insoluble liquid phases of different densities. Solids having a higher density than the liquids can be removed at the same time. The lighter liquid phase, which is the major part of the mixture, shall be purified as far as possible. |
|                           | Only at emergency operation.  |
| Sediment (sludge)         | Solids separated from a liquid  |
| Sludge discharge          | Ejection of sludge from the separator bowl.   |
| Throughput                | The feed of process liquid to the separator per time unit. Expressed in m³/hour or litres/hour.   |
| Viscosity                 | Fluid resistance against movement. Normally expressed in centistoke (cSt = mm <sup>2</sup> /s), at a specified temperature.   |
| Water seal                | Water in the solids space of the separator bowl to prevent the light phase (oil) from leaving the bowl through the heavy phase (water) outlet, in purifier mode.  |

4.2 Definitions 4 Separator basics

# 5 Service instructions

## 5.1 Periodic maintenance

### 5.1.1 Introduction

Periodic, preventive maintenance reduces the risk of unexpected stoppages and breakdowns. Maintenance logs are shown on the following pages in order to facilitate periodic maintenance.



#### **Disintegration hazards**

Separator parts that are worn beyond their safe limits or incorrectly assembled may cause severe damage or fatal injury.

#### 5.1.2 Maintenance intervals

The following directions for periodic maintenance give a brief description of which parts to clean, check and renew at different maintenance intervals.

The service logs for each maintenance interval later in this chapter give detailed enumeration of the checks that must be done.

**Daily checks** consist of simple check points to carry out for detecting abnormal operating conditions.

**Oil change** interval is 1500 hours. If the total number of operating hours is less than 1500 hours change oil at least once every year.

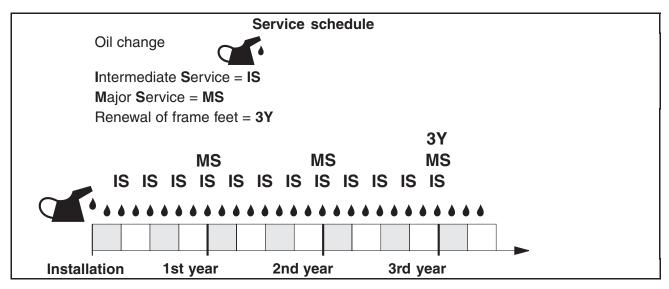
Time of operation between oil changes can be extended from the normal 1500 hours to 2000 hours if a synthetic oil of group D is used.

In seasonal operation change the oil before a new period.

**IS - Intermediate Service** consists of an overhaul of the separator bowl, inlet and outlet every 3 months or 2000 operating hours. Seals in bowl and gaskets in the inlet/outlet device and operating device are renewed.

MS - Major Service consists of an overhaul of the complete separator every 12 months or 8000 operating hours. An Intermediate Service is performed, and the flat belt, friction elements, seals and bearings in the bottom part are renewed.

**3-year service** consists of service of the coupling bearings, service of frame intermediate part and renewal of frame feet. The rubber feet get harder with increased use and age.



#### Other

Check and prelubricate spindle bearings of separators which have been out of service for 6 months or longer. Also see 5.11.2 Before shut-downs on page 77.



### Do not interchange bowl parts!

To prevent mixing of parts, e.g. in an installation comprising several machines of the same type, the major bowl parts carry the machine manufacturing number or its last three digits.

## 5.1.3 Maintenance procedure

At each intermediate and major service, take a copy of the service log and use it for notations during the service. An intermediate and major service should be carried out in the following manner:

- 1. Dismantle the parts as mentioned in the service log and described in 6 Dismantling & Assembly on page 79. Place the separator parts on clean, soft surfaces such as pallets.
- 2. Inspect and clean the dismantled separator parts according to the service log.
- Fit all the parts delivered in the service kit
  while assembling the separator as described
  in6 Dismantling & Assembly on page 79. The
  assembly instructions have references to check
  points which should be carried out during the
  assembly.

### 5.1.4 Service kits

Special service kits are available for Intermediate Service (IS), Major Service (MS) and 3-year service (3-YSK).

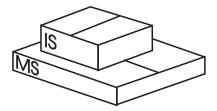
For other services the spare parts have to be ordered separately.

Note that the parts for IS are not included in the MS kits.

The contents of the service kits are described in the Spare Parts Catalogue.



Always use Alfa Laval genuine parts as otherwise the warranty will become invalid. Alfa Laval takes no responsibility for the safe operation of the equipment if non-genuine spare parts are used.



Spare parts kits are available for Intermediate Service and Major Service

# 5.2 Maintenance Logs

## 5.2.1 Daily checks

The following steps should be carried out daily.

| Main component and activity   | Part               | Page | Notes |
|---|--------------------|------|-------|
| Inlet and outlet  |                    |      |       |
| Check for leakage   | Connecting housing |      |       |
| Separator bowl  |                    |      |       |
| Check for vibration and noise                                       |                    |      |       |
| Belt transmission   |                    |      |       |
| Check for vibration and noise                                       |                    |      |       |
| Oil sump  |                    |      |       |
| Check   | Oil level          |      |       |
| Electrical motor  |                    |      |       |
| Check for vibration, heat and noise See manufacturer's instructions |                    |      |       |

# 5.2.2 Oil change - monthly

The oil change and check of belt transmission should be carried out every 1500 hours of operation.

When using a group D oil, time of operation between oil changes can be extended from the normal 1500 hours to 2000 hours.

When the separator is run for short periods, the lubricating oil must be changed every 12 months even if the total number of operating hours is less than 1500 hours (less than 2000 hours if a group D oil is used).

See chapter 5.9 Lubricants on page 63 for further information on oil brands etc.

| Main component and activity   | Part            | Page | Notes |
|-------------------------------|-----------------|------|-------|
| Bowl spindle and transmission |                 |      |       |
| Check                         | Belt tension    |      |       |
| Change                        | Oil in oil sump | 61   |       |

# 5.2.3 Intermediate Service (IS)

Name of plant: Local identification: Separator: Manufacture No./Year:

Total running hours: Product No: Date: Signature:

Renew all parts included in the Intermediate Service (IS) and do the following activities.

| Main component and activity         | Part                                 | Page | Notes |
|-------------------------------------|--------------------------------------|------|-------|
| Inlet and outlet, frame             |                                      |      |       |
| Clean and inspect                   | Threads of inlet pipe                | 49   |       |
|                                     | Paring disc                          | 49   |       |
|                                     | Housing and frame hood               | -    |       |
| Separator bowl                      |                                      |      |       |
| Clean and inspect                   | Bowl hood                            | 46   |       |
|                                     | Top disc                             |      |       |
|                                     | Bowl discs                           | 60   |       |
|                                     | Distributor                          |      |       |
|                                     | Sliding bowl bottom                  | 46   |       |
|                                     | Discharge mechanism                  | 46   |       |
|                                     | Threads on bowl hood and bowl body   | 50   |       |
|                                     | Bowl spindle cone and bowl body nave | 49   |       |
|                                     | Corrosion                            | 42   |       |
|                                     | Cracks                               | 45   |       |
|                                     | Erosion                              | 44   |       |
|                                     | Galling of guide surface             | 50   |       |
|                                     | Disc stack pressure                  | 52   |       |
| Power transmission                  |                                      |      |       |
| Check                               | Belt and belt tension                |      |       |
| Change                              | Oil in oil sump                      | 61   |       |
| Electrical motor                    |                                      |      |       |
| Lubrication (if nipples are fitted) | See sign on motor                    |      |       |
| Signs and labels on separator       |                                      |      |       |
| Check attachment and legibility     | Safety label on hood                 | 158  |       |
|                                     | Other plates and labels              |      |       |

# 5.2.4 Major service (MS)

Name of plant: Local identification: Separator: Manufacture No./Year:

Total running hours: Product No: Date: Signature:

Renew all parts included in the Intermediate service (IS) and Major Service (MS) and do the following activities.

| Main component and activity | Part                                 | Page | Notes |
|-----------------------------|--------------------------------------|------|-------|
| Inlet and outlet, frame     |                                      |      |       |
| Clean and inspect           | Threads of inlet pipe                | 49   |       |
|                             | Paring disc                          | 49   |       |
|                             | Housing and frame hood               | -    |       |
| Separator bowl              |                                      |      |       |
| Clean and inspect           | Bowl hood                            | 46   |       |
|                             | Top disc                             |      |       |
|                             | Bowl discs                           | 60   |       |
|                             | Distributor                          |      |       |
|                             | Nozzles in bowl body                 |      |       |
|                             | Sliding bowl bottom                  | 46   |       |
|                             | Discharge mechanism                  | 46   |       |
|                             | Threads on bowl hood and bowl body   | 50   |       |
|                             | Bowl spindle cone and bowl body nave | 49   |       |
| Check                       | Corrosion                            | 42   |       |
|                             | Cracks                               | 45   |       |
|                             | Erosion                              | 44   |       |
|                             | Galling of guide surface             | 50   |       |
|                             | Height of paring disc                | 53   |       |
|                             | Disc stack pressure                  | 52   |       |

| Main component and activity     | Part                              | Page | Notes |
|---------------------------------|-----------------------------------|------|-------|
| Vertical driving device         |                                   |      |       |
| Clean and inspect               | Oil mist fan                      | 106  |       |
|                                 | Oil pump                          | 106  |       |
|                                 | Water tank                        | 131  |       |
|                                 | Pump sleeve                       |      |       |
|                                 | Bowl spindle                      | 101  |       |
|                                 | Ball bearing housing indentations | 101  |       |
|                                 |                                   |      |       |
| Check                           | Radial wobble of bowl spindle     | 54   |       |
| Oil sump                        |                                   |      |       |
| Clean                           | Oil sump                          | 61   |       |
| Change                          | Oil                               | 61   |       |
| Clean and inspect               | Oil filling device                | 130  |       |
| Friction coupling               |                                   |      |       |
| Clean and inspect               | Friction coupling                 | 118  |       |
| Electrical motor                |                                   |      |       |
| Replace                         | Bearings*                         |      |       |
| Signs and labels on separator   |                                   |      |       |
| Check attachment and legibility | Safety label on hood              | 158  |       |
|                                 | Other signs and labels            | -    |       |

<sup>\*</sup> See manufacturer's instructions.

# 5.3 Check points at Intermediate Service

### 5.3.1 Corrosion

Evidence of corrosion attack should be looked for and rectified each time the separator is dismantled. Main bowl parts such as the bowl body, sliding bowl bottom, bowl hood and lock ring must be inspected with particular care for corrosion damage.



### **Disintegration hazard**

Inspect regularly for corrosion damage. Inspect frequently if the process liquid is corrosive.

Always contact your Alfa Laval representative if you suspect that the largest depth of the corrosion damage exceeds 1,0 mm or if cracks have been found. Do not continue to use the separator until it has been inspected and given clearance for operation by Alfa Laval.

Cracks or damage forming a line should be considered as being particularly hazardous.

### Non-stainless steel and cast iron parts

Corrosion (rusting) can occur on unprotected surfaces of non-stainless steel and cast iron. Frame parts can corrode when exposed to an aggressive environment.



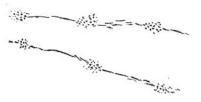


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Main bowl parts to check for corrosion

#### Stainless steel

Stainless steel parts corrode when in contact with either chlorides or acidic solutions. Acidic solutions cause general corrosion. The chloride corrosion is characterized by local damage such as pitting, grooves or cracks. The risk of chloride corrosion is higher if the surface is:



Example of chloride corrosion in stainless steel

- Exposed to a stationary solution.
- In a crevice.
- Covered by deposits.
- Exposed to a solution that has a low pH.

Corrosion damage caused by chlorides on stainless steel begins as small dark spots that can be difficult to detect.

- Inspect closely for all types of damage by corrosion and record these observations carefully.
- 2. Polish dark-coloured spots and other corrosion marks with a fine grain emery cloth. This may prevent further damage.



### Disintegration hazard

Pits and spots forming a line may indicate cracks beneath the surface.

All forms of cracks are a potential danger and are totally unacceptable.

Renew the part if corrosion can be suspected of affecting its strength or function.

### Other metal parts

Separator parts made of materials other than steel, such as brass or other copper alloys, can also be damaged by corrosion when exposed to an aggressive environment. Possible corrosion damage can be in the form of pits and/or cracks.



Polish corrosion marks to prevent further damage

### 5.3.2 Erosion

Erosion can occur when particles suspended in the process liquid flow along or strike against a surface. Erosion can become intensified locally by flows of higher velocity.



### **Disintegration hazard**

Inspect regularly for erosion damage. Inspect frequently if the process liquid is erosive.

Always contact your Alfa Laval representative if the largest depth of any erosion damage exceeds 1,0 mm or if the surface of the sliding bowl bottom shows any sign of damage. Valuable information as to the nature of the damage can be recorded using photographs, plaster impressions or hammered-in lead.

Erosion is characterized by:

- Burnished traces on the material.
- Dents and pits having a granular and shiny surface.

Look carefully for any signs of erosion damage. Erosion damage can deepen rapidly and consequently weaken parts by reducing the thickness of the metal.



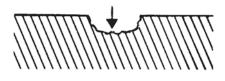
### **Disintegration hazard**

Erosion damage can weaken parts by reducing the thickness of the metal.

Pay special attention to the pillars between the sludge ports in the bowl wall.

Renew the part if erosion is suspected of affecting its strength or function.

Max. 1 mm



Max. permitted erosion

### 5.3.3 Cracks

Cracks can initiate on the machine after a period of operation and propagate with time.

- Cracks often initiate in an area exposed to high cyclic material stresses. These are called fatigue cracks.
- Cracks can also initiate due to corrosion in an aggressive environment.
- Although very unlikely, cracks may also occur due to the low temperature embrittlement of certain materials.

The combination of an aggressive environment and cyclic stresses will speed-up the formation of cracks. Keeping the machine and its parts clean and free from deposits will help to prevent corrosion attacks.



### Disintegration hazard

All forms of cracks are potentially dangerous as they reduce the strength and functional ability of components.

Always replace a part if cracks are present.

It is particularly important to inspect for cracks in rotating parts and especially the pillars between the sludge ports in the bowl wall.

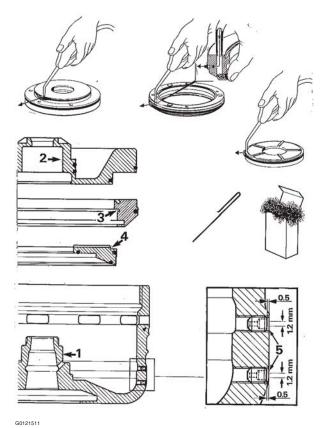
Always contact your Alfa Laval representative if you suspect that the largest depth of the damage exceeds 1,0 mm. Do not continue to use the separator until it has been inspected and cleared for operation by Alfa Laval.

## 5.3.4 Discharge mechanism

Dirt and lime deposits in the sludge discharge mechanism can cause discharge malfunction or no discharge.

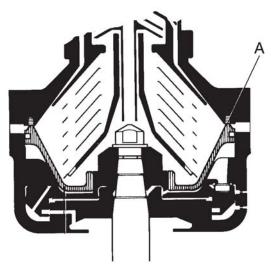
- Thoroughly clean and inspect the parts. Pay special attention to important surfaces (1, 2, 3 and 4). If necessary, polish with steel wool.
- Clean nozzles (5) using soft iron wire or similar.
   Note that lime deposits can with advantage be dissolved in a 10% acetic acid solution.

Use Loctite 242 on the threads if the nozzles have been removed or replaced.



# 5.3.5 Bowl hood and sliding bowl bottom

Poor sealing between the bowl hood seal ring and the edge of the sliding bowl bottom will cause a leakage of process liquid from the bowl.



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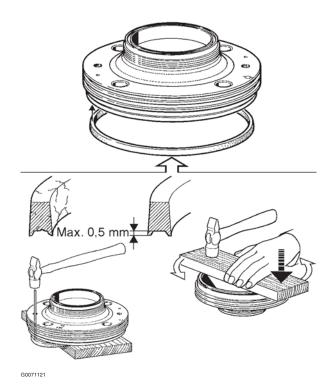
A Sealing surface in the bowl between bowl hood and sliding bowl bottom.

Fit a new bowl hood seal ring at each Intermediate Service (IS) if the old ring is damaged or indented more than 0,5 mm. Fit a new ring as follows: Press the ring into the groove with a straight board (1" x 4"), placed across the ring.



If a new ring is too narrow, put it into hot water, 70 - 80  $^{\circ}\text{C}$  for about 5 minutes.

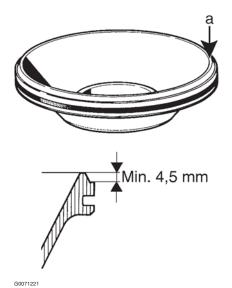
If it is too wide it will recover after drying at 80 - 90  $^{\circ}\text{C}$  for about 24 hours.



Exchange of seal ring in bowl hood.

Check the sealing edge (a) of the sliding bowl bottom.

If damaged through corrosion or erosion or in other ways it can be rectified by turning in a lathe. Minimum permissible height of sealing edge: 4,5 mm.



Sealing edge on sliding bowl bottom



Removal of seal ring on sliding bowl bottom.

### -

## 5.3.6 Spindle top cone and bowl body nave

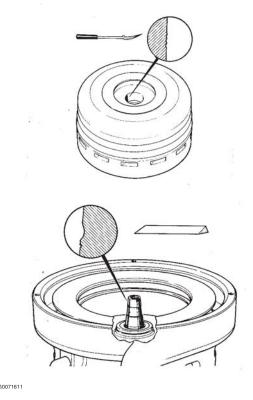
Impact marks on the spindle cone or in the bowl body nave may cause the separator to vibrate while running.

Corrosion may cause the bowl to stick firmly to the spindle cone and cause difficulties during the next dismantling.

 Remove any impact marks using a scraper and/or a whetstone. Rust can be removed by using a fine-grain emery cloth (e.g. No. 320). Finish with polishing paper (e.g. No. 600).



Always use a scraper with great care. The conicity must not be marred.

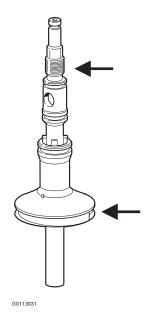


Use whetstone or scraper with great care

# 5.3.7 Threads of inlet pipe, paring disc

Damage to threads or a broken paring disc can prevent correct tightening of the inlet pipe and cause the paring disc to scrape against the top disc, even though the height adjustment of the paring disc has been made correctly.

- Examine the threads for damage and rectify if required.
- 2. Examine the paring disc for damage and to see if the disc walls have parted. If they have, the inlet pipe has to be replaced with a new one.

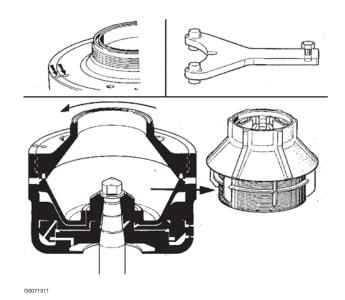


## 5.3.8 Threads on bowl hood and bowl body

Excessive wear or impact marks on threads and guide surfaces of the bowl hood or bowl body can cause seizure damage.

Examine the thread condition by tightening the bowl hood after removing the disc stack and top disc from the bowl.

When the bowl is new the alignment marks on the bowl hood and the bowl body should be aligned. If not, contact an Alfa Laval representative.



#### Wear

If thread wear is observed, mark the bowl body at the new position by punching a new alignment mark. If the mark on the bowl hood passes the mark on the bowl body by more than 25x, (A in the illustration) an Alfa Laval representative should be contacted immediately.

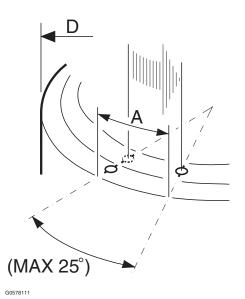
The measure A in millimeters (mm) is obtained by calculating bowl outside diameter D times 0,2.

If the marks are illegible, an Alfa Laval representative should be contacted for determination and punching of new alignment marks.



#### Disintegration hazards

Wear on threads must not exceed safety limit. f mark on bowl hood must not pass f mark on bowl body by more than 25°.



### **Damage**

The position of threads, contact and guide surfaces are indicated by arrows in the illustration.

Examine for burrs and protrusions caused by impact.

Clean the threads, contact and guide surfaces with a suitable degreasing agent.

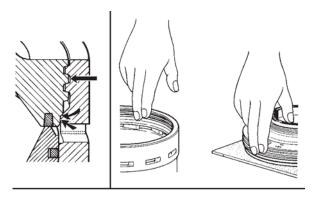


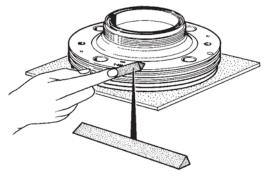
#### **Cut hazard**

The threads have sharp edges which can cause cuts.

If damage is found, rectify by using a whetstone or fine emery cloth. Recommended grain size: 240.

If the damage is bad, use a fine single-cut file, followed by a whetstone. After rectifying, the threads have to be primed with Molykote 1000.





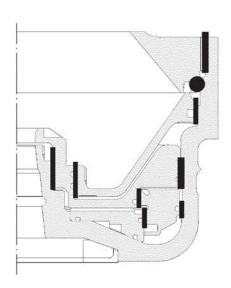
Contact surfaces to inspect on the bowl

# 5.3.9 Priming of bowl parts

The instruction refers to contact surfaces (dark shaded) of both matching parts.

### Before assembly:

- 1. These surfaces should be sprayed with Molykote D321R after a careful cleaning.
- 2. Air cure for 15 minutes.
- 3. Polish to an even, homogenous surface.
- 4. Spray a second time.
- 5. Air cure for 15 minutes.
- 6. Polish to a shiny surface, the surface should look like well polished leather when properly done.
- 7. Finish the treatment by lubricating the surfaces with lubricating paste see 5.9.2 Recommended lubricants on page 64.



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## 5.3.10 Disc stack pressure

The bowl hood exerts a pressure on the disc stack clamping it in place.



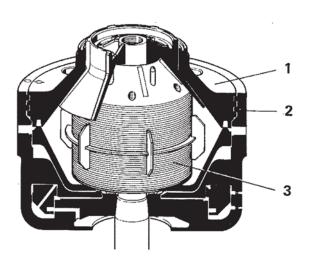
Insufficient pressure in the disc stack may affect the bowl balance, which in turn will cause abnormal vibration of the separator and shorten the life of ball bearings.

- Place the bowl hood\* on the top of the disc stack and tighten it by hand. The assembly mark on the bowl hood should now be positioned at the angle a (see illustration), 30° - 60° ahead of the corresponding mark on the bowl body.
   \* Also see 5.3.8 Threads on bowl hood and bowl
  - \* Also see 5.3.8 Threads on bowl hood and bowl body on page 50.
- 2. If the bowl hood can be tightened by hand without resistance until the marks are in line with each other, an extra disc must be added to the top of the disc stack beneath the top disc

If one or more discs have been added re-check the disc stack pressure by repeating the procedure above.

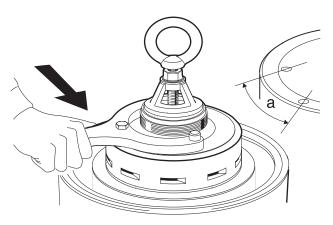


The top disc can stick inside the bowl hood and fall when the hood is lifted.



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- 1. Bowl hood
- 2. Bowl body
- 3. Disc stack
  - below wing insert: 32
  - above wing insert: at least 31



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a Angle 30° - 60° between assembly marks before final tightening

# 5.4 Check points at Major Service

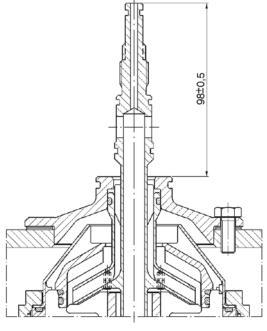
## 5.4.1 Paring disc height adjustment

The height of the paring disc above the frame hood must be measured if the bowl spindle has been dismantled or if the bowl has been replaced with a new one.



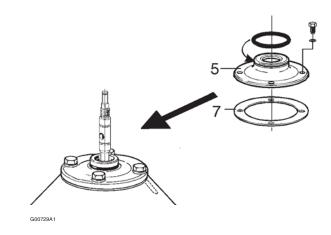
Incorrect height position can cause the paring disc (14) to scrape against the paring chamber cover.

Pay attention to scraping noise at start-up after service.

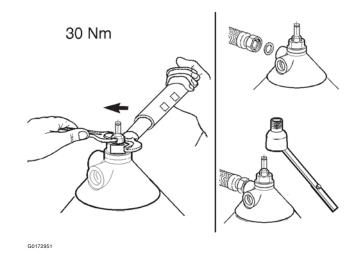


- G0883911
- Assemble the bowl and frame hood as described in 6.1.2 Inlet/outlet and bowl - assembly on page 91.
- 2. Measure the distance according to the illustration above. Adjust the distance by adding or removing height adjusting rings (7).
- 3. Fit the support ring (5) and the inlet/outlet housing. Tighten the nut with 30 Nm.

### Left-hand thread!



- 4. Rotate the bowl spindle by hand by means of the flat belt. If it does not rotate freely or if a scraping noise is heard, incorrect height adjustment or incorrect fitting of the inlet pipe can be the cause. Remove the parts and readjust.
- 5. Finally, fit the safety device.



## 5.4.2 Radial wobble of bowl spindle

The bowl spindle wobble must be measured if the bowl spindle has been dismantled or if rough bowl run (vibration) occurs.



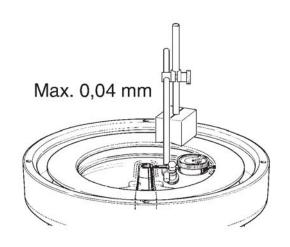
Spindle wobble will cause rough bowl run. This leads to vibration and reduces lifetime of ball bearings.

Check the wobble before removing the bowl spindle.

If the bowl spindle has been dismantled check the wobble before installing the bowl.

- 1. Fit a dial indicator in a support and fasten it in position as illustrated.
- 2. Remove the water tank from the frame bottom part for access to the flat belt. Use the flat belt to turn the spindle.
- Permissible radial wobble: max. 0,04 mm.
   If the spindle wobble is more than the maximum permitted value, contact Alfa Laval representatives.
- 4. Finally fit the water tank to the frame bottom part.

Incorrect belt tension causes displacement of the vertical line of the spindle centre, but does not affect the wobble of the spindle.



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# 5.5 3-year service

### **Exchange of frame feet**

See 6.8.1 Mounting of new frame feet on page 133.

## **Friction coupling**

Exchange of ball bearings, see 6.3 Friction coupling on page 118.

### Frame intermediate part

Replace O-ring and gasket, see 6.2.2 Bowl spindle and frame - assembly on page 109.

# 5.6 Lifting instructions

 Remove the inlet/outlet housings, the frame hood and the bowl according to the instructions in 6.1.1 Inlet/outlet and bowl - dismantling on page 86.



Make sure to remove the cap nut fixing the bowl to the bowl spindle.

Before lifting the bowl, check that the bowl hood has been screwed home into the bowl body. Less than 2 mm of bowl hood threading must remain above the bowl body edge.

When lifting the bowl, use the compression tool fastened on the distributor.

- 2. Disconnect the motor cables.
- 3. Tighten the frame hood.
- Fit the lifting eyes. The two eyebolts must be fitted in the holes nearest to the electric motor.
- Use two endless slings to lift the separator. Length of each sling: minimum 1,5 metres. Thread the slings through the lifting eyes and fit them to the hook of the hoist.
- 6. Unscrew the foundation bolts.
- When lifting and moving the separator, obey normal safety precautions for lifting large heavy objects.

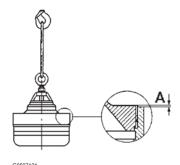
Do not lift the separator unless the bowl has been removed.

8. Remove the lifting eyes afterwards.

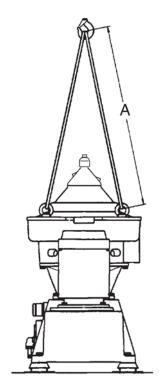


#### Crush hazards

Use only the two special lifting eyes (M12) for lifting the machine. They are to be screwed into the special threaded holes. Other holes are not dimensioned for lifting the machine. A falling separator can cause accidents resulting in serious injury and damage.



A<2 mm



A Minimum 750 mm distance between lifting eye and hook. Use a lifting hook with catch.



Separator without bowl: Use lifting slings for WLL 300 kg.

Bowl: Use lifting slings for WLL 100 kg

5.7 Cleaning

# 5.7 Cleaning

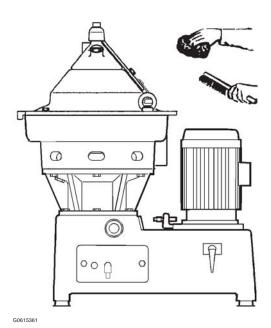
### **External cleaning**

The external cleaning of frame and motor should be restricted to brushing, sponging or wiping while the motor is running or is still hot.

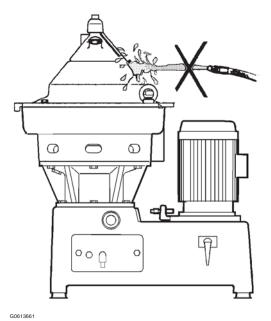
Never wash down a separator with a direct water stream. Totally enclosed motors can be damaged by direct hosing to the same extent as open motors and even more than those, because:

- Many operators believe that these motors are sealed, and normally they are not.
- A water jet played on these motors will produce an internal vacuum, which will suck the water between the metal-to-metal contact surfaces into the windings, and this water cannot escape.
- Water directed on a hot motor may cause condensation resulting in short-circuiting and internal corrosion.

Be careful even when the motor is equipped with a protecting hood. Never play a water jet on the ventilation grill of the hood.



Use a brush and a sponge or cloth when cleaning.



Never wash down a separator with a direct water stream or spray.

5.7 Cleaning 5 Service instructions

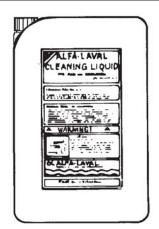
## 5.7.1 Cleaning agents

When using chemical cleaning agents, make sure you follow the general rules and suppliers' recommendations regarding ventilation, protection of personnel, etc.

### For separator bowl, inlet and outlet

A chemical cleaning agent must dissolve the deposits quickly without attacking the material of the separator parts.

- For cleaning of lube oil separators the most important function of the cleaning agent is to be a good solvent for the gypsum in the sludge. It should also act as a dispersant and emulsifier for oil. It is recommended to use Alfa Laval cleaning liquid for lube oil separators which has the above mentioned qualities. Note that carbon steel parts can be damaged by the cleaning agent if submerged for a long time.
- Fuel oil sludge mainly consists of complex organic substances such as asphaltenes. The most important property of a cleaning liquid for the removal of fuel oil sludge is the ability to dissolve these asphaltenes.



Alfa Laval cleaning liquid for lube oil and fuel oil separators.



#### Skin irritation hazard

Read the instructions on the label of the container before using the chemical cleaning agent.

Always wear safety goggles, gloves and protective clothing as the liquid is alkaline and dangerous to skin and eyes.

### For operating mechanism

Use 10% acetic acid solution to dissolve lime deposits. The acid should be heated to 80 °C.

#### For parts of the driving devices

Use white spirit, cleaning-grade kerosene or diesel oil.

5 Service instructions 5.7 Cleaning

## Oiling (protect surfaces against corrosion)

Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and coated with a thin layer of clean oil and protected from dust and dirt.

5.7 Cleaning 5 Service instructions

## 5.7.2 Cleaning of bowl discs

Handle the bowl discs carefully to avoid damage to the surfaces during cleaning.



#### **Cut hazard**

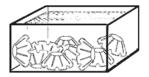
Sharp edges on the separator discs may cause cuts.



Mechanical cleaning is likely to scratch the disc surfaces causing deposits to form quicker and adhere more firmly.

A gentle chemical cleaning is therefore preferable to mechanical cleaning.

 Remove the bowl discs from the distributor and lay them down, one by one, in the cleaning agent.



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Put the discs one by one into the cleaning agent

- 2. Let the discs remain in the cleaning agent until the deposits have been dissolved. This will normally take between two and four hours.
- 3. Finally clean the discs with a **soft** brush.



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Clean the discs with a soft brush

5 Service instructions 5.8 Oil change

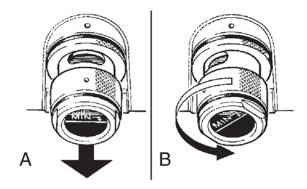
# 5.8 Oil change

## 5.8.1 Oil change procedure



Before adding or renewing lubricating oil in the oil sump, the information concerning different oil groups, handling of oils, oil change intervals etc. given in chapter 5.9 Lubricants on page 63 must be well known.

- 1. Place a collecting vessel under the drain hole.
- 2. Pull out (A) the oil filling device and turn it half a turn (B).



3. Collect the oil in the vessel.



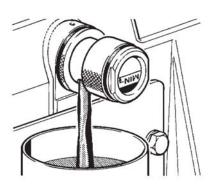
#### **Burn hazards**

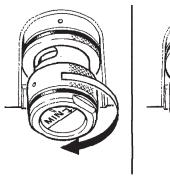
The lubricating oil and various machine surfaces can be sufficiently hot to cause burns.

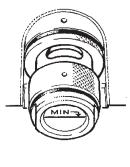
4. Turn the oil filling device back to its normal position (A), the drain hole pointing upwards.



When changing from one group of oil to another, the frame housing and the spindle parts must be thoroughly cleaned before the new oil is filled.







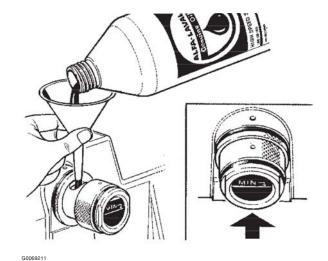
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5.8 Oil change 5 Service instructions

5. Fill the oil sump in the frame housing with new oil. The oil level should be slightly above middle of the sight glass. Information on volume see 7.3 Technical Data on page 137.

6. Push in the oil filling device.



5 Service instructions 5.9 Lubricants

# 5.9 Lubricants

# 5.9.1 Lubrication chart, general

Alfa Laval ref. 553216-01 Rev. 8

| Lubricating points  | Type of lubricant   | Interval  |
|---|---|---|
| The oil bath.  Bowl spindle ball bearings are lubricated by oil splash from the oil bath. | Lubricating oil as specified in<br>5.9.3 Recommended lubricating<br>oils on page 68.<br>See 7.3 Technical Data on page<br>137 | Oil Change: 1. Continuous operation: 2000h 2. Seasonal operation: Before every operating period. 3. Short periods operation: 12 months even if the total number of operating hours is less than stated above. |
| Bowl spindle taper.   | Lubricating oil (only a few drops for rust protection).   | At assembly   |
| Bowl:<br>Sliding contact surfaces, thread<br>of lock nut and cap nut.                     | Pastes as specified in 5.9.2<br>Recommended lubricants on<br>page 64.   | At assembly   |
| Rubber seal rings.  | Grease as specified in 5.9.2 Recommended lubricants on page 64.   | At assembly   |
| Friction coupling ball bearings. Not valid for rigid coupling.                            | The bearings are packed with grease and sealed and need no extra lubrication.   | -   |
| Electric motor  | Follow manufacturer's instructions.   | Follow manufacturer's instructions.   |
| Threads   | Lubricating oil, if not otherwise stated.   | At assembly   |



If not otherwise specified, follow the suppliers instructions about applying, handling and storing of lubricants.

Instructions related to a specific design of the machine refer to general assembly drawings.



Check the oil level before start. Top up when necessary. Do not overfill. 5.9 Lubricants 5 Service instructions

## 5.9.2 Recommended lubricants

### Lubricant recommendation for hygienic and non-hygienic applications

Alfa Laval ref. 553217 01 Rev. 13

Lubricants with a Alfa Laval part number are approved and recommended for use.

The data in the below tables is based on supplier information in regards to lubrication properties.

Trade names and designations might vary from country to country. Please contact your local supplier for more information.

### Paste for assembly of metallic parts, non-hygienic applications

| Part no                | Quantity      | Designation                    | Manufacturer    | Remark |
|------------------------|---------------|--------------------------------|-----------------|--------|
| 537086-02              | 1000 g        | Molykote 1000 Paste            | Dow Corning     | -      |
| 537086-03<br>537086-06 | 100 g<br>50 g | Molykote G-n plus Paste        | Dow Corning     | -      |
| 537086-04              | 50 g          | Molykote G-rapid plus<br>Paste | Dow Corning     | -      |
| -                      | -             | Gleitmo 705                    | Fuchs Lubritech | -      |
| -                      | -             | Wolfracoat C Paste             | Klüber          | -      |
| -                      | -             | Dry Moly Paste                 | Rocol           | -      |
| -                      | -             | MTLM                           | Rocol           | -      |

### Bonded coating for assembly of metallic parts, non-hygienic applications

| Part no   | Quantity | Designation          | Manufacturer    | Remark           |
|-----------|----------|----------------------|-----------------|------------------|
| 535586-01 | 375 g    | Molykote D321R Spray | Dow Corning     | -                |
| -         | -        | Gleitmo 900          | Fuchs Lubritech | Varnish or spray |

5 Service instructions 5.9 Lubricants

# Paste for assembly of metallic parts, hygienic applications (NSF registered H1 is preferred)

| Part no   | Quantity | Designation               | Manufacturer    | Remark  |
|-----------|----------|---------------------------|-----------------|---|
| -         | -        | Molykote D paste          | Dow Corning     | -   |
| 537086-07 | 50 g     | Molykote P-1900           | Dow Corning     | NSF Registered H1 (22<br>Jan 2004)  |
| -         | -        | Molykote TP 42            | Dow Corning     | -   |
| 561764-01 | 50 g     | Geralyn 2                 | Fuchs Lubritech | NSF Registered H1 (3<br>Sep 2004)   |
| -         | -        | Geralyn F.L.A.            | Fuchs Lubritech | NSF Registered H1 (2<br>April 2007). German<br>§ 5 Absatz 1 LMBG<br>approved. |
| 554336-01 | 55 g     | Gleitmo 1809              | Fuchs Lubritech | -   |
| -         | -        | Gleitmo 805               | Fuchs Lubritech | DVGW (KTW) approval<br>for drinking water (TZW<br>prüfzeugnis)                |
| -         | -        | Klüberpaste 46 MR 401     | Klüber          | White, contains no lead, cadmium, nickel, sulphur nor halogens.               |
| -         | -        | Klüberpaste UH1<br>84-201 | Klüber          | NSF Registered H1 (26<br>Aug 2005)  |
| -         | -        | Klüberpaste UH1<br>96-402 | Klüber          | NSF Registered H1 (25 Feb 2004)   |
|           |          | 252                       | OKS             | NSF Registered H1 (23<br>July 2004)   |
| -         | -        | Foodlube Multi Paste      | Rocol           | NSF Registered H1 (13<br>April 2001)  |

5.9 Lubricants 5 Service instructions

## Silicone grease/oil for rubber rings, hygienic and non-hygienic applications

| Part no   | Quantity | Designation                          | Manufacturer    | Remark   |
|-----------|----------|--------------------------------------|-----------------|--|
| -         | -        | No-Tox Food Grade<br>Silicone grease | Bel-Ray         | NSF Registered H1 (16 December 2011)   |
|           |          | Dow Corning 360<br>Medical Fluid     | Dow Corning     | Tested according to and complies with all National Formulary (NF) requirements for Dimethicone and European Pharmacopeia (EP) requirements for Dimeticone or Silicone Oil Used as a Lubricant, depending on viscosity. |
| 569415-01 | 50 g     | Molykote G 5032                      | Dow Corning     | NSF Registered H1 (3<br>June 2005)   |
| -         | -        | Geralyn SG MD 2                      | Fuchs Lubritech | NSF Registered H1 (30 March 2007)  |
| -         | -        | Chemplex 750                         | Fuchs Lubritech | DVGW approved according to the German KTW-recommendations for drinking water.  |
| -         | -        | Paraliq GTE 703                      | Klüber          | NSF Registered H1 (25 Feb 2004). Approved according to WRAS.   |
| -         | -        | Unisilkon L 250 L                    | Klüber          | Complies with German<br>Environmental Agency<br>on hygiene requirements<br>for tap water. Certified<br>by DVGW-KTW, WRAS,<br>AS4020, ACS.  |
| -         | -        | ALCO 220                             | MMCC            | NSF Registered H1 (25<br>March 2002)   |
| -         | -        | Foodlube Hi-Temp                     | Rocol           | NSF Registered H1 (18<br>April 2001)   |

5 Service instructions 5.9 Lubricants

Always follow the lubrication recommendations of the bearing manufacturer.

## Grease for ball and roller bearings in electric motors

| Part no | Quantity | Designation       | Manufacturer        | Remark                             |
|---------|----------|-------------------|---------------------|------------------------------------|
| -       | -        | Energrease LS2    | BP                  | -                                  |
| -       | -        | Energrease LS-EP2 | BP                  | -                                  |
| -       | -        | Energrease MP-MG2 | BP                  | -                                  |
| -       | -        | APS 2             | Castrol             | -                                  |
| -       | -        | Spheerol EPL 2    | Castrol             | -                                  |
| -       | -        | Multifak EP2      | Chevron             | -                                  |
| -       | -        | Multifak AFB 2    | Chevron             | -                                  |
| -       | -        | Molykote G-0101   | Dow Corning         | -                                  |
| -       | -        | Molykote Multilub | Dow Corning         | -                                  |
| -       | -        | Unirex N2         | ExxonMobil          | -                                  |
| -       | -        | Mobilith SHC 460  | ExxonMobil          | -                                  |
| -       | -        | Mobilux EP2       | ExxonMobil          | -                                  |
| -       | -        | Lagermeister EP2  | Fuchs Lubritech     | -                                  |
| -       | -        | Rembrandt EP2     | Q8/Kuwait Petroleum | -                                  |
| -       | -        | Alvania EP2       | Shell               | -                                  |
| -       | -        | LGEP 2            | SKF                 | -                                  |
| -       | 1-       | LGMT 2            | SKF                 | -                                  |
| -       | -        | LGFP 2            | SKF                 | NSF Registered H1 (17<br>Aug 2007) |
| -       | -        | Multis EP2        | Total               | -                                  |

5.9 Lubricants 5 Service instructions

## 5.9.3 Recommended lubricating oils

Alfa Laval ref. 553219-09 Rev. 1

Type of frame: **D/D and P/P** with motor < 7,5 kW.

Two different groups of lubricating oils are approved. They are designated as Alfa Laval lubricating oil groups A and D. The numerical value after the letter states the viscosity grade.

The numerical value after the letter states the viscosity grade.

The corresponding commercial oil brands are found in chapter 5.9.4 Recommended oil brands on page 69 and 5.9.5 Recommended oil brands on page 71.

| Ambient temperature (°C) |       | Time in operation Oil change interval |
|--------------------------|-------|---------------------------------------|
| Between +5 and +45*)     | A/150 | 1 500 h                               |
| Between +2 and +65       | D/220 | 2 000 h                               |

#### Note:

- When the separator is operated for short periods, lubricating oil must be changed every 12 months even if the total number of operating hours is less than stated in the recommendations above.
- Check and prelubricate spindle bearings on separators which have been out of service for 6 months or longer.
- In seasonal operation, change oil before every operating period.

5 Service instructions 5.9 Lubricants

## 5.9.4 Recommended oil brands

Alfa Laval ref. 553218-04 Rev. 6

Paraffinic mineral lubricating oil category (ISO-L-) HM 150. Viscosity grade (ISO 3448/3104) VG 150. The oil shall follow the requirements in one of the standards below.

| Standard                                | Designation                 |
|---|-----------------------------|
| ISO 11158, (ISO 6743/4)                 | ISO-L-HM or HV 150          |
| ISO 12925-1, (ISO 6743/6)               | ISO-L-CKC or CKE 150        |
| DIN 51524 part 2 or 3 (German standard) | DIN 51524 - HLP or HVLP 150 |
| DIN 51517 part 3                        | DIN 51517 - CLP 150         |

| Alfa Laval lubrication oil group A |                                  |  |
|------------------------------------|----------------------------------|--|
| Viscosity grade (ISO 3448/3104)    | VG 150                           |  |
| Viscosity index (ISO 2909)         | VI >95                           |  |
| Manufacturer                       | Designation                      |  |
| Alfa Laval                         | 546098-81 4 litres               |  |
|                                    | 546098-83 1 litre                |  |
| BP                                 | Bartran 150                      |  |
|                                    | Bartran HV 150                   |  |
|                                    | Energol SHF-HV 150               |  |
| Castrol                            | Alpha ZN 150                     |  |
|                                    | Hyspin AWH(-M)                   |  |
|                                    | 150 Hyspin AWS 150               |  |
| Chevron                            | Meropa 150                       |  |
|                                    | Rando HD 150                     |  |
|                                    | Paper Machine oil XL 150         |  |
| ExxonMobil                         | Mobil DTE PM 150                 |  |
|                                    | Mobil DTE 10 excel 150           |  |
|                                    | Mobil Vacuoline 528 (ISO VG 150) |  |
|                                    | Nuto H 150                       |  |
|                                    | Mobilgear 600 XP 150             |  |
| Q8/Kuwait Petroleum                | Haydn 150                        |  |
| Shell                              | Morlina 150                      |  |
|                                    | Morlina S2 B 150                 |  |
| Statoil                            | LubeWay XA 150                   |  |
| Total                              | Azolla ZS 150                    |  |
|                                    | Lubmarine Visga 150              |  |

5.9 Lubricants 5 Service instructions

Paraffinic mineral lubricating oil category HM 150 for hygienic applications. Conform to U.S. Food and Drug Administration (FDA) requirements of lubricants with incidental food contact, Title CFR 21 178.3570, 178.3620 and/or those generally regarded as safe (US 21 CFR 182).

| Lubrication oils for food and hygienic applications |                                |  |
|---|--------------------------------|--|
| Viscosity grade (ISO 3448/3104)                     | VG 150                         |  |
| Viscosity index (ISO 2909)                          | VI >95                         |  |
| Manufacturer  | Designation                    |  |
| Bel-Ray   | Bel-Ray No-Tox Gear Oil 85     |  |
|   | Bel-Ray No-Tox Anti-Wear 40    |  |
| ExxonMobil  | Mobil DTE FM 150 (Mineral/PAO) |  |
| Fiske Brothers                                      | Lubriplate FMO-AW 900          |  |
| Total   | (Keystone) Nevastane EP 150    |  |

The hygienic oil on the list is in the online "NSF White BookTM Listing" at the time of the revision of this document. For more information about the NSF registration and up to date H1 registration, see www.nsf.org (http://www.nsf.org/business/nonfood\_compounds/)

5 Service instructions 5.9 Lubricants

## 5.9.5 Recommended oil brands

Alfa Laval ref. 553218-08 Rev. 6

Synthetic lubricating oil, category PAO (ISO-L-) CKE 220 . Viscosity grade (ISO 3448/3104) VG 220.

The following are lists of recommended oil brands. Trade names and designations might vary from country to country. Please contact your local oil supplier for more information.

Brands with Alfa Laval article number are approved and recommended for use.

| Alfa Laval lubrication oil group D |   |  |
|------------------------------------|---|--|
| Manufacturer                       | Designation   |  |
| Alfa Laval                         | 542690-80 20 litres<br>542690-81 4 litre  |  |
| BP                                 | Enersyn HTX 220<br>Enersyn EP-XF 220  |  |
| Castrol                            | Alphasyn EP 220<br>Alphasyn HG 220<br>Optigear Synthetic A 220                                    |  |
| Chevron                            | (Texaco/Caltex) Pinnacle EP 220<br>Tegra Synthetic Gear Lubricant 220<br>Pinnacle Marine Gear 220 |  |
| ExxonMobil                         | Mobil SHC 630   |  |
| Q8/Kuwait Petroleum                | Schumann 220  |  |
| Shell                              | Shell Morlina S4 B 220<br>Omala RL 220  |  |
| Statoil                            | Mereta 220  |  |
| Total                              | Carter SH 220<br>Elf Epona SA 220   |  |

The lists of recommended oil brands are not complete. Other oil brands may be used as long as they have equivalently quality as the brands recommended. The oil must have the same viscosity class and ought to follow the ISO standard 12925-1, category ISO-L-CKC, CKD, CKE or CKT (ISO 6743-6) or DIN 51517, part 3 CLP, but shall have a synthetic base oil of polyalphaolefin type (PAO) instead of mineral base oil. The oil must be endorsed for worm gear with brass worm wheel. The use of other lubricants than recommended is done on the exclusive responsibility of the user or oil supplier.

# Synthetic lubricating oil, category PAO (ISO-L-) CKE 220 for hygienic applications.

Conform to U.S. Food and Drug Administration (FDA) requirements of lubricants with incidental food contact, Title CRF 21 178.3570, 178.3620 and/or those generally regarded as safe (US 21 CRF 182).

| Lubrication oils for food and hygienic applications |                      |
|---|----------------------|
| Manufacturer  | Designation          |
| Shell   | Cassida fluid GL 220 |

The hygienic oil on the list is in the online "NSF White BookTM Listing" at the time of the revision of this document. For more information about the NSF registration and up to date H1 registration, see www.nsf.org (http://www.nsf.org/business/nonfood\_compounds/).

5 Service instructions 5.10 Vibration

# 5.10 Vibration

# 5.10.1 Vibration analysis

A separator normally vibrates and produces a different sound when passing through its critical speeds during run-up and run-down.

It also vibrates and sounds to some extent when running. It is good practice to be acquainted with these normal conditions.

Excessive vibrations and noise indicate that something is wrong. Stop the separator and identify the cause.

Use vibration analysis equipment to periodically check and record the level of vibration.

The level of vibration of the separator should not exceed 9 mm/s.

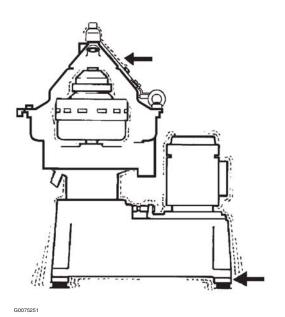


#### **Disintegration hazards**

When excessive vibration occurs, keep bowl filled and stop separator.

The cause of the vibration must be identified and corrected before the separator is restarted.

Excessive vibration can be due to incorrect assembly or poor cleaning of the bowl.



## 5.10.2 Vibration switch (optional)

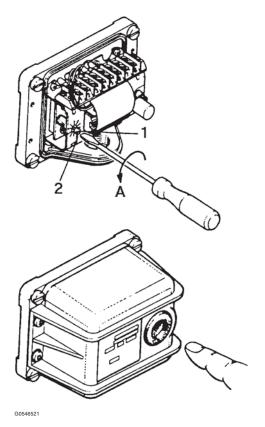
#### Adjustment of setpoint

The vibration switch is adjusted with the separator in operation. The cover must be removed to gain access to the setpoint adjusting screw (1).

- Back-off the setpoint adjusting screw counter-clockwise (A) two or three turns. Press the reset button. If the armature does not remain in the reset position, turn the adjusting screw another turn or two until the armature stays in position when the reset button is pressed.
- Now turn the adjusting screw slowly clockwise until the armature rocks. Mark this position with a line immediately in front-of the adjusting screw pointer (2).
- Back-off the adjusting screw counter-clockwise a three-quarter turn. Press the reset button. If the armature now rocks, turn the adjusting screw counter-clockwise another quarter turn and so on until the armature remains in the reset position. Refit the cap and fasten with the screws.



Further adjustment may become necessary if alarm occurs due to vibration from surrounding equipment.



Setpoint adjustment

- 1. Adjusting screw
- 2. Pointer
- A. Direction of increased checkpoint (admit higher vibration)

#### **General directions** 5.11

# 5.11.1 Ball and roller bearings

## Specially designed bearings for the bowl spindle

The bearings used for the bowl spindle are special to withstand the speed, vibration, temperature and load characteristics of high-speed separators.

Only Alfa Laval genuine spare parts should be

A bearing that in appearance looks equivalent to the correct may be considerably different in various respects: inside clearances, design and tolerances of the cage and races as well as material and heat treatment.



Using an incorrect bearing can cause a serious breakdown with injury to personnel and damage to equipment as a result.

Do not re-fit a used bearing. Always replace it with a new one.

#### Dismantling

Remove the bearing from its seat by using a puller. If possible, let the puller engage the inner ring, then remove the bearing with a steady force until the bearing bore completely clears the entire length of the cylindrical seat.

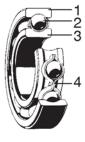
The puller should be accurately centered during dismantling; otherwise it is easy to damage the seating.

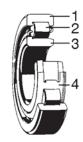


Do not hit with a hammer directly on the bearing.

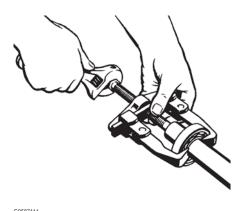
#### Cleaning and inspection

Check shaft (spindle) end and/or bearing seat in the housing for damage indicating that the bearing has rotated on the shaft (spindle) and/or in the housing respectively. Replace the damaged part, if the faults cannot be remedied by polishing or in some other way.





- 1. Outer race
- 2. Ball/roller
- Inner race
- 4. Cage



For bearings where no driving-off sleeve is included in the tool kit, use a puller when removing bearings.

#### **Assembly**

- Leave new bearings in original wrapping until ready to fit. The anti-rust agent protecting a new bearing should not be removed before use.
- Use the greatest cleanliness when handling the bearings.

To facilitate assembly and also reduce the risk of damage, first clean and then lightly smear the bearing seating on shaft (spindle) or alternatively in housing, with a thin oil.

 When assembling ball bearings, the bearings must be heated in oil to maximum 125 °C.

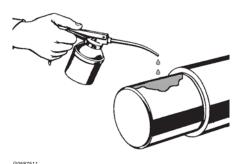


Heat the bearing in a clean container with a cover.

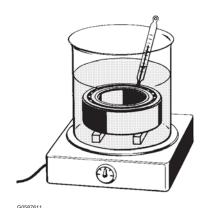
Use only clean oil with a flash point above 250 °C.

The bearing must be well covered by the oil and not be in direct contact with the sides or the bottom of the container. Place the bearing on some kind of support or suspended in the oil bath.

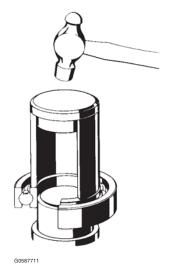
- There are several basic rules for assembling cylindrical bore bearings:
- Never directly strike a bearing's rings, cage or rolling elements while assembling. A ring may crack or metal fragments break off.
- Never apply pressure to one ring in order to assemble the other.
- Use an ordinary hammer. Hammers with soft metal heads are unsuitable as fragments of the metal may break off and enter the bearing.
- Make sure the bearing is assembled at a right angle to the shaft (spindle).
- If necessary use a driving-on sleeve that abuts the ring which is to be assembled with an interference fit, otherwise there is a risk that the rolling elements and raceways may be damaged and premature failure may follow.



Clean and smear the bearing seating before assembly.



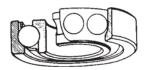
The bearing must not be in direct contact with the container.



Use a driving-on sleeve for bearings that are not heated.

#### Angular contact ball bearings

Always fit single-row angular contact ball bearings with the wide shoulder of the inner race facing the axial load (upwards on a bowl spindle).



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The wide shoulder of the inner race must face the axial load.

## 5.11.2 Before shut-downs

Before the separator is shut-down for a period of time, the following must be carried out:

- Remove the bowl, according to instructions in chapter 6 Dismantling & Assembly on page 79
- Protect parts in contact with process liquid from corrosion by applying a thin layer of oil.
- Remove the O-rings.

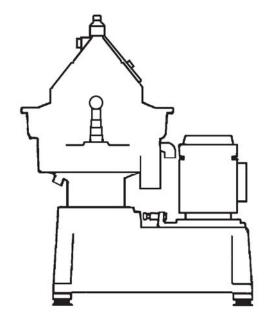
Protect cleaned carbon steel parts against corrosion by oiling. Separator parts that are not assembled after cleaning must be wiped and protected against dust and dirt.

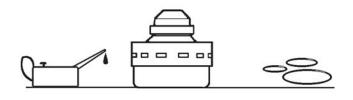


The bowl must not be left on the spindle during standstill for more than one week.

Vibration in foundations can be transmitted to the bowl and produce one-sided loading of the bearings.

The resultant indentations in the ball bearing races can cause premature bearing failure.





Remove the bowl if the separator is left at standstill for more than one week.

# 6 Dismantling & Assembly

#### References to check points

In the text you will find references to the check point instructions in chapter 5 Service instructions on page 35. The references appear in the text as in the following example:

**Check point** 5.3.10 Disc stack pressure on page 52. In this example, look up check point Disc stack pressure for further instructions.



Switch off and lock power supply before starting any dismantling work.

#### **Tools**

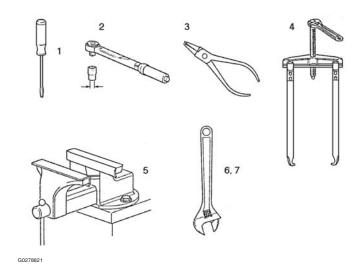
Special tools from the tool kit must be used for dismantling and assembly. The special tools are specified in the Spare Parts Catalogue.

Additional tools needed for dismantling but not included in the tool kit are shown here.

For bowl and bowl spindle

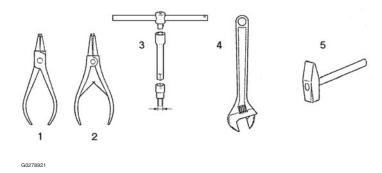
- 1. Screwdriver
- 2. Torque wrench (50 Nm) with socket 16 mm
- 3. Pliers for internal snap ring
- 4. Ball bearing puller
- 5. Screw vice with copper liners
- 6. Adjustable wrench, length approx. 400 mm
- 7. Adjustable wrench or spanner, width of jaws 24 mm

Two lifting slings, working load limit (WLL): >300 kg are also needed.

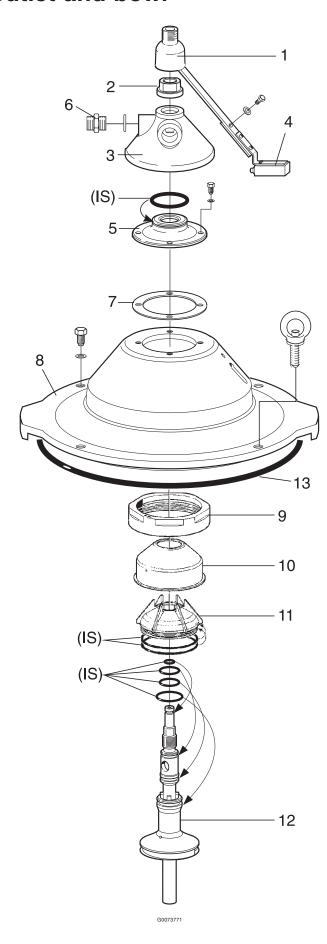


# For friction coupling and flat belt

- 1. Pliers for internal snap ring
- 2. Pliers for external snap ring
- 3. T-handle, extension rod and socket 16 mm
- 4. Adjustable wrench or spanner, width of jaws 36 mm
- 5. Hammer



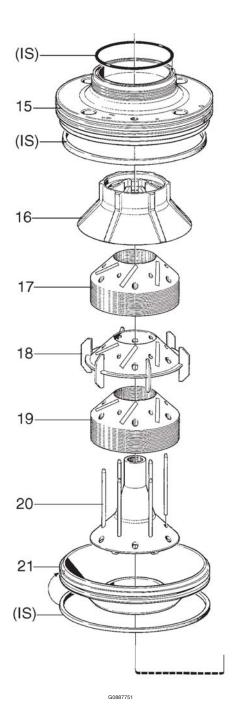
# 6.1 Inlet/outlet and bowl



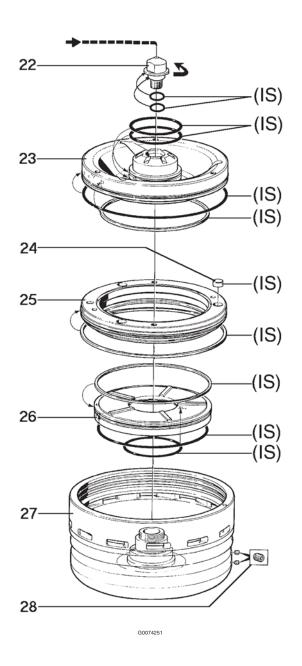
- 1. Safety device
- 2. Nut
- 3. Inlet/outlet housing
- 4. Interlocking switch (optional)
- 5. Support ring

The support ring is removed from the frame hood top, at paring disc adjustment (Major Service)

- 6. Insert
- 7. Height adjusting ring
- 8. Frame hood
- 9. Lock ring
- 10. Disc
- 11. Paring chamber cover
- 12. Inlet pipe with paring disc
- 13. O-ring
- IS. Intermediate service kit
- MS.Major service kit



- 15. Bowl hood
- 16. Top disc
- 17. Bowl discs
- 18. Wing insert
- 19. Bowl discs
- 20. Distributor
- 21. Sliding bowl bottom
- IS. Intermediate service kit
- MS.Major service kit



- 22. Cap nut
- 23. Upper distributing ring
- 24. Valve plug
- 25. Operating slide
- 26. Lower distributing ring
- 27. Bowl body
- 28. Nozzle
- SK. Sealing kit
- SK. Sealing kit
- DK.Discharge kit

# 6.1.1 Inlet/outlet and bowl - dismantling

The frame hood and the heavy bowl parts must be lifted by means of a hoist. Position the hoist exactly above the bowl centre. Use an endless sling and a lifting hook with catch.

The parts must be handled carefully. Don't place parts directly on the floor, but on a clean rubber mat, fibreboard or a suitable pallet.



#### **Entrapment hazard**

To avoid accidental start, switch off and lock power supply before starting any dismantling work.

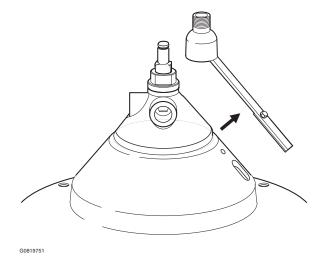
1. Remove safety device and look through the slot in the frame hood to see if the bowl still rotates.

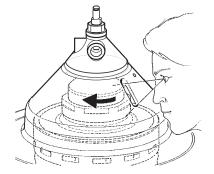


#### **Entrapment hazard**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work.

The bowl parts can remain very hot for a considerable time after the bowl has come to a standstill.





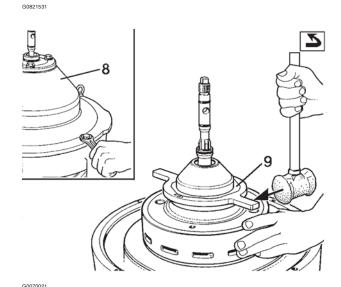
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2. Unscrew nut clockwise and lift off inlet- outlet housing together with the connecting hoses. When removing the connecting hoses, do not drop the washer.

#### Left-hand thread!

- 3. Remove the bolts and lift off frame hood (8).
- 4. Unscrew lock ring (9) clockwise by using the special tool; spanner for lock ring.

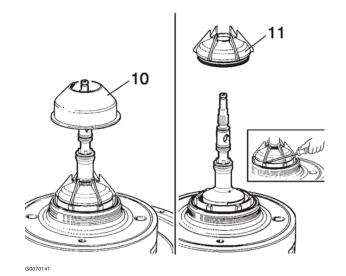
#### Left-hand thread!



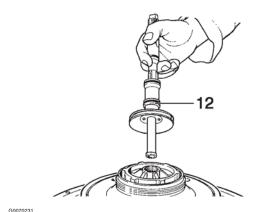
- 5. Lift off the disc (10).
- 6. Carefully prise loose paring chamber cover (11) by using a screwdriver. Lift off the paring chamber cover.



If the gravity disc has to be replaced owing to changed operating conditions, see 8.3.3 Gravity disc nomogram on page 175.



7. Lift out inlet pipe (14) with the paring disc.



- 8. Preparations for unscrewing of bowl hood (15):
  - Fit the spanner to the bowl hood and secure it with the bolt (a).
  - Fit the compression tool and screw down the central screw (b) until it stops
  - Compress the disc stack by tightening the nut
     (c) firmly.

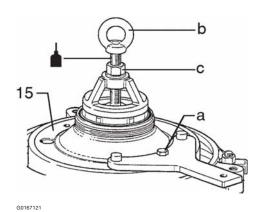


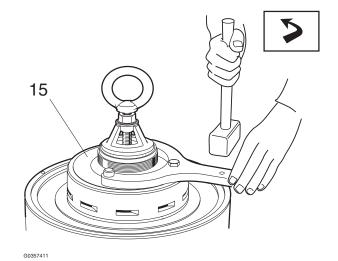
Use the compression tool as instructed. Use of substitute tools can damage the equipment.

9. Unscrew bowl hood (15) clockwise by using a tin hammer.

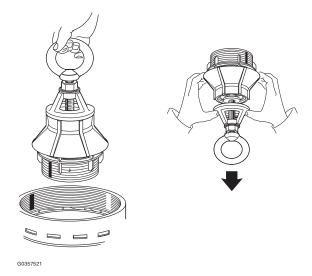
#### Left-hand thread!

10. Lift off the bowl hood with the spanner still attached.

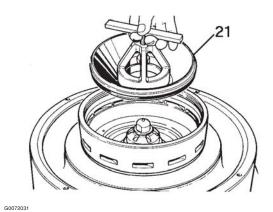




11. Lift out the top disc, the bowl discs with wing insert and the distributor. Screw the nut of the compression tool up against the eye bolt, turn the unit with the tool still attached upside down and hit it against a firm base. This will facilitate loosening of the top disc.



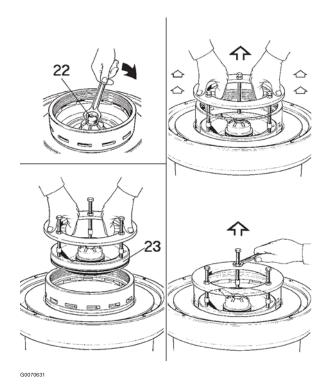
12. Lift out sliding bowl bottom (21) using the special tool. Ease the sliding bowl bottom off with the central screw of the tool. If necessary, knock on the handle.



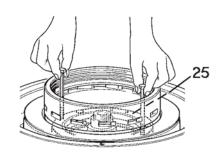
13. Unscrew cap nut (22).

#### Left-hand thread!

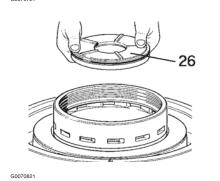
- 14. Remove upper distributing ring (23) using the special tool. Detach the distributing ring either:
  - by jerking, or
  - by tightening the nuts equally



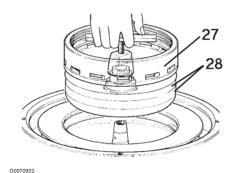
15. Lift out operating slide (25) using the special tool: lifting bolts for operating slide.



16. Lift out lower distributing ring (26).



- 17. Lift out bowl body (27) using the special tool.
- 18. Ease the bowl body off with the central screw of the tool. If necessary, knock on the handle.
- 19. Soak and clean all parts thoroughly in suitable cleaning agent, see 5.7 Cleaning on page 57.
- 20. Clean nozzles (28) in bowl body (27) using soft iron wire of maximum 1,2 mm diameter, see 5.3.4 Discharge mechanism on page 46.





Dirt and lime deposits in the sludge discharge mechanism can cause discharge malfunction or failing discharge.

21. Remove O-rings and replace them with spares from the intermediate service kit (IS).

# 6.1.2 Inlet/outlet and bowl - assembly



Be sure bowl parts are not interchanged.

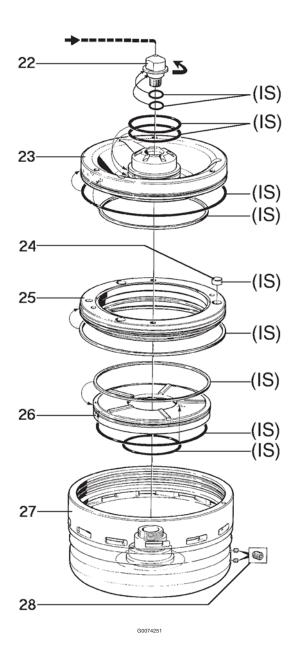
Out of balance vibration will reduce ball bearing life.

Make sure that the following check points are carried out before and during assembly of the separator bowl.

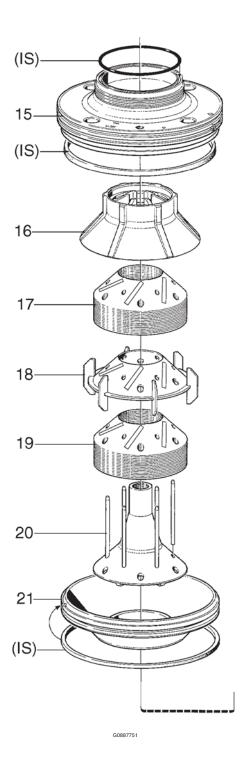
#### **Check point**

#### Corrosion

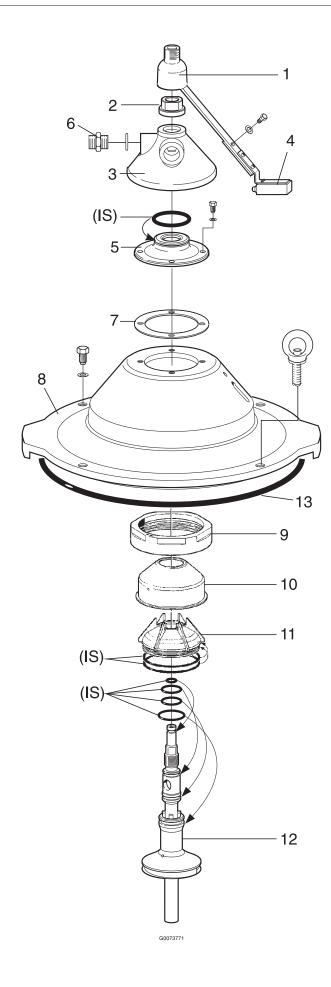
- 5.3.1 Corrosion on page 42
- 5.3.3 Cracks on page 45
- 5.3.4 Discharge mechanism on page 46
- 5.3.6 Spindle top cone and bowl body nave on page 49
- 5.3.7 Threads of inlet pipe, paring disc on page
- 5.3.8 Threads on bowl hood and bowl body on page 50
- 5.3.10 Disc stack pressure on page 52
- 5.4.1 Paring disc height adjustment on page 53



- 22. Cap nut
- 23. Upper distributing ring
- 24. Valve plug
- 25. Operating slide
- 26. Lower distributing ring
- 27. Bowl body
- 28. Nozzle



- 15. Bowl hood
- 16. Top disc
- 17. Bowl discs
- 18. Wing insert
- 19. Bowl discs
- 20. Distributor
- 21. Sliding bowl bottom
- SK. Sealing kit
- DK.Discharge kit



- 1. Safety device
- 2. Nut
- 3. Inlet/outlet housing
- 4. Interlocking switch (optional)
- 5. Support ring

The support ring is removed from the frame hood top, at paring disc adjustment (Major Service)

- 6. Insert
- 7. Height adjusting ring
- 8. Frame hood
- 9. Lock ring
- 10. Disc
- 11. Paring chamber cover
- 12. Inlet pipe with paring disc
- 13. O-ring
- IS. Intermediate service kit
- MS.Major service kit

- Clean the hollow part (b) of the spindle top and the radial hole (a). Wipe clean the spindle top and nave bore in the bowl body. Apply oil to the tapered end of the spindle, smear the oil over the surface and wipe off surplus with a clean cloth.
- 2. Clean the nozzles in the bowl body, see 5.3.4 Discharge mechanism on page 46.

#### **Check point**

5.3.6 Spindle top cone and bowl body nave on page 49 and 5.3.9 Priming of bowl parts on page 51.

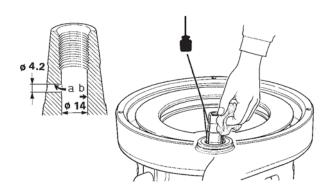
- 3. Fit the bowl body (27) on the spindle. Avoid damaging the spindle cone.
  - Attach the special lifting tool to the bowl body nave.
  - Screw down the central screw of the tool, then lower the bowl body until the screw rests on the spindle top.
  - Screw up the central screw and the bowl body will sink down on the spindle cone.



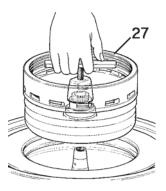
Using the lifting bolts fit the operating slide (25).

Make sure that the seal rings lie concentrically in their grooves.

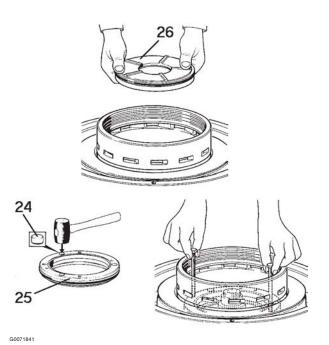
If replacing valve plugs (24), use a rubber mallet.



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G0071831



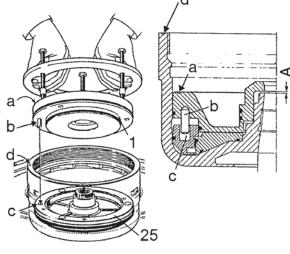
96

5. Fit the upper distributing ring so that drill mark (a) is in line with hole (c) on the distributing ring. When the distributing ring is in correct position the guide pin (b) will enter hole (c).



The two guide pin (b) in the distributing ring have to be fitted properly in the hole (c).

Check the distance "A". If the play is larger than 2 mm the guide pins have not entered the hole properly.

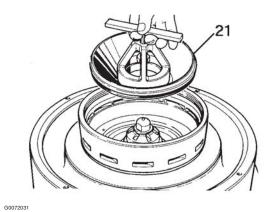


- G0378031
- a. Drill mark
- b. Guide pin
- c. Guide pin
- 6. Screw cap nut (22) counter-clockwise onto the spindle. Tighten firmly.

Left-hand thread!



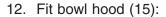
 Fit sliding bowl bottom (21). Make sure that the square seal ring lies concentrically in its groove. Press the sliding bowl bottom down on the upper distributing ring.



#### 8. Check point

Before assembling the bowl discs, check the threads of the bowl hood and bowl body, see 5.3.8 Threads on bowl hood and bowl body on page 50.

- Assemble the bowl discs with wing insert and top disc on the distributor. Note the angular positioning (six options). Ensure that the pins in the distributor fit properly into the holes of the top disc.
- 10. Preparations for lifting in the disc stack
  - Fit the compression tool and screw down the central screw until it stops
  - Tighten the compression nut by hand
- 11. Fit the disc stack assembly in the bowl body. Make sure that the cuts in the wings on the underside of the distributor fit properly in the corresponding lugs of the bowl.



- Apply a thin layer of Molykote Paste 1000 to threads and on contact and locating surfaces.
- Fit the spanner for the bowl hood and secure it with the bolt (a).
- Screw on the bowl hood by hand.

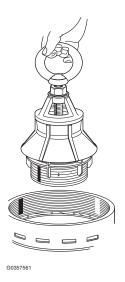
#### Left-hand thread!

13. Fit the compressing tool and screw down the central screw (b) until it stops. Compress the disc stack by tightening the nut (a) firmly.



Use the compression tool as instructed. Use of substitute tools can damage the equipment.

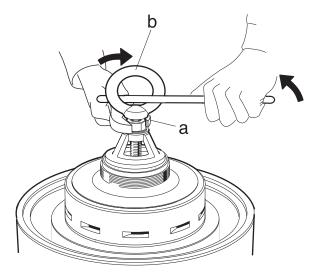
**Check point** 5.3.10 Disc stack pressure on page 52.











G007236

14. Attach the spanner and tighten the bowl hood by using a tin hammer. Strike the spanner handle until the bowl hood lies tightly against the bowl body. In a new bowl, the assembly marks now will be in line with each other.



#### **Disintegration hazard**

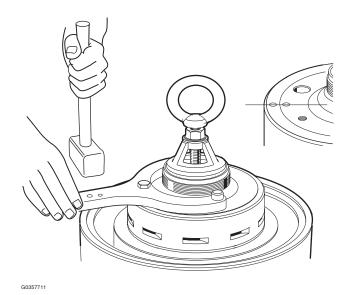
The assembly mark on the bowl hood must never pass the mark on the bowl body by more than 25°.

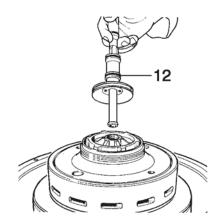
Also see 5.3.8 Threads on bowl hood and bowl body on page 50.

15. Place inlet pipe (12) in the bowl.

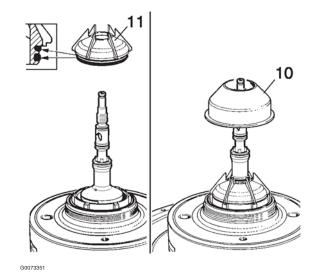
**Check point** 5.3.7 Threads of inlet pipe, paring disc on page 49.

- Fit paring chamber cover (11) by pressing it down gently.
- 17. Assemble the disc (10).



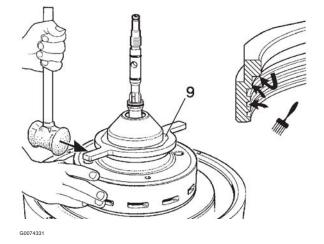


G0072731



18. Fit lock ring (9). Apply a thin layer of Molykote Paste 1000 to the threads and on contact and locating surfaces.

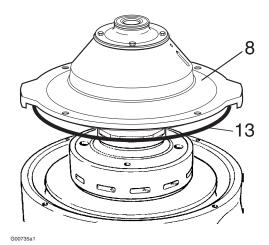
#### Left-hand thread!



19. Fit frame hood (8) and O-ring (13). The two eye-bolts must be fitted in the holes nearest to the electric motor.

In case of Major Service remove the connecting housing and fit a new O-ring on the insert (2).

Check point 5.4.1 Paring disc height adjustment on page 53. To be performed at Major Service and if the bowl spindle has been dismantled.



20. Fit inlet/outlet housing. Tighten nut.

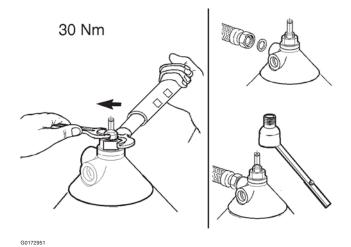
#### Left-hand thread!

21. Then rotate the bowl by means of the flat belt. If the bowl does not rotate freely or a scraping noise is heard, incorrect bowl assembly or incorrect height adjustment of the paring disc can be the cause.



To avoid damage on the inlet pipe the tightening torque must not exceed 30 Nm.

- 22. Make sure that the gasket on the safety device is in position. If not, glue with Loctite 407. Fit and secure safety device.
- 23. Fit the connecting hoses if they have been removed. Make sure to fit their gasket rings.
- 24. Fit the water tank on the frame bottom part if it has been removed.

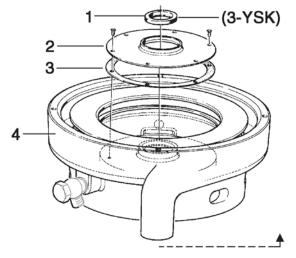


# 6.2 Bowl spindle and frame

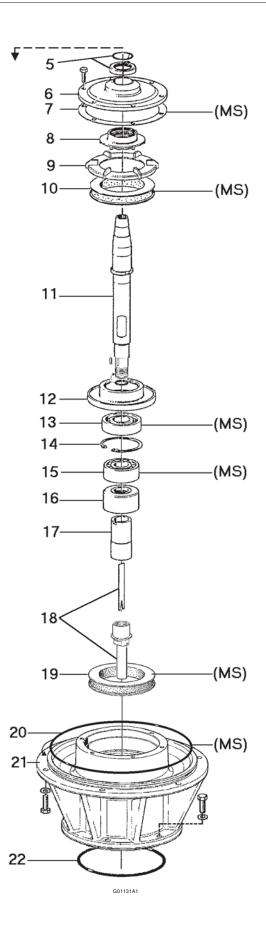
# 6.2.1 Bowl spindle and frame - dismantling

Before dismantling the bowl spindle, the inlet and outlet housing, frame hood and bowl as well as the flat belt must be removed.

Before dismantling, in the case of Major Service, or if the separator vibrates while running, see **Check point** 5.4.2 Radial wobble of bowl spindle on page 54.

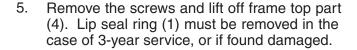


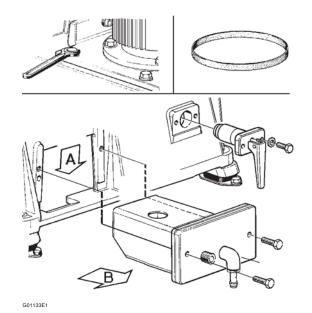
- G01132b
- 1. Lip seal ring
- 2. Screen
- 3. Gasket
- 4. Frame, top part
- 3-YSK .Parts to be renewed at Three year service

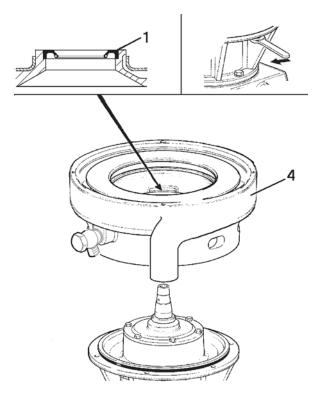


- 5. Deflector ring
- 6. Top bearing cover
- 7. Gasket
- 8. Fan
- 9. Buffer holder
- 10. Rubber buffer
- 11. Bowl spindle
- 12. Ball bearing holder
- 13. Ball bearing
- 14. Snap ring
- 15. Ball bearing
- 16. Oil pump
- 17. Belt pulley
- 18. Pump sleeve
- 19. Rubber buffer
- 20. O-ring
- 21. Frame, intermediate
- 22. O-ring
- MS.Parts to be renewed at Major Service

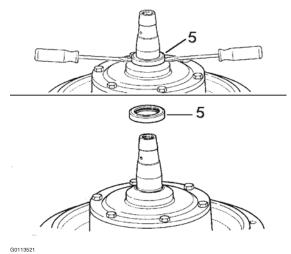
- Loosen but do not remove the motor adapter screws.
- 2. Remove the water tank.
- 3. Remove the brake.
- 4. Remove the flat belt.







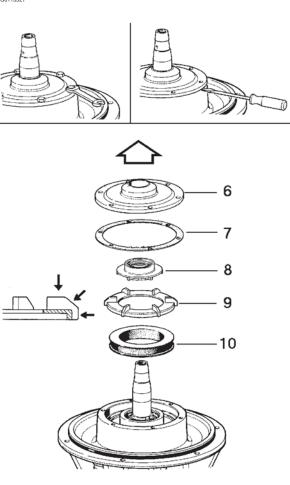
6. Clean the bowl spindle cone in place and remove deflector ring (5).



- 7. Remove, in the following sequence:
  - Top bearing cover (6)
  - Gasket (7)
  - Fan (8)
  - Buffer holder (9)
  - Rubber buffer (10).



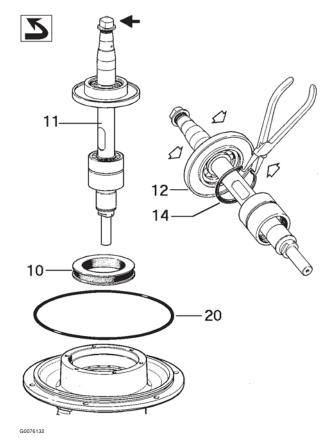
Be very careful not to damage the wings of the buffer holder.



8. Screw the cap nut counter-clockwise (left-hand thread) onto the spindle top to protect the top and bore.

Lift out spindle assembly (11), rubber buffer (10) and O-ring (20).

Remove snap ring (14) by using a pair of pliers and pull off ball bearing holder (12).

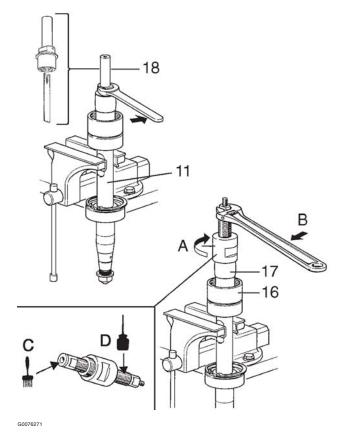


- 9. Clamp the bowl spindle (11) in a screw vice. Remove the pump sleeve (18). When turning the spindle upside down there is a risk that the vane in the pump sleeve can slide down partly or entirely into the spindle. Therefore, after unscrewing the sleeve, check that the vane has not been damaged.
- 10. Remove the belt pulley (17). If the pulley has stuck proceed with point 10.
- 11. Lubricate the mounting/dismantling tool.

Fit the mounting/dismantling tool and screw it down as far as it will go (A).

Use a long spanner (450 - 650 mm) to press the belt pulley off the spindle (B).

Remove the oil pump (16) by hand, do not loose the flat key.



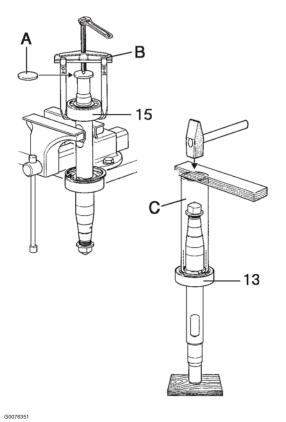
C. Molykote 1000 paste

D. Oil

12. Pull off ball bearing (15) using a puller (B) and thrust washer (A). Pull off bearing (13) using the special mounting tool (C) and a hammer.

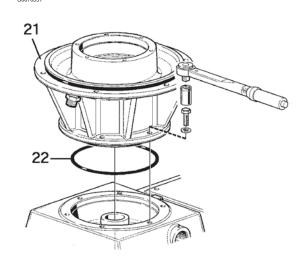


Always discard a used bearing.



- 13. Loosen the screws and lift off the frame intermediate part (21).
- 14. In case of 3-year-service

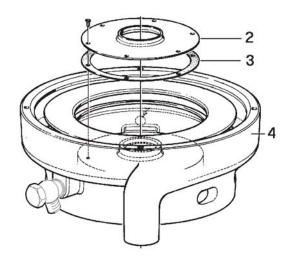
Discard the O-ring (22). This O-ring is not included in any service kit, but must be ordered separately.



G009379

- 15. Remove the screen (2) from the frame top part (4). Discard the gasket (3). This gasket is not included in any service kit, but must be ordered separately.
- 16. Clean the oil sump.
- 17. Clean all dismantled parts thoroughly in a degreasing agent and check for damage and corrosion.

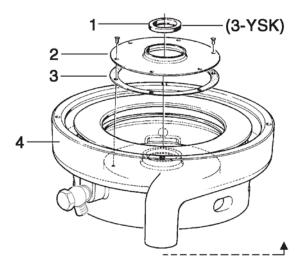
Replace all parts supplied in the spare parts kits.



G0113771

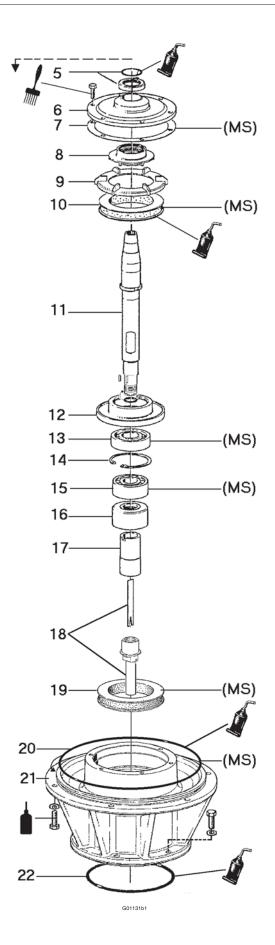
# 6.2.2 Bowl spindle and frame - assembly

The bowl spindle and frame is assembled in reverse sequence to dismantling.



G01132b

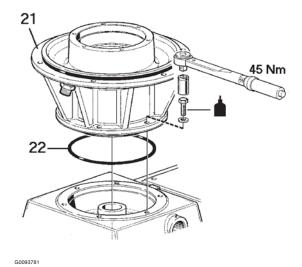
- 1. Lip seal ring
- 2. Screen
- 3. Gasket
- 4. Frame, top part
- 3-YSK . Parts to be renewed at Three year service



- 5. Deflector ring
- 6. Top bearing cover
- 7. Gasket
- 8. Fan
- 9. Buffer holder
- 10. Rubber buffer
- 11. Bowl spindle
- 12. Ball bearing holder
- 13. Ball bearing
- 14. Snap ring
- 15. Ball bearing
- 16. Oil pump
- 17. Belt pulley
- 18. Pump sleeve
- 19. Rubber buffer
- 20. O-ring
- 21. Frame, intermediate
- 22. O-ring
- MS.Parts to be renewed at Major Service
- A. Molykote 1000 paste (thin layer to be rubbed into surface)
- B. Silicone grease (thin layer)
- C. Loctite 242
- MS.Major service kit

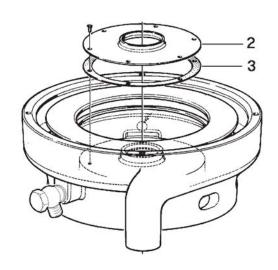
## 1. In case of 3-year-service.

Fit a new O-ring (22) and assemble the frame intermediate part (21). Use a torque wrench and tighten the screws lightly crosswise at first. Then tighten all around to 45 Nm. Secure the screws with Loctite 242.

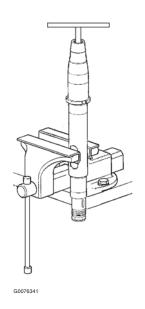


## 2. Fit a new gasket (3).

Fit the screen (2).



# 3. Clear the spindle bore from dirt and lime deposits with the special reamer



G0113761

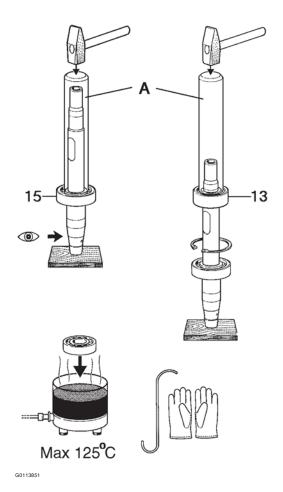
4. Inspect the tapered end and the hollow part of the bowl spindle for wear and clean if necessary. Assemble ball bearings (13 and 15).

Heat the new ball bearings in oil to maximum 125  $^{\circ}$ C. Use the special mounting tool (A) from the tool kit.

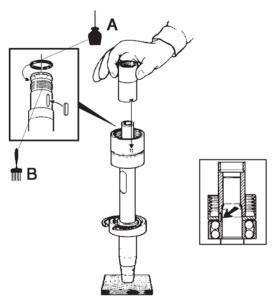


Always fit new bearings.

If in doubt how to install roller bearings in a correct way, please see the detailed description in 5.11.1 Ball and roller bearings on page 75.



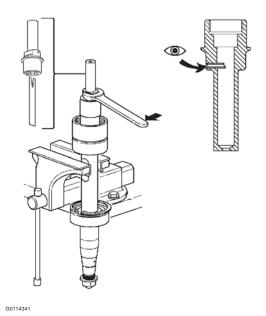
5. Fit oil pump, flat key and belt pulley. Make sure that the recess in the belt pulley fits over the guide pin in the oil pump.



A. Oil B. Molykote 1000 paste (Thin layer to be rubbed into surface)

G0113961

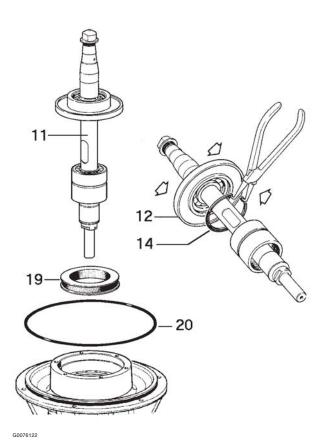
6. Check that the radial hole (Ø 1 mm) in the pump sleeve is clean, and fit the pump.



7. Fit ball bearing holder (12) and secure it with snap ring (14).

Fit O-ring (20) and rubber buffer (19).

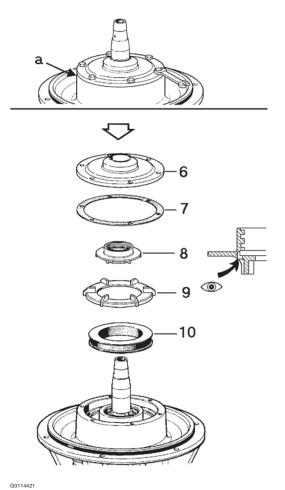
Lower spindle assembly (11) carefully into the separator intermediate frame.



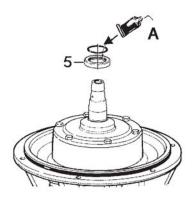
- 8. Assemble, in the following sequence:
  - Rubber buffer (10)
  - Buffer holder (9)
  - Fan (8)
  - Gasket (7)
  - Top bearing cover (6)
     Make sure that the Ø 3 mm hole in fan (8) is
     clean and the lugs in the fan enter the recesses
     in the bowl spindle.

Before tightening, make sure that there is some play (a) between top bearing cover (6) and the frame. The play will disappear when the screws are tightened.

Tighten the screws sequentially (not crosswise) in order to successively compress the rubber buffers.



9. Push down deflector ring (5) till it stops.



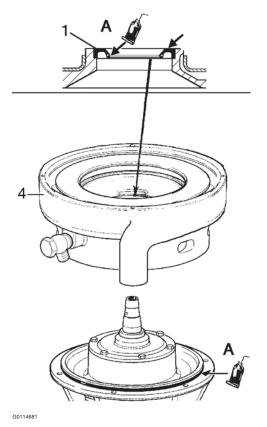
A. Silicone grease (thin layer)

G0114541

10. Assemble frame top part (4). If lip seal ring (1) has been removed, fit a new one before the frame top part is put in place.

Make sure the lip seal is turned the correct way. See illustration.

When frame top part (4) is assembled there shall be a small gap between the bowl spindle and the lip seal (1).

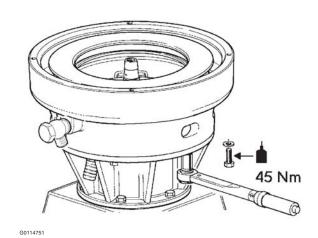


A. Silicone grease (thin layer)

11. Tighten the screws of the top frame using a torque wrench (width across flats 16 mm).

Tighten the screws slightly crosswise at first. Then tighten all around to 45 Nm.

Secure the screws with Loctite 242.

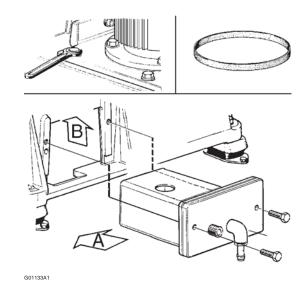


12. Fit and adjust the flat belt, see on page .

# **Check point**

5.4.2 Radial wobble of bowl spindle on page 54

13. Fit the water tank and tighten the screws.



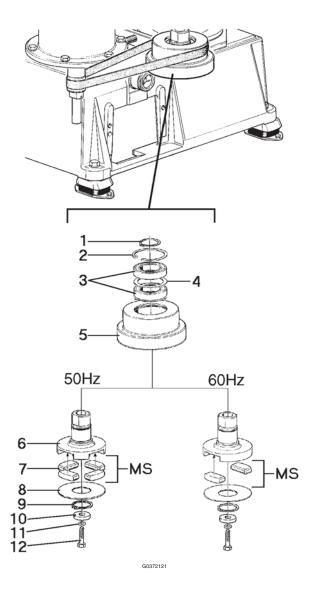
# 6.3 Friction coupling

If the separator does not attain full speed within about 2 minutes, the friction elements or the coupling may be worn or greasy. The friction elements must then be replaced with new ones or be thoroughly cleaned from grease.



#### **Entrapment hazards**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work.



- 1. Snap ring
- 2. Snap ring
- 3. Ball bearings
- 4. Washer
- 5. Belt pulley
- 6. Coupling hub
- 7. Friction element
- 8. Cover
- 9. Snap ring
- 10. Washer
- 11. Spring washer
- 12. Screw

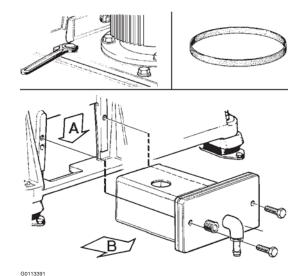
MS.Set of friction elements included in the Major service Kit for 50 Hz or 60 Hz

## 6.3.1 Friction coupling - dismantling

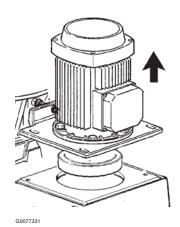
- 1. Check that the belt tightener is in backward position.
- 2. Remove the motor adapter screws.
- 3. Remove the water tank and the flat belt.

Note that the tank must be lowered past spindle end (A) before it can be withdrawn (B).

4. Remove the flat belt.



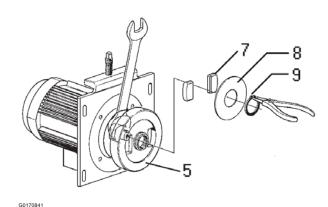
 Remove the electric motor complete with the friction coupling and motor adapter. Weight of motor including adapter and friction coupling is not more than 35 kg.



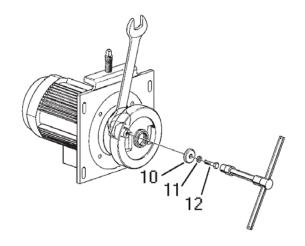
6. Remove snap ring (9), cover (8) and friction elements (7).

If the friction elements are worn, fit new ones. Replace all friction elements even if only one is worn.

If the friction elements are only greasy: Clean the friction elements and the inside of belt pulley (5) with a degreasing agent.

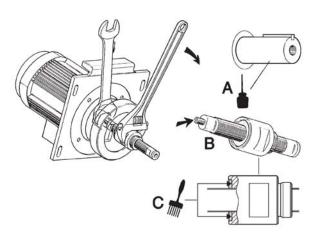


7. Remove the screw (12), spring washer (11) and washer (10) from the friction coupling.



# Complete dismantling of the friction coupling

1. Lubricate and fit the special mounting and dismantling tool. Ease off the coupling.



G0171051

G0170921

A. Oil

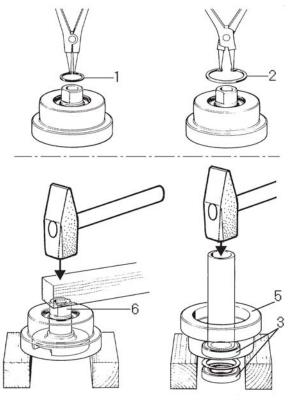
B. Mounting tool

C. Molykote 1000 Paste (thin layer to be rubbed into surface)

- 2. Remove snap rings (1 and 2) and drive off coupling hub (6). Turn the coupling, i.e. belt pulley (5) with bearings (3), the other way round and drive off the ball bearings and washer by using a tube.
- 3. Clean all parts in a degreasing agent and replace parts supplied in the spare parts kits.



Always discard a used bearing.



## 6.3.2 Friction coupling - assembly

Before the friction coupling is assembled, examine all parts thoroughly for wear and corrosion.

Assemble the new ball bearings in belt pulley
 by using a tube and a hammer.

Apply Loctite 641 on the outer surfaces of ball bearings (3).

Knock down the bearings carefully (do not forget washer 4) by using the tube which must rest on the outer race of the bearing.

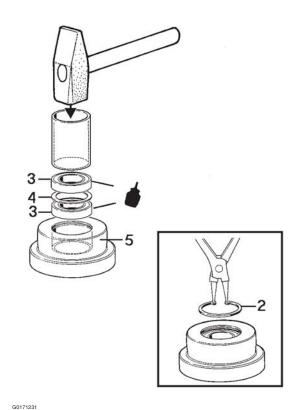
The new bearings must not be heated as they are packed with grease and sealed with plastic membranes.

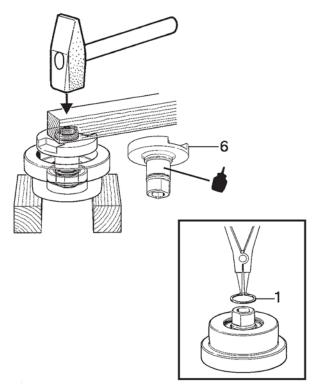
After the assembly of the bearings, fit snap ring (2).



Do not refit used bearings.

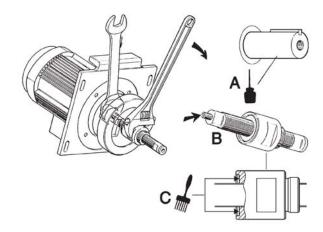
- 2. Apply Loctite 641 on the coupling hub (6) and knock it down into the belt pulley by using a hammer.
- 3. Fit snap ring (1).





G0171321

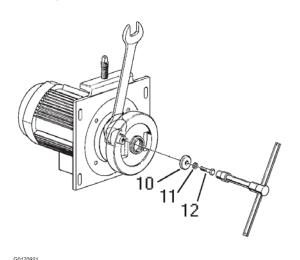
4. Wipe clean the motor shaft and apply a thin oil film on it. Fit the special mounting and dismantling tool to the motor shaft (by means of the small screw on one end of the tool) and press the friction coupling onto the shaft.



G0171051

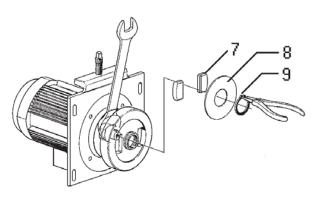
A. Oil B. Mounting tool Molykote 1000 Paste (thin layer to be rubbed into surface)

5. Fit the screw (12) with the washer (11) and spring washer (10) to secure the friction coupling.



#### Assembly of friction elements

- 1. Fit new friction elements (7), cover (8) and snap ring (9).
  - A coupling with two friction elements is used for 60 Hz installations.
  - A coupling with four friction elements is used for 50 Hz installations.

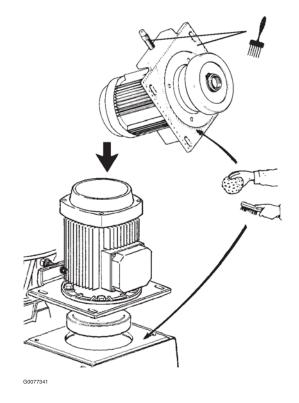


G0170831

- 2. Degrease and clean the contact surfaces of frame and motor adapter. Lubricate the contact surfaces with Molykote 1000 paste. Then fit the electric motor with adapter and friction coupling in position. Also lubricate the threads of the belt tightener with Molykote 1000 paste or similar.
- 3. Fit and tighten the flat belt, see on page.
- Install the water tank and the cover.



The belt must be re-tightened before starting the separator, see next page.



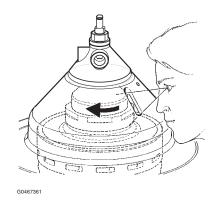
# 6.4 Change of belt



#### **Entrapment hazards**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work.

Look into the slot in the frame hood to see if separator parts are rotating or not.



Alfa Laval ref. 9007861 Rev. 2

#### Remove water tank or cover and brake

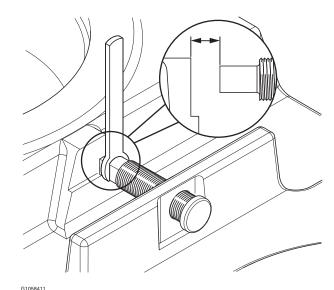
1. For separators with water tank: Remove the water tank by lowering the back end of the tank and then pulling it out of the frame.

For separators without water tank: Remove the cover.

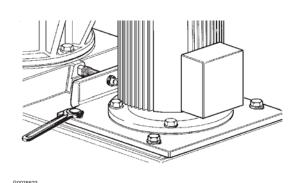
2. Remove the brake.

#### Remove belt

1. Adjust the belt tightener to make sure there is a gap between frame pad and belt tightener.



Loosen but do not remove the motor adapter screws.



- 3. Remove the belt.
- 4. Clean the raceways and the friction coupling.

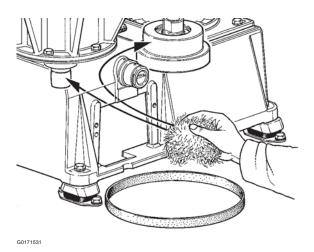
Clean the raceways of the bowl spindle and the friction coupling using a degreasing agent.

Wipe the raceways with a clean rag after cleaning.



Make sure there is no dirt, oil or grease on the raceways.

5. Remove the motor adapter screws.



6. Remove the motor and the friction coupling.

Lift the motor together with adapter and friction coupling.



The capacity of the lifting equipment should be at least 50 kg.

7. Lubricate the adapter and the frame surface.

Make sure there is a sufficient film of lubricating paste between the adapter and the frame surface.

For more information regarding lubricants refer to the lubrication instructions for the product.

- 8. Install motor and friction coupling.
- 9. Fit the motor adapter screws but do not tighten them.
- 10. Lubricate the threads of the belt tightener.

Make sure there is a sufficient film of lubricating paste on the threads of the belt tightener.

For more information regarding lubricants refer to the lubrication instructions for the product.

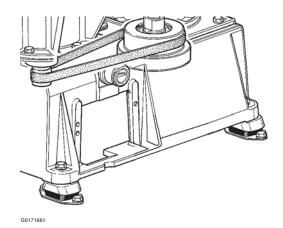
# G0027341

#### Install belt

1. Assemble the belt on the motor side first and then on to the spindle.

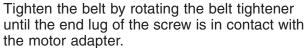
Tighten the belt by moving the motor backwards by hand.

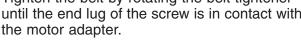
Pull the belt around a few turns by hand.

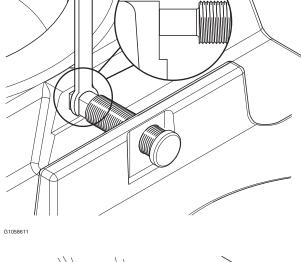


#### 2. Tighten belt

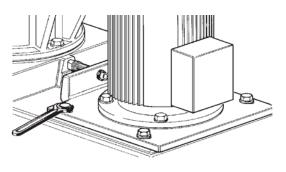
Rotate the belt tightener until it makes contact with the frame pad.







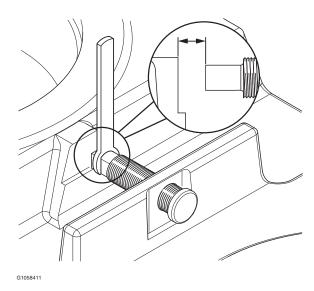
3. Tighten the motor adapter screws.



G0076622

G1058511

4. Loosen the belt tightener.



## Install water tank or cover and brake

1. For separators with water tank: Install the water tank.

For separators without water tank: Install the cover.

2. Install the brake.

#### Before starting the separator

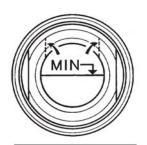
Wait at least 30 minutes before starting the separator.

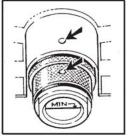
# 6.5 Oil filling device

## 6.5.1 Dismantling/assembly

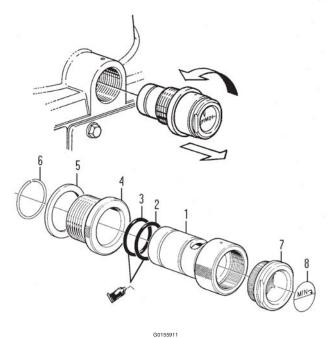
Drain off the oil, see 5.8 Oil change on page 61.

- 1. Unscrew nipple (4) and pull off the oil filling device. Then unbend the round safety wire (6) and pull off nipple (4).
- 2. If plate (8) is to be replaced, wipe the sight glass (7) with a degreasing agent.
- 3. Fit the new plate on the outside of the sight glass. The plate is self-adhesive.
- 4. Mark the position of the plate relative to the recess in sleeve (1).
- Assemble the oil filling device and fit it into the frame. Note that the mark on sleeve (1) must be positioned opposite the mark on the frame. Fill the sump with new oil.





G0155811



- 1. Sleeve for oil filling
- 2. O-ring, Silicone grease (thin layer)
- 3. O-ring, Silicone grease (thin layer)
- 4. Nipple
- 5. Sealing ring
- 6. Round safety wire
- 7. Sight glass
- 8. Plate

## 6.6 Water tank

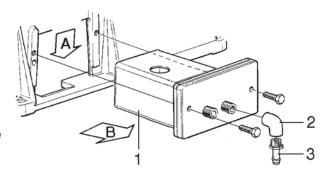
Remove the water tank (1).

Note that the tank must be lowered past the spindle end (A) before it can be withdrawn (B).

- Check the tank interior and clean out if necessary.
- Check that the pipes are not defective. Replace if necessary.

If the parts fitted on the tank have been removed, it is necessary to fit the parts properly together at assembly.

Seal the water inlet pipe with Loctite 573.



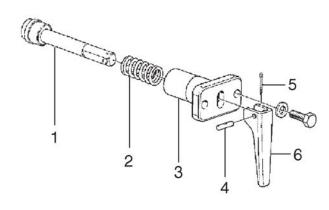
- 1. Water container
- 2. Elbow

G0884711

3. Pipe

# 6.7 Brake

# 6.7.1 Exploded view

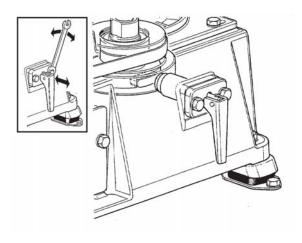


- G0171731
- 1. Spindle with friction element
- 2. Spring
- 3. Bracket
- 4. Cylindrical pin with hole
- 5. Split pin
- 6. Brake handle

## 6.7.2 Checking of friction element

A worn or oily friction element will lengthen the stopping time. Remove bracket with the brake. Examine the friction element.

- If the friction element is worn; Fit a new complete spindle (includes friction element).
- If the friction element is oily; Clean the element and its surface in contact with the belt pulley with a suitable degreasing agent.

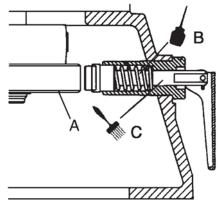


G0171821

### Checking of bracket, spindle and spring

Rust can form on the brake parts and cause the brake to jam.

Remove rust from the spindle and the corresponding guide surface on the bracket. Rub the surface of the spindle with a thin layer of lubricating paste. Replace the spring with a new one if it has lost its stiffness. Oil the spring when assembling.



G0171941

- A. Coupling surface
- B. Oil
- C. Molykote 1000 Paste

#### Checking the brake

After the brake assembly has been fitted, release the brake and rotate the bowl slowly by hand. If a scraping noise is heard, the friction element is probably touching the coupling pulley surface (A). If so, it is necessary to adjust the position of the motor adapter and re-tighten the flat belt, see on page.

# 6.8 Frame feet

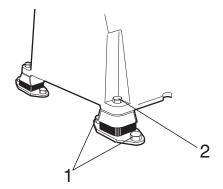
# 6.8.1 Mounting of new frame feet

When replacing the frame feet, the separator must be lifted.

Remove the bowl before lifting the separator.

Follow the Lifting instructions.

- 1. Loosen the foundation bolts and lift the separator.
- 2. Remove the existing frame feet.
- 3. Mount the new feet.
- 4. Place the separator in its original position and fasten the foundation bolts.
- 5. Remove the two lifting eye bolts.
- 6. Assemble the separator bowl, see 6.1.2 Inlet/outlet and bowl assembly on page 91.



- G0358351
- 1. Foundation bolts
- 2. Bolt

# 7 Technical Reference

# 7.1 Product description

Alfa Laval ref. 9010798 Rev. 0



The separator is a component operating in an integrated system including a monitoring system.

If the technical data in the system description does not agree with the technical data in this instruction manual, the data in the system description is the valid one.

Product specification: 881099-07-02/0

Commercial name: S 805
Application: Mineral oil

**Technical Design:** Clarifier (alternative Purifier).

Partial discharge

Belt drive machine bottom part

Intended for marine and land applications.

Colour of finish painting of painted parts according to order. Quality of painting according to specifications on drawings.

Sealings available in Nitrile.

**Operational limits:** 

Discharge interval: 2 - 60 minutes Feed temperature: 0 °C to + 100 °C

Maximum allowed density of operating liquid: 1000 kg/m<sup>3</sup>.

Ambient temperature: + 5 °C to + 55 °C

Not to be used for liquids with flashpoint below 60 °C.

Risk for corrosion and erosion have to be investigated in each case.

# 7.2 Directives & Standards

Alfa Laval ref. 591985 Rev. 5

#### **Declaration of Incorporation of Partly Completed Machinery**

The machinery complies with the relevant, essential health and safety requirements of:

| Designation | Description         |
|-------------|---------------------|
| 2006/42/EC  | Machinery Directive |

To meet the requirements the following standards have been applied:

| Designation  | Description  |
|--------------|--|
| EN 60204-1   | Safety of machinery - Electrical equipment of machines. Part1: General requirements      |
| EN ISO 12100 | Safety of machinery - General principles for design - Risk assessment and risk reduction |
| ISO 3744     | Acoustics - Determination of sound power levels of noise sources using sound pressure    |

#### **Declaration of Conformity**

The machinery complies with the following Directives:

| Designation | Description                             |
|-------------|---|
| 2004/108/EC | Electromagnetic Compatibility Directive |

To meet the requirements the following standards have been applied:

| Designation  | Description   |
|--------------|---|
| EN 60204-1   | Safety of machinery - Electrical equipment of machines. Part 1: General requirements                              |
| EN 61000-6-2 | Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity for industrial environments          |
| EN 61000-6-4 | Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments |
| EN ISO 12100 | Safety of machinery - General principles for design - Risk assessment and risk reduction                          |

This machinery is to be incorporated into other equipment and must not be put into service until it has been completed with starting/stopping equipment, control equipment, auxiliary equipment. e.g. valves, according to the instructions in the technical documentation, and after the completed machinery has been declared in conformity with the directives mentioned above, in order to fulfill the EU-requirements.

7 Technical Reference 7.3 Technical Data

# 7.3 Technical Data

Alfa Laval ref. 561687 Rev. 3

| Maximum density                   | feed  | 1100 kg/m <sup>3</sup>                       |
|-----------------------------------|---|--|
|                                   | sediment  | 2631 kg/m <sup>3</sup>                       |
| Power consumption                 | idling  | 0,8 kW                                       |
|                                   | running (at max. capacity)                        | 1,8 kW                                       |
| Dowl and dynahronous              | max. power consumption 9512/9307                  | 2,8 kW (at starting-up)                      |
| Bowl speed synchronous            |   | r/min. 50Hz/60Hz                             |
| Motor speed synchronous           | 3000/3600   | r/min. 50Hz/60Hz                             |
| Gear ratio (pulleys)              | 130:41 (50 Hz)<br>106:41 (60 Hz)                  |  |
| Starting time min./max. 50 Hz     | 2,4 - 3,2 minutes                                 |  |
| Starting time min./max. 60 Hz     | 3,3 / 4,0 minutes                                 |  |
| Stopping time                     | Running down without brake With brake             | average 14 minutes<br>min. 3, max. 4 minutes |
| Maximum running time without flow | Empty bowl/Filled bowl                            | 180 minutes                                  |
| Sludge volume total/efficient     | 0,6 / 0,2 litres                                  |  |
| Fixed discharge bowl volume       | 1,0 litres  |  |
| Discharge volume                  | 1 litre (nominal) fixed                           |  |
| Max. density of operating liquid  | 1000 kg/m <sup>3</sup>                            |  |
| Max. bowl inner diameter          | 198 mm  |  |
| Lubricating oil volume            | 0,5 litres  |  |
| Bowl liquid volume                | 1,5 litres  |  |
| Sound pressure level              | 69 dB(A)  |  |
| Vibration level                   | Separator in use                                  | Max. 9 mm/sec                                |
| Weight                            | Separator without motor<br>Motor<br>Complete bowl | Net weight approx. 191 kg<br>16 kg<br>35 kg  |
| Motor power                       | 2,2 / 2,5 Kw                                      |  |
| Jp reduced to motor shaft, 50 Hz: | 2,5 kg/m <sup>3</sup>                             |  |
| Jp reduced to motor shaft, 60 Hz: | 1,7 kg/m <sup>3</sup>                             |  |
| Bowl material                     | AL 111 2377-02                                    | stainless steel                              |



The separator is a component operating in an integrated system including a monitoring system. If the technical data in the system description does not agree with the technical data in this instruction manual, the data in the system description is the valid one.

# 7.4 Connection list

Alfa Laval ref. 579648 Rev. 0

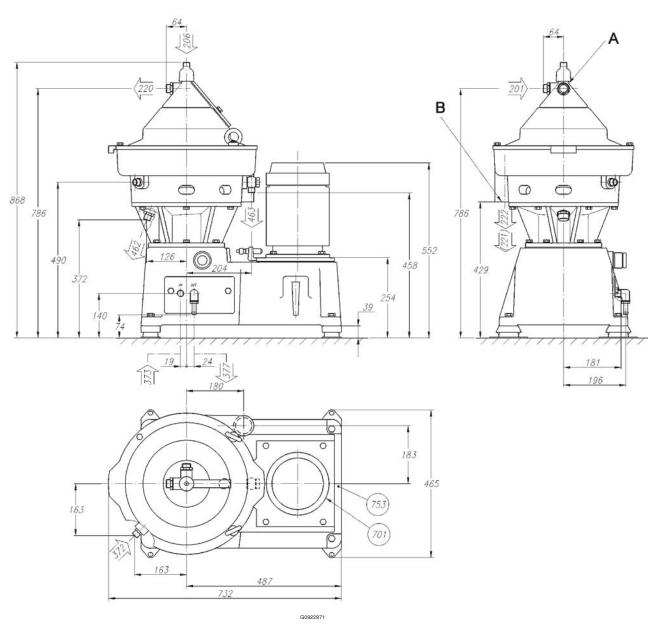
| Connection No. | Description  | Requirements/limits   |
|----------------|--|---|
| 201            | Inlet for process liquid - Flow - Pressure   | See 7.11 Performance data, in- and outlet device on page 154 See 7.11 Performance data, in- and outlet device on page 154   |
| 206            | Inlet for liquid seal and displacement liquid Quality requirements: - Flow, set value: | See 7.7 Water quality on page 149 1,3 litres/minute   |
| 220            | Outlet for light phase, clarified liquid - Counter pressure - Capacity                 | See 7.11 Performance data, in- and outlet device on page 154. See 7.11 Performance data, in- and outlet device on page 154.   |
| (221)          | Outlet for heavy phase   | Should be possible to drain liquids by gravity.   |
| 222            | Outlet for solid phase - Discharge volume:   | See 7.3 Technical Data on page 137Technical data. The outlet after the separator should be installed in such a way that you can not fill the frame top part with sludge. (Guidance of sludge pump or open outlet) |
| 372            | Inlet for discharge liquid Flow, set value: - Quality requirements:                    | 18 litres/minute<br>See 7.7 Water quality on page 149   |
| 373            | Inlet for make-up liquid Flow, set value: - Quality requirements: - Consumption:       | 0,9 litres per minute See 7.7 Water quality on page 149 0,9 litres per discharge  |
| 377            | Outlet for operating liquid.   | Should be possible to drain liquids by gravity.   |
| 462            | Drain of frame top part, lower   | Should be possible to drain liquids by gravity.   |
| 463            | Drain of frame top part, upper.  | Should be possible to drain liquids by gravity.   |
| 701            | Motor for separator - Allowed frequency variation (momentarily during 5 seconds)       | ± 5%<br>± 10%   |

7 Technical Reference 7.4 Connection list

| Connection No. | Description   | Requirements/limits  |
|----------------|---|--|
| 753            | Unbalance sensors, vibration - Type: - Frequency range: - Vibration measurement range: - Internal impedance: - Reset coil voltage: - Reset coil power: - Switch rating, resistive load max. | Mechanical switch < 300 Hz < 4,5 g 4 kΩ ± 5% 48 V DC Max. 14 W 2 A @ 24 V DC |

# 7.5 Basic size drawing

Alfa Laval ref. 565297 Rev. 2

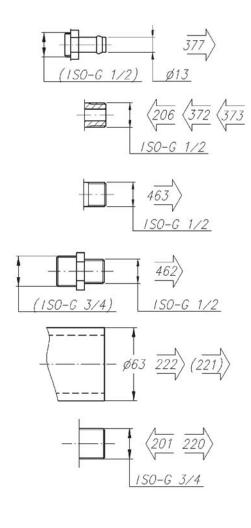


Connections 201 and 220 are turnable 90°.

- A. Maximum horizontal displacement during operation ± 20 mm.
- B. Maximum vertical displacement during operation ± 10 mm.

# 7.5.1 Dimensions of connections

Alfa Laval ref. 565297 Rev. 2



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All dimensions are nominal.

Reservation for individual deviations due to tolerance.

All connections to be installed non-loaded and flexible.

Data for connections see 7.4 Connection list on page 138.

# 7.6 Interface Description

Alfa Laval ref. 565810 Rev. 0

## 7.6.1 Scope

This document gives information, requirements, and recommendations about operational procedures and signal processing for safe and reliable operation of the separator. It is intended to be used for designing auxiliary equipment and control systems for the separator.

#### 7.6.2 References

This Interface Description is one complementary document to the separator. Other such documents that contain necessary information and are referred to here are:

- Interconnection Diagram
- Connection List
- Technical Data
- Operating Water Interface

#### Standards referred to are:

- EN 418 Safety of machinery Emergency stop equipment, functional aspects - Principles of design
- EN 1037 Safety of machinery Prevention of unexpected start-up

#### 7.6.3 Definitions

For the purpose of this document, the following definitions apply:

- Synchronous speed: The speed the machine will attain when it is driven by a three phase squirrel-cage induction motor and there is no slip in the motor and the drive system.
- Full speed: The synchronous speed minus normal slip.

#### 7.6.4 Goal

To eliminate situations that can cause harm, i.e. injury, damage to health or property and unsatisfactory process result are e.g.:

| Situation  | Effect  |
|--|---|
| Unbalance caused by uneven sediment accumulation in the bowl. Too high bowl speed. | Too high stress on bowl and bearing system which might cause harm.  Too high stress on bowl which might cause harm. |
| Access to moving parts.  Insufficient cleaning of separator.                       | Can cause injury to person who accidentally touches these parts. Unsatisfactory product quality.                    |
| Bowl leakage.  | Product losses.   |

Information and instructions given in this document aim at preventing these situations.

Control and supervision can be more or less comprehensive depending on the type of used control equipment. When a simple control unit is used it would be impossible or too expensive to include many of the functions specified here while these functions could be included at nearly no extra cost when a more advanced control unit is used. For this reasons functions that are indispensable or needed for safety reasons to protect the machine and/or personnel are denoted with *shall* while other functions are denoted with *should*.

# 7.6.5 Description of separator modes

For control purposes the operation of the separator should be divided into different modes. The normally used modes are described below but other modes might exist. It is assumed that:

- The separator is correctly assembled.
- All connections are made according to Connection List, Interconnection Diagram and Interface Description.
- The separator control system is activated.

If above conditions are not fulfilled the separator is unready for operation.

#### Stand still means:

- The power to the separator motor is off
- The bowl is not rotating.

### Starting means:

- The power to the separator motor is on.
- The bowl is rotating and accelerating.

#### **Running means:**

- The power to the separator motor is on.
- The bowl is rotating at full speed.
- RUNNING is a collective denomination for a number of sub modes which e.g. can be:
  - STAND BY: Separator is in a waiting mode and not producing.
  - *PRODUCTION*: Separator is fed with product and producing.
  - CLEANING: Separator is fed with cleaning liquids with the intention to clean the separator.

#### **Stopping means:**

- The power to the separator motor is off.
- The bowl is rotating and decelerating.
- STOPPING is a collective denomination for a number of sub modes which e.g. can be:
  - NORMAL STOP: A manually or automatically initiated stop.
  - SAFETY STOP: An automatically initiated stop at too high vibrations.
  - EMERGENCY STOP: A manually initiated stop at emergency situations. This stop will be in effect until it is manually reset.

# 7.6.6 Handling of connection interfaces

#### **Electrical connections**

701 Separator motor.

The separator is equipped with a 3-phase DOL (Direct On Line) started motor.

There shall be an emergency stop circuit designed according to EN 418 and a power isolation device according to EN 1037.

There shall be a start button close to the separator that shall be used for first start after assembly of the separator.

There should be a counter to count number of running hours.

There should be a current transformer to give an analogue signal to the control unit about the motor current.

#### 753 Unbalance sensor.

For indication of any abnormal unbalance and to be able to perform appropriate countermeasures, the separator may be equipped with a vibration initiated mechanical switch on the separator frame.

The vibration monitor shall include a self-check function to be performed at least at initiation of STARTING.

If to high vibrations occur the separator shall be stopped the quickest way possible and it shall not be restarted until the reasons for the vibrations have been found and measures to remove them have been taken.

Signal processing in *STARTING*:

- If to high vibrations occur the separator shall be stopped automatically by SAFETY STOP.
- If the self-check system triggers, an alarm shall be given and an automatic stop by NORMAL STOP shall be initiated.

Signal processing in *RUNNING*:

- If to high vibrations occur the separator shall be stopped automatically by SAFETY STOP.
- If the self-check system triggers, an alarm shall be given.

Signal processing in STOPPING:

 If the self check system triggers, an alarm shall be given..

Signal processing in NORMAL STOP:

 If to high vibrations occur the system shall turn over automatically to SAFETY STOP.

#### Fluid connections

Complementary information is given in the document Connection List.

201 Inlet for process liquids (feed).

Processing in STAND STILL:

Shall be closed.

Processing in STARTING:

 Should be closed. Bowl will be open and empty or closed and filled depending on if start is done from STAND STILL or STOPPING.

Processing in RUNNING:

- · Could be closed or open.
- Shall be closed before a discharge. See 8.2.1
   Operating water interface on page 172 or 8.3.1
   Operating water interface on page 173.

Processing in *NORMAL STOP* or *EMERGENCY STOP*:

 Could be closed or open but the bowl should be filled unless the stop is initiated in STARTING.

Processing in SAFETY STOP:

 Could be closed or open but the bowl shall be filled unless the stop is initiated in STARTING.

206 Inlet to liquid seal.

Processing in STAND STILL:

Shall be closed.

Processing in STARTING:

Shall be closed.

Processing in *RUNNING*:

 Supplying a liquid seal prior to opening the feed: See Operating water interface.  Displacing (the interface) before a discharge: See 8.2.1 Operating water interface on page 172 or 8.3.1 Operating water interface on page 173.

220 and 221 Outlets

Processing in STAND STILL:

Could be closed or open.

Processing in other modes

Shall be open.

372 Inlet for discharge liquid.

Processing in STAND STILL:

Shall be closed.

Signal processing in STARTING:

Shall be closed.

Signal processing in *RUNNING*:

- A discharge is initiated according to procedure in "Operating Water Interface".
- After a discharge has been triggered the motor current or bowl speed should be monitored to indicate if there comes a current peak or a sudden drop in speed. The absence of such a signal indicates that the discharge has failed and corrective action should be taken (e.g. trigger a new discharge). Absence of a discharge may result in problems due to solidification of the sediment. That the current returns to original value after discharge could also be supervised. If current is much higher after the discharge this might be an indication that the bowl has not closed properly after the discharge.
- For service purposes there should be a counter to count number of discharges.

373 Inlet for make-up liquid.

Processing in STAND STILL:

Shall be closed.

Signal processing in STARTING:

Shall be closed.

Signal processing in *RUNNING*:

 The separator bowl is closed according to procedure in "Operating Water Interface".

- The separator bowl is closed in a discharge sequence according to procedure in "Operating Water Interface".
- For service purposes there should be a counter to count number of discharges.

7 Technical Reference 7.7 Water quality

# 7.7 Water quality

Alfa Laval ref. 553406 Rev. 10

Operating water is used in the separator for several different functions: e.g. to operate the discharge mechanism, to lubricate and cool mechanical seals.

Poor quality of the operating water may cause erosion, corrosion and/or operating problem in the separator and must therefore be treated to meet certain demands.



Alfa Laval accepts no liability for consequences arising from unsatisfactory purified operating water supplied by the customer

### The following conditions must be fulfilled:

1. Turbidity free water, solids content <0,001% by volume

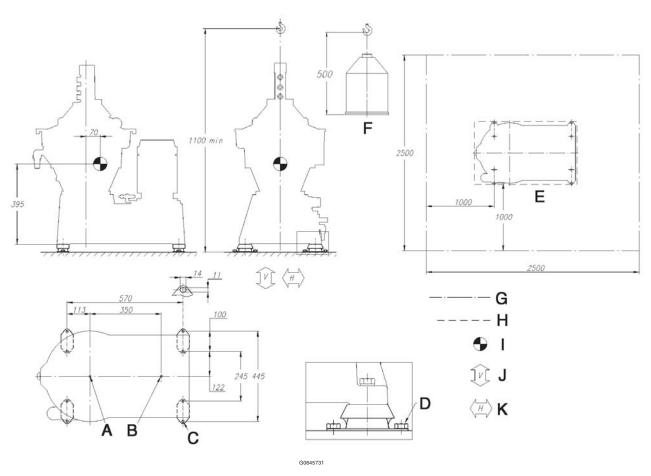
Deposits must not be allowed to form in certain areas in the separator.

- 2. A maximum particle size of 50 µm.
- 3. A total hardness of less than 180 mg CaCO<sub>3</sub> per litre, which corresponds to 10°dH or 12.5°E. Hard water may with time form deposits in the operating mechanism. The precipitation rate is accelerated with increased operating temperature and low discharge frequency. These effects become more severe as the hardness of the water increase.
- 4. A chloride content of maximum 100 ppm NaCl (equivalent to 60 mg Cl/l) A chloride concentration above 60 mg/l is not recommended. Chloride ions contribute to corrosion on the separator surface in contact with the operating water, including the spindle. Corrosion is a process that is accelerated by increased separating temperature, low pH, and high chloride ion concentration.

5 pH>6 Increased acidity (lower pH) increases the risk for corrosion; this is accelerated by increased temperature and high chloride ion content.

# 7.8 Foundation drawing

Alfa Laval ref. 548711 Rev. 2

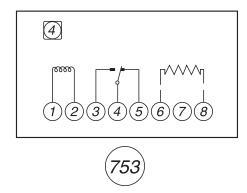


- A. Centre of separator bowl.
- B. Center of motor
- C. 8 holes for foundation bolt
- D. Foundation bolt. Installation according to stated foundation force.
- E. Service side
- F. Max. height of largest component incl. lifting tool
- G. Recommended free floor space for unloading when doing service.
- H. No fixed installation within this area.
- I. Centre of gravity (complete machine).
- J. Vertical force not exceeding 5 kN/foot
- K. Horizontal force not exceeding 7 kN/foot.
- K. Total static load max. 4 kN

# 7.9 Interconnection diagram

Alfa Laval ref. 561723 Rev. 0

| 1 | Reset Coil |
|---|------------|
| 2 |            |
| 3 | NO         |
| 4 | Common     |
| 5 | NC         |
| 6 | Heater     |
| 7 |            |
| 8 |            |



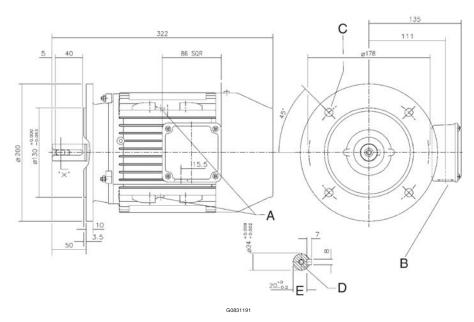
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Vibration sensor (mechanical switch)

# 7.10 Electric motor

# 7.10.1 Crompton Greaves

Alfa Laval ref. 585146 Rev. 3



- A. M5 external earth
- B. ø20 conduit entry
- C. 4 holes drilled ø12 on a 165 P.C.D. equi-spaced as shown.
- D. Hole tapped M8x19 deep. To DIN 332 form D
- E. View on "X"

Manufacturer: Crompton Greaves Ltd.

Manuf. drawing: Cat. Crompton Greaves Ltd

TEFC, SCR

Standards: IEC 34-series, 72, 79 and 85

Size: IEC 90
Type: GD 90
Weight: 16 kg
Poles: 2
Insulation class: F

Bearings: D-end 6205-ZZ

N-end 6203-ZZ

Method of cooling: IC 411 (IEC 34-6)

**Spec:** Totally enclosed three-phase

motor for marine service.

| Type of mounting |         | Degree of protection |  |
|------------------|---------|----------------------|--|
| IEC 34-7         |         | IEC 34-5             |  |
| G0541421         | IM 3011 | IP 55                |  |

The rotor balanced with half key, max vibration velocity 1,8 mm/s (rms)

Max. vibration velocity 1,8 mm/s (rms)

according to IEC 34-14.

The motor bearings are permanently lubricated.

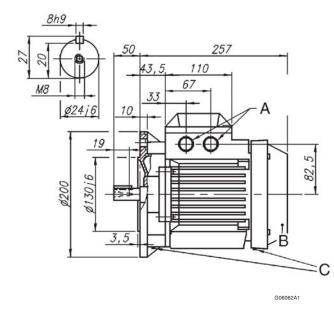


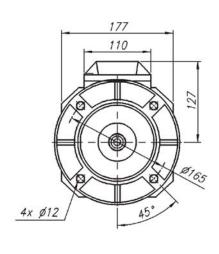
For complete information about motor variants, please contact your Alfa Laval representative.

7 Technical Reference 7.10 Electric motor

### 7.10.2 ABB

Alfa Laval ref. 552807 Rev. 7





- A. Knock out openings for cable glands on both sides 2 x M25
- B. Sheet-steel fan hood
- C. Drain holes with closable plugs to be positioned at lowest point for IM 3011 mounting position.

Manufacturer: ABB Motors

Manuf. drawing: CAT. BA/Marine motors GB

98-05

Standards: IEC 34-series, 72, 79 and 85

Size: 90 L

Type: M2AMA 90L

Weight: 16 kg

Poles: 2

Insulation class: F

Bearings: D-end 6305-2Z/C3

N-end 6204- 2Z/C3

Method of cooling: IC 411 (IEC 34-6)

| Type of mounting |          | Degree of protection |  |
|------------------|----------|----------------------|--|
| IEC 34-7         |          | IEC 34-5             |  |
| G0541511         | IM 30011 | IP 55                |  |

The rotor balanced with half key, max vibration velocity 1,8 mm/s (rms)

Max. vibration velocity 1,8 mm/s (rms)

according to IEC 34-14.

The motor bearings are permanently

lubricated.

**Spec:** Totally enclosed three-phase motor for marine service.

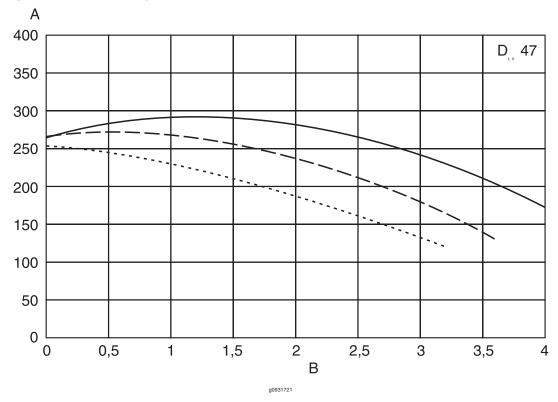


For complete information about motor variants, please contact your Alfa Laval representative.

# 7.11 Performance data, in- and outlet device

Alfa Laval ref. 565805 Rev. 0

Maximum light phase counter pressure as a function of throughput and viscosity:

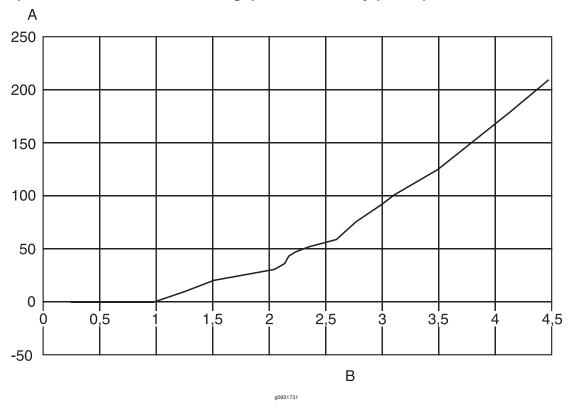


A. Max. light phase counter pressure, kPa

B. Light phase throughput, m3/h

 Alfa Laval ref. 565805 Rev. 0

# Inlet pressure as a function of throughput and viscosity (30 cSt)

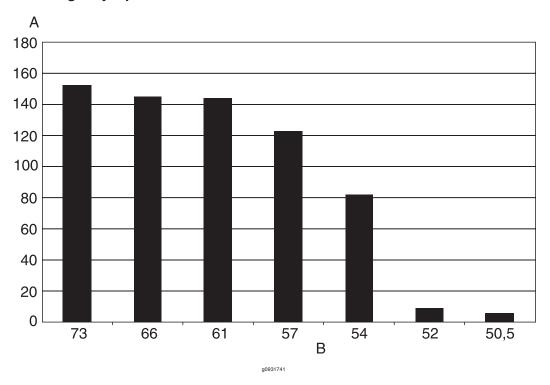


- A. Pressure kPa
- B. Throughput m<sup>3</sup>/h

Alfa Laval ref. 565805 Rev. 0

# Maximum heavy capacity as a function of gravity disc:

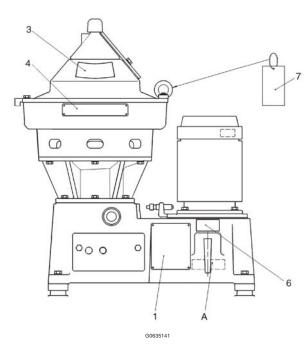
# **Only for Emergency Operation**



- A. litres/hour
- B. Gravity disc

# 7.12 Machine plates and safety labels

Alfa Laval ref. 556430 Rev. 3



# 1. Machine plate

Separator type

Serial No / Year

Product No

Main group no

Configuration no

Designation

Max allowed speed (bowl)

Direction of rotation (bowl)

Speed motor shaft

El. current frequency

Recommended motor power

Max. density of feed

Max. density of sediment

Max. density of operating liquid

Process temperature min./max.

Inside diameter of bowl body

Manufacturer

Service enquiries

www.alfalaval.com



## 3. Safety label

Text on label:

### Warning

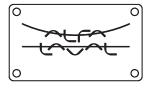
Read the instruction manuals **before** installation, operation and maintenance. Consider inspection intervals.

Failure to strictly follow instructions can lead to fatal injury.

If excessive vibration occurs, **stop** separator and **keep bowl filled** with liquid during rundown.

Out of balance vibration will become worse if bowl is not full.

# 4. Name plate



#### 5. Arrow

Indicating direction of rotation.

## 7. Power supply frequency



## 8. Lifting instructions

Text on label:

Read instruction manual before lifting.

\* Space reserved for plate indicating representative





# 7.13 Storage an Installation

## 7.13.1 Introduction

These installation specifications are valid for the separator.

The installation instructions are specifications, which are compulsory requirements.

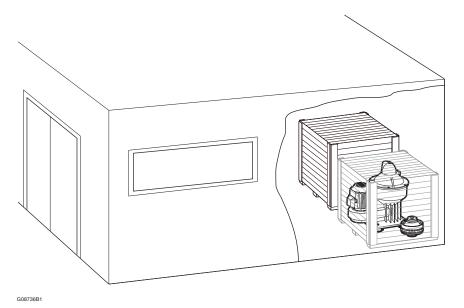
Any specific requirements from classification societies or other local authorities must be followed



If the specifications are not followed, Alfa Laval can not be held responsible for any malfunctions related to the installation.

# 7.13.2 Protection and storage of goods

 The separator must be stored indoors at 5 -55 °C, if not delivered in a water-resistant box, designated for outdoor storage.



- 2. If there is a risk for water condensation, the equipment must stand well ventilated and at a temperature above dew point.
- 3. If the storage time exceeds 12 months, the equipment must be inspected every 6 months and, if necessary, the protection be renewed.

#### The following protection products are recommended:

- Anti-rust oil (Dinitrol 112 or equivalent) with long lasting effective treatment for external surfaces. The oil should prevent corrosion attacks and leaves a waxy surface.
- 2. Anti-rust oil (Dinitrol 40 or equivalent) is a thin lubricant for inside protection. It gives a lubricating transparent oil film.
- 3. Solvent, e.g. white spirit, to remove the anti-rust oil after the storage period.
- Moist remover to be packed together with the separator equipment.

# 7.13.3 Storage at out of operation

If the separator is out of operation for more than **1 month**:

- 1. Lift out the bowl.
- 2. Protect the spindle taper from corrosion by lubricating it with oil.
- 3. Keep the separator and bowl well stored, dry and protected from mechanical damage.

For details see 7.13.2 Protection and storage of goods on page 161

# 7.13.4 Before start-up

If the separator has been out of operation for:

## 1 months or longer

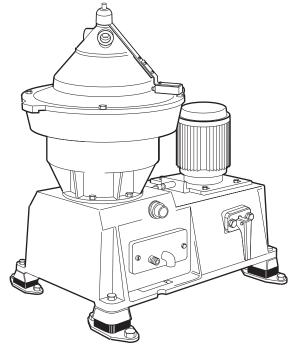
Pre-lubricate the spindle bearings.

## 6 months or longer

- Perform an Intermediate service and make sure to pre-lubricate the spindle bearings.
- Change the oil before starting.

# 18 months or longer

- Perform an Major service and make sure to pre-lubricate the spindle bearings.
- Change the oil before starting.



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# 7.13.5 Connections to surrounding equipment

## Local safety regulations

If the local safety regulations prescribe that the installation has to be inspected and approved by responsible authorities before the plant is put into service, consult with such authorities before installing the equipment and have the projected plant design approved by them.



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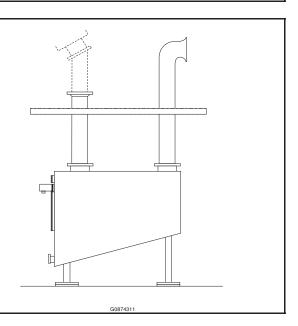
#### Service media

Ensure that all service media (electric power, operating and safety liquids etc.) required for the separator have the correct quality and capacity.



### Sludge discharge tank

If the sediment from the separator is discharged into a tank, this tank must be sufficiently ventilated. The connection between the separator and the tank must be of the size and configuration specified. If the solids are discharged from the separator bowl casing into a closed system, ensure that this system cannot be overfilled or closed in such a way that the solids cannot leave the bowl casing. This could cause a hazardous situation.



## Valves, Pipes and Similar Equipment

- Components like valves need to be cleaned with solvent and treated with anti-rust oil (type 112).
- Water pipes should be drained and treated with anti-rust oil (type 112).

 Articles made of rubber or plastics (e.g. seals) must not be treated with anti-rust oil.

# 7.13.6 Reassembly and Start up

- Clean away the anti-rust oil with white spirit.
- Remove the silica gel bags from all units.
- Follow all relevant instructions in the Service Manual and Operating Instructions.

# 7.13.7 Storage and transport of goods

## **Storage**

Specification

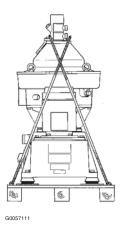
Upon arrival to the store, **check all components** and keep them:

- A. Well stored and protected from mechanical damage.
- B. Dry and protected from rain and humidity.
- C. Organized in the store in such a way that the goods will be easily accessible when installation is about to take place.

A separator can be delivered with different types of protection:

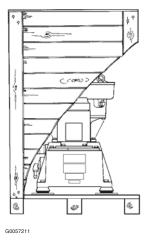
Fixed on a pallet.

The separator must be stored in a storage room well protected from mechanical damage as well as from rain and humidity.



Fixed on a pallet

In a wooden box which is not water tight.
 The separator must be stored dry and protected from rain and humidity.

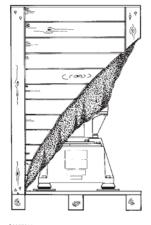


In a wooden box which is not water tight

 In a special water-resistant box for outdoor storage.

The separator and its parts have been treated with an anti-corrosion agent. Once the box has been opened, store dry and protected from rain and humidity.

The packaging for outdoor storage is only to special order.



In a special water-resistant box for outdoor storage

## **Transport**

# Specification

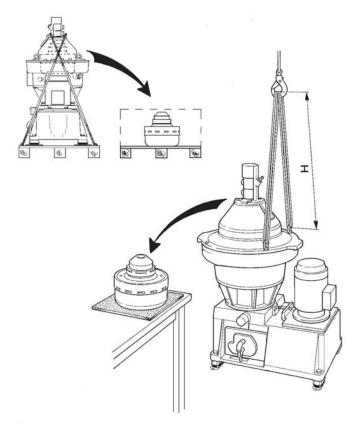
- During transport of the separator, the frame hood and bowl must always be removed from the machine.
- When lifting a separator it must always be hung securely. See chapter Lifting instructions on page 56.



## **Crush hazards**

Use correct lifting tools and follow lifting instructions.

 During erection, all inlets and outlets to separators and accessories must be covered to be protected from dirt and dust.



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H = minimum 750 mm

# 7.13.8 Planning of installation

#### Space for separator

The separator shall be placed in such a way that suitable space for maintenance and repair is obtained.

The space required for one or more separators can be calculated by consulting the drawings in the chapters Basic size drawing on page 140, Foundation drawing on page 150 and instructions for ancillary equipment, electrical and electronic equipment and cables.



Check the drawings when planning the installation

## Specification

 See chapter Foundation drawing on page 150 for the service space required with the separator installed. The spanner for the large lock ring should have sufficient space to make a complete turn without touching any of the ancillary equipment surrounding the separator.

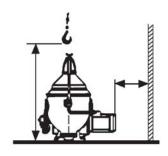
#### Recommendation

 The spanner for the large lock ring should have sufficient space to make a complete turn without touching any of the ancillary equipment surrounding the separator.

#### Important measurements

Important measurements are the minimum lifting height for lifting tackle, shortest distance between driving motor and wall, free passage for dismantling and assembly, maintenance and operation.

Plan your installation with sufficient room for the controls and operation so that instruments are easily visible. Valves and controls must be within convenient reach. Pay attention to space requirements for maintenance work, work benches, dismantled machine parts or for a service trolley.



## Lifting height for transport of bowl

## Specification

 A minimum height is required to lift the bowl, bowl parts and the bowl spindle, see chapter Foundation drawing on page 150.

#### Recommendation

 When two or more separators are installed it is recommended to plan the installation in such a way that parts from one separator do not have to be lifted over another separator.

## Space for oil changing

#### Specification

 The plug for gearbox oil draining must not be blocked by floor plate arrangement, etc.

#### Recommendation

 It should be possible to place a portable collecting tray under the gearbox drain plug for changing oil.

## 7.13.9 Foundations



When lifting a separator it must always be hung securely. See chapter Lifting instructions on page 56.

- See 7.8 Foundation drawing on page 150.
- The separator must be installed on a strong and rigid foundation to reduce the influence of vibrations from adjacent machinery.
- The foundation should be provided with a cofferdam.
- Fit the separator frame on the foundation as follows:
  - Check that the bolts do not press against the edges of the holes, otherwise the elasticity of the mounting of the separator frame will be impeded.
  - Fit height adjusting washers required.
  - Check that the separator frame is horizontal and that all feet rest on the foundation.
  - Tighten the screws.

# 8 Operating

# 8.1 Operating routine

These operating instructions describe routine procedures to be followed before and during the start, running, and stopping sequences of the separator.

If system documentation is available, always follow the operating instructions therein. If there is no system documentation, the instructions below are to be followed.

# 8.2 ALCAP Operation

# 8.2.1 Operating water interface

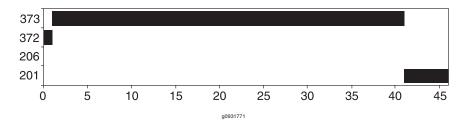
Alfa Laval ref. 565849 Rev. 1

Proposed operation of operating water interface.

## Closing the bowl:

- Initialise by opening connection 372 for 1 second.
- 2. Close the bowl by opening connection 373 for 40 seconds.
- 3. Open the feed (connection 201).

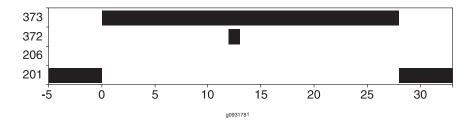
Starting sequence illustrated graphically:



### Performing a discharge:

- 1. Close the feed (connection 201).
- 2. Open connection 373.
- 3. After 12 seconds open connection 372 during 1 second.
- 4. After another 15 seconds close connection 373.
- 5. Open the feed (connection 201).

Starting sequence illustrated graphically:



During the separating process the make-up water supply volume is maintained by opening connection 373 for 2 seconds every 15 minutes.

# 8.3 Emergency Operation

# 8.3.1 Operating water interface

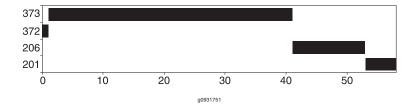
Alfa Laval ref. 565819 Rev. 0

Proposed operation of operating water interface for purifier execution.

#### Closing the bowl and supplying liquid seal:

- 1. Initialise by opening connection 372 for 1 second.
- 2. Close the bowl by opening connection 373 for 40 seconds.
- 3. Supply liquid seal by opening connection 206 for 12 seconds.
- 4. Open the feed (connection 201).

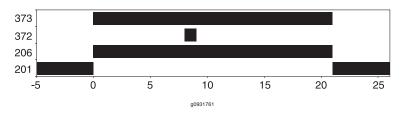
Starting sequence illustrated graphically:



## Performing a discharge:

- 1. Close the feed (connection 201).
- 2. Open connection 373 and perform a displacement (of the interface) by opening connection 206.
- 3. After 8 seconds open connection 372 during 1 second.
- 4. After another 12 seconds close connections 206 and 373.
- 5. Open the feed (connection 201).

Starting sequence illustrated graphically:



# 8.3.2 Selection of gravity disc

The separator is delivered with a set of gravity discs with different diameters for purification operation. The hole diameter of the gravity disc sets the position of the oil/water interface in the separator. The separation efficiency can be optimized by selection of the correct diameter for each oil quality.

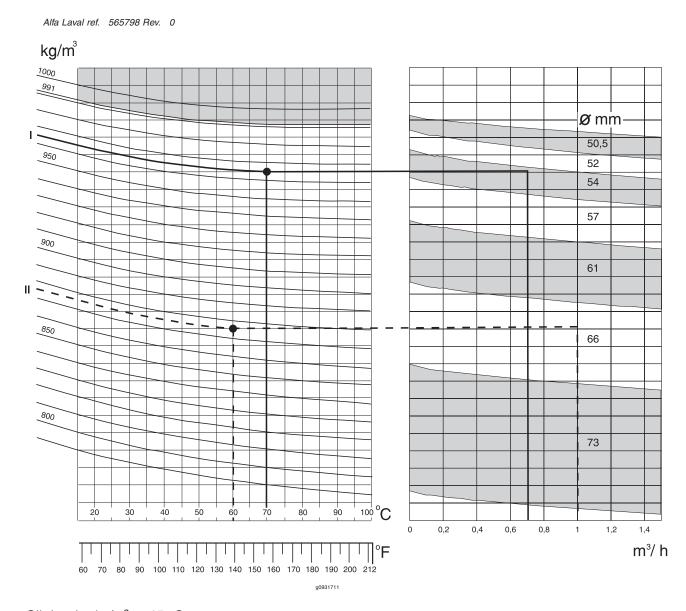
As a guide the Gravity disc nomogram can be used. The size of the first gravity disc to be tried can be read directly from the nomogram.

The best separation results are obtained by using a gravity disc with as large size as possible, which will not cause a broken water seal in the bowl or an emulsification in the water outlet.

The presence of salt water in the oil may demand the use of a gravity disc with bigger hole than indicated in the nomogram. The nomogram is based on the properties of fresh water in the oil.

For operating the separator as as an ALCAP separator the diameter of the disc should be 40 mm.

# 8.3.3 Gravity disc nomogram



Oil density, kg/m³ at 15 °C Oil temperature, °C, °F Gravity disc hole diameter, • mm Throughput, m³/h

The nomogram is based on the properties of fresh water.

| Example I in nomogram  |  | Example II in nomogram  |  |
|------------------------|--|---|--|
| Reference in graph:    |  | Reference in graph:   |  |
| Oil density            | 965 kg/m <sup>3</sup> at 15 °C (60 °F) | Oil density   | 875 kg/m <sup>3</sup> at 15 °C (60 °F) |
| Separation temperature | 70 °C (158 °F)                         | Separation temperature  | 60 °C (140 °F)                         |
| Throughput             | 0,7 m <sup>3</sup> /h                  | Throughput  | 1 m <sup>3</sup> /h                    |
|                        |  | From the graphs (broken line), the correct gravity disc has a hole diameter of 66 mm. |  |

8.4 Before first Start 8 Operating

# 8.4 Before first Start

Technical demands for connections and logical limitations for separator are listed in chapter "Technical Reference".

 Ensure that the separator is correctly installed and that feed lines and drains have been flushed clean.



#### **Breakdown hazard**

Assemble the separator completely before start. All couplings, covers, and guards must be in place and properly tightened. Non compliance may lead to breakdown.



#### **Electrical hazard**

Follow local regulations for electrical installation and earthing (grounding).

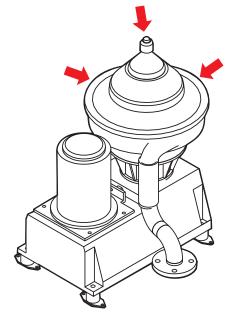


#### **Breakdown hazard**

Check that the power frequency is in agreement with the machine plate. If incorrect, resulting overspeed may cause breakdown.



Use the separation system for the purpose, and within the limits, specified by Alfa Laval. Failure to do so could cause a violent breakdown.



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P003992

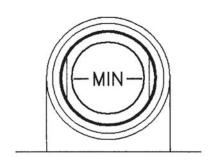
50 Hz? 60 Hz?

8 Operating 8.4 Before first Start

- 2. Check the oil sump level. Top up if necessary.
  - The oil level should be slightly above middle of the sight glass.



Too much or too little oil can damage the separator bearings.



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8.5 Start after a service 8 Operating

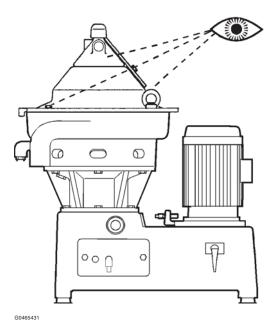
# 8.5 Start after a service

Pay special attention to unusual conditions when starting the separator after a service.

## 8.5.1 Before normal start

Check these points before every start.

- 1. Make sure that the bowl is clean and that the separator is properly assembled.
- 2. Make sure that the bolts of the outlet cover and the frame hood are fully tightened.



Check assembly and tightenings

3. Make sure that all couplings and connections are securely tightened to prevent leakage.



Slip hazard

Check all connections for leakage.

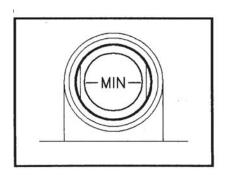
Oil leakage may make the floor slippery.

4. Make sure that the inlet pipe is tightened.



Check for leakages (not admitted)

5. Read the oil level. The line in the middle of the sight glass shows the minimum level. Refill if necessary. For grade and quality of oil see5.9 Lubricants on page 63.



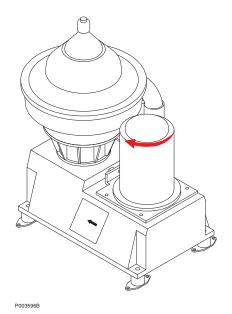
Check the oil level

#### **Rotation Direction**

Check the rotation of the bowl by doing a quick start/stop. The motor fan must rotate in a clockwise direction.



If power cable polarity has been reversed, the separator will rotate in reverse, and vital rotating parts can loosen.



WARNING

### **Disintegration hazards**

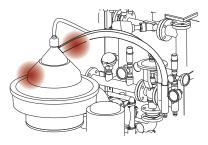
After change of feed the sludge discharge interval must be adjusted.

Too long intervals between discharges can result in breakdown.



#### **Burn hazard**

Avoid contact with hot surfaces. Process pipes, various machine surfaces, and processed liquid can be hot and cause burns.



P004073C

8.5 Start after a service 8 Operating

# 8.5.2 Starting and running-up procedure

1. Open the water supply valve(s). Make sure that the water supply is on 150-600 kPa (1,5-6 bar).



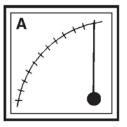
- 2. Start the separator.
- 3. Be alert for unusual noises and conditions.
- 4. Note the normal occurrence of critical speed periods. Some vibrations occur for short periods during the starting cycle, when the separator passes through its critical speeds. This is normal and passes over without danger. Try to learn the vibration characteristics of the critical speed pattern.



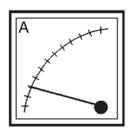
#### **Disintegration hazards**

When excessive vibration occurs, keep bowl filled and stop separator. The cause of the vibration must be identified and rectified before the separator is restarted. Excessive vibration may be due to incorrect assembly or insufficient cleaning of the bowl.

5. Check the current to the separator motor to ensure that the separator has reached full speed: During start, the current reaches a peak and then slowly drops to a low and stable value. For normal length of the start-up period see 7.3 Technical Data on page 137.



Current increases during start...



... to decrease to a stable value when full speed has been reached

### 6. For **purification**:

- a. Supply water to form the water-seal. The water should have the same temperature as the process liquid.
- b. Close the water feed when water flows out through the water outlet.
- c. Start the oil feed slowly to avoid breaking the water seal.

#### 7. For clarification:

- a. Start the oil feed with full flow.
- 8. For both **purification** and **clarification** modes:

Check the separator inlet and outlet pressures. See recommended values in your system documentation.

9. Adjust to desired throughput.

# 8.5.3 Separation

Do regular checks on:

- oil inlet temperature (if applicable)
- water collecting tank level (if applicable)
- sound/vibration of the separator
- back pressure
- motor current

8.5 Start after a service 8 Operating

# 8.5.4 Stopping procedure

- 1. Turn off the oil feed.
- 2. Feed displacement water until water flows out through the water outlet. Then close this feed.
- 3. Stop the separator.
- 4. Wait until the separator has come to a complete standstill.

Remove the safety device and look through the slot in the frame hood to see the movement of the bowl.

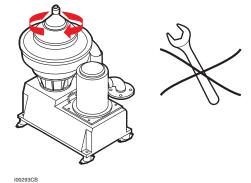
## Separator standstill

Dismantling work must not be started before all rotating parts have come to a complete standstill.



#### **Entrapment hazard**

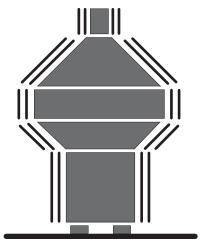
Make sure that rotating parts have come to a complete standstill before starting any dismantling work.



# 8.5.5 Safety stop

If the separator begins to vibrate excessively during operation, stop it immediately by pushing the safety stop. The separator motor is switched off.

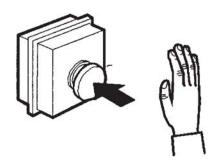
- Keep the bowl filled during the run-down to minimize the excessive vibration.
- Evacuate the room. The separator may be hazardous when passing its critical speeds during the run-down.



Hazard!



**Disintegration hazards Never discharge a vibrating separator.** 



Push the safety stop!

# 8.6 After Safety Stop

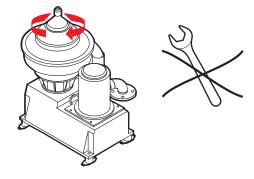
## Separator standstill

Dismantling work must not be started before all rotating parts have come to a complete standstill.



## **Entrapment hazard**

Make sure that rotating parts have come to a complete standstill before starting any dismantling work.



#### Avoid accidental start



#### **Entrapment hazard**

To avoid accidental start, switch off and lock power supply before starting any dismantling work. Make sure that separator has come to a complete standstill before starting any dismantling work.

## Remedy the cause

The cause of the emergency must be remedied before attempting to restart the separator. If the cause is not found, an overhaul must be performed on the separator, and all moving parts thoroughly checked.



#### Disintegration hazard

Do not start the separator after an emergency stop without first remedying the cause of the emergency. Make sure that the bowl is clean before restart.

## Separator reassembled

The separator must be fully reassembled with all covers and guards in place and tightened before unlocking the power supply and starting the system.



#### Breakdown hazard

Assemble the separator completely before restart. All couplings, covers, and guards must be in place and properly tightened. Non compliance may lead to breakdown.

