

| SEZ                            | N 9-70 / 1                                        | Date                               | 14.08.2025                                                                                                        |
|--------------------------------|---------------------------------------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| DS [mm]                        | 700                                               | Project Number                     | 4005826330                                                                                                        |
| QTY                            | 1                                                 | Project Name                       | Termoelectrica - Republic of Mo                                                                                   |
| Load                           | 1 x 100%                                          | Customer                           |                                                                                                                   |
| nq                             | 95                                                | Rev                                | 0                                                                                                                 |
| Operating Data                 |                                                   | Design                             |                                                                                                                   |
| Medium                         | River water                                       | Mounting Arrangement               | EJ                                                                                                                |
| Fluid Temperature [C]          | 20                                                | No. Of Stages                      | 1                                                                                                                 |
| Density [kg/m³]                | 998                                               | Direction of rotation from drive   | Clockwise (viewed from above)                                                                                     |
| Flow [m³/h]                    | 11700                                             | Discharge Elbow Diameter [mm]      | 900                                                                                                               |
| Discharge Head [m]             | 21                                                | Discharge Nominal pressure         | PN 6                                                                                                              |
| Efficiency [%]                 | 83,54                                             | Disc. Elbow Flange holes           | DIN EN 1092 - 1                                                                                                   |
| Power absorbed [kW]            | 801,79                                            | Disc. Elbow Flange thickness       | DIN EN 1092 - 1, PN6                                                                                              |
| Pump speed of rotation [1/min] | 740                                               | Thrust bearing                     | KSB Standard                                                                                                      |
| NPSHR3% [m]                    | 9,99                                              | Thrust bearing cooler              | KSB Standard                                                                                                      |
| Hv ESK losses [m]              | 1,03                                              | Shaft Seal                         | Gland Packing                                                                                                     |
| Head at zero flow [m]          | 48                                                | Reverse rotation lock              | No                                                                                                                |
| Min. Flow [m³/h]               | 8379,57                                           | Flood Proof Arrangement            | No                                                                                                                |
| Max. Flow [m³/h]               | 14353,59                                          | Pull Out Type                      | No                                                                                                                |
| Driver, accessories            |                                                   | Test Pressure [bar]                | 6,24                                                                                                              |
| Driver Type                    | Electric motor, direct                            | Impeller diameter max [mm]         | 924                                                                                                               |
| Designed for VFD Operation     | No                                                | Impeller diameter rated [mm]       | 853,92                                                                                                            |
| Motor speed [1/min]            | 740                                               | Radial Bearing Impeller            | Thordon Bearings                                                                                                  |
| Frequenzy [Hz]                 | 50                                                | Radial Bearing Other               | Thordon Bearings                                                                                                  |
| Voltage [V]                    | 6000                                              | Intake Chamber Typ preferred       | Intake Chamber Typ 2.2                                                                                            |
| Drive Rating [kW]              | 906                                               | Motor Coupling                     | KTR Radex (all-steel coupling) or equal                                                                           |
| Material Combination           |                                                   | Painting Spec.                     |                                                                                                                   |
| Material Combination           | 10                                                | Surface in Contact with medium     |                                                                                                                   |
| Part Designation               | Material                                          | Pre Treatment                      | Sand Blasting SA 2,5 acc. DIN EN ISO 12944-4                                                                      |
| Bellmouth                      | S235JR or A283 GR B                               | Primer                             | 2-component epoxy zinc dust, thickness = 50 µm, Product = SikaCor Zinc R                                          |
| Discharge Elbow                | S235JR + 1.4404 or A283 GR B + SA240(M) Type 316L | Top Coat                           | 2-component epoxy resin, 1 x 150 µm black 1 x 150 µm tinted red, 1x 150 µm black, Product = Sika Poxicolor SW New |
| Diffusor                       | S235JR + 1.4404 or A283 GR B + SA240(M) Type 316L | Surface not in contact with medium |                                                                                                                   |
| Inlet Cone                     | S235JR or A283 GR B                               | Pre Treatment                      | Sand Blasting SA 2,5 acc. DIN EN ISO 12944-4                                                                      |
| Shafts                         | C45+N or A576 GR 1045                             | Primer                             | 2-component epoxy zinc dust, thickness = 50 µm, Product = SikaCor Zinc R                                          |
| Impeller                       | 1.4409 or A743 GR CF-3M                           | Intermediate Coat                  | 2-component epoxy resin, 2 x 80 µm, Product = SikaCor EG1                                                         |
| Drive Lantern                  | S235JR or A283 GR B                               | Top Coat                           | 2-Component polyurethane (PUR), 1 x 60 µm, RAL 5002 Ultramarine blue, Product = SikaCor EG5                       |
| Wear Ring                      | 1.4404 or SA240(M) Type 316L                      | Tests                              |                                                                                                                   |
| Column Pipe                    | S235JR or A283 GR B                               | QCP acc. To                        | See QCP Information                                                                                               |
| Disc Coupling                  | P250GH or A105                                    | Hydraulic Test (Non Witness)       | ISO 9906 Class 1B                                                                                                 |
| Base Frame                     | S235JR or A283 GR B                               | Submerge Test                      | No                                                                                                                |
| Impeller Nut                   | 1.4462 or A473 Type S32950                        | NPSH Test (5 Points)               | No                                                                                                                |
| Scope of Supply                |                                                   | Hydraulic Test (Witness) Qty:      | No                                                                                                                |
| Drive                          | No                                                | Motor Engine for Tests             | Test Bed Motor with reduced speed                                                                                 |
| Spacer Sleeve                  | No                                                |                                    |                                                                                                                   |
| Venting Valve                  | No                                                |                                    |                                                                                                                   |
| Other                          |                                                   |                                    |                                                                                                                   |

# Mounting Arrangement



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Drawing Nr.

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|    |      |    |
|----|------|----|
| ET | 2952 | mm |
| H1 | 2500 | mm |
| H2 | 560  | mm |
| H3 | 900  | mm |
| H4 | 4500 | mm |
| L3 | 900  | mm |
| D1 | 1400 | mm |
| D3 | 900  | mm |

|             |     |   |
|-------------|-----|---|
| Motor Level | 4,5 | m |
|-------------|-----|---|

|             |   |   |
|-------------|---|---|
| Floor Level | 0 | m |
|-------------|---|---|

|                |  |   |
|----------------|--|---|
| NPSHA          |  | m |
| Max Waterlevel |  | m |

|                 |  |   |
|-----------------|--|---|
| NPSHA           |  | m |
| Mid. Waterlevel |  | m |

|                      |      |   |
|----------------------|------|---|
| Necessary Waterlevel | -1,2 | m |
|----------------------|------|---|

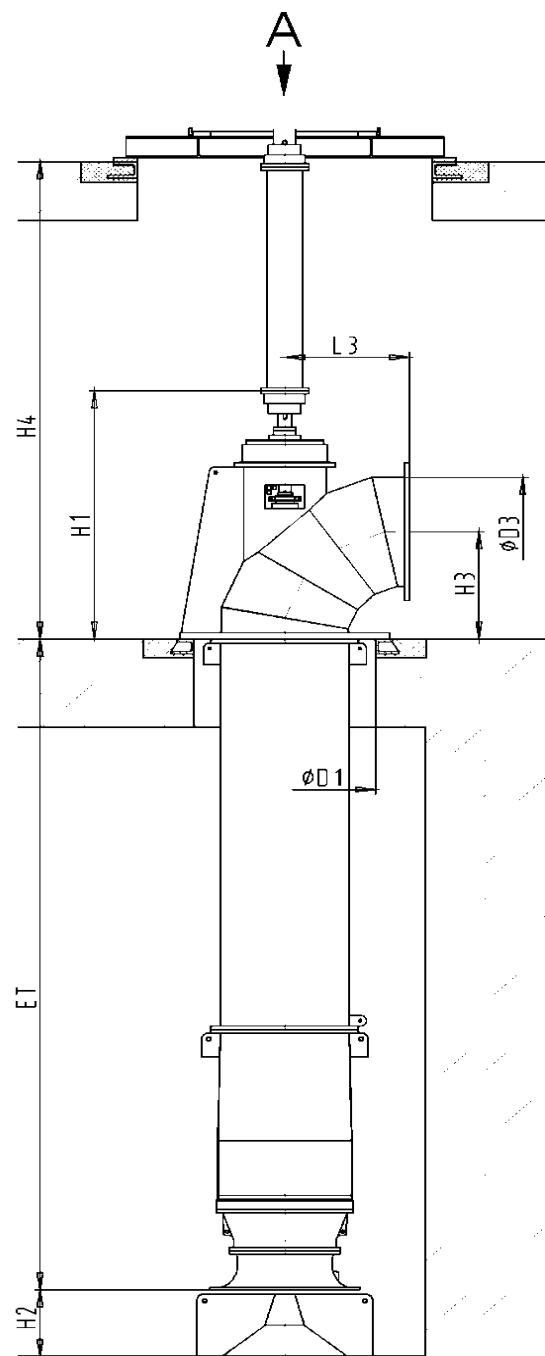
|                 |       |   |
|-----------------|-------|---|
| NPSHA           | 11,37 | m |
| Min. Waterlevel | -1,2  | m |

|                      |        |   |
|----------------------|--------|---|
| NPSH Reference level | -2,602 | m |
|----------------------|--------|---|

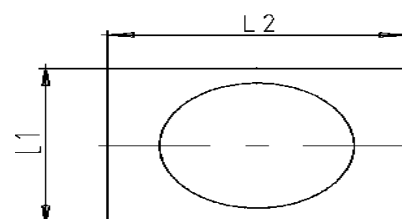
|               |        |   |
|---------------|--------|---|
| Inlet of Pump | -2,952 | m |
|---------------|--------|---|

|              |        |   |
|--------------|--------|---|
| Ground Level | -3,512 | m |
|--------------|--------|---|

|                   |       |    |
|-------------------|-------|----|
| Pump Weight [kg]  | 7800  | kg |
| Water Column [kg] | 1048  | kg |
| Motor Weight [kg] | 11000 | kg |



Ansicht View A

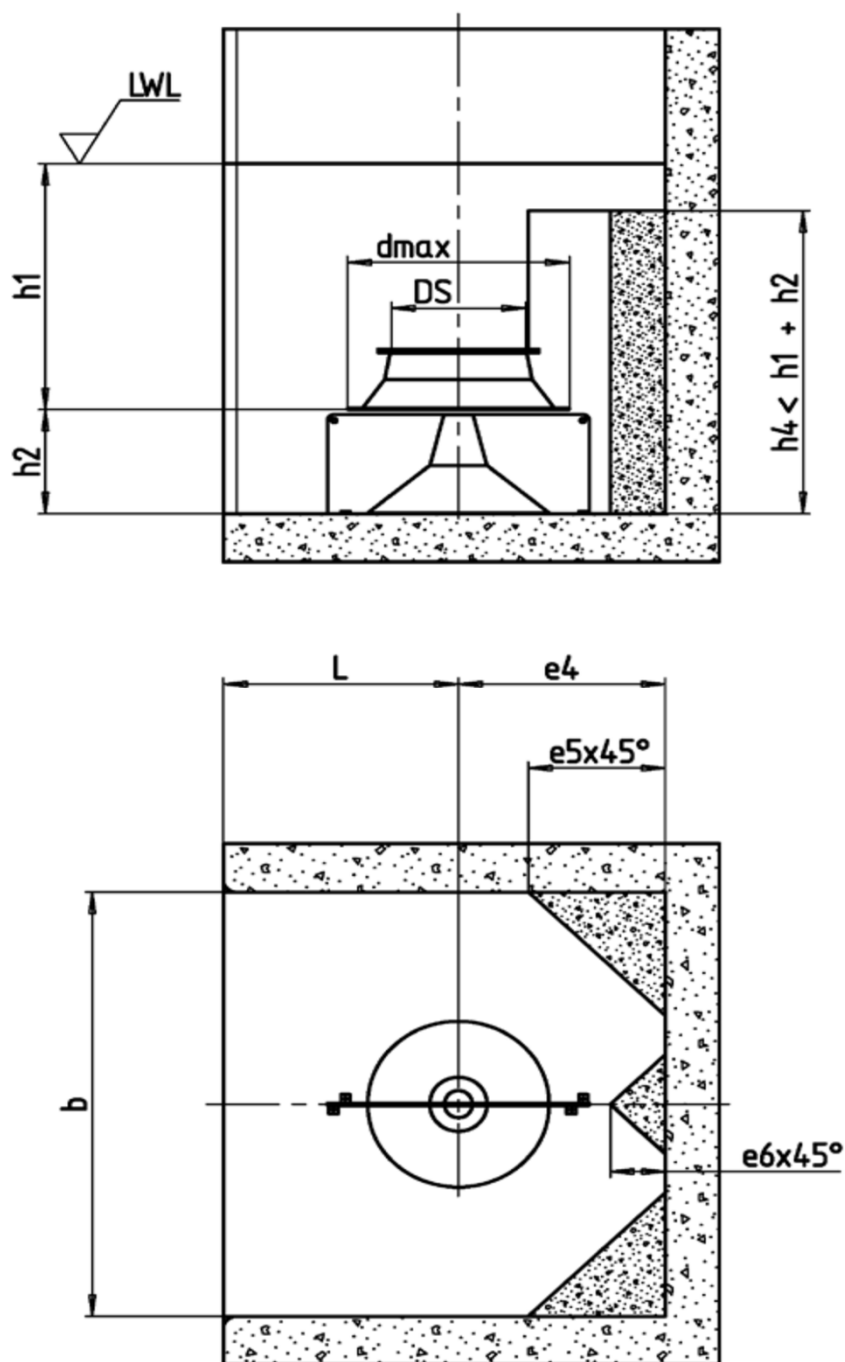


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|      |      |    |
|------|------|----|
| h1   | 1752 | mm |
| h2   | 560  | mm |
| Lmin | 1150 | mm |
| b    | 2300 | mm |
| e4   | 1010 | mm |
| e5   | 670  | mm |
| e6   | 270  | mm |
| dmax | 1360 | mm |



## Sectional Drawing

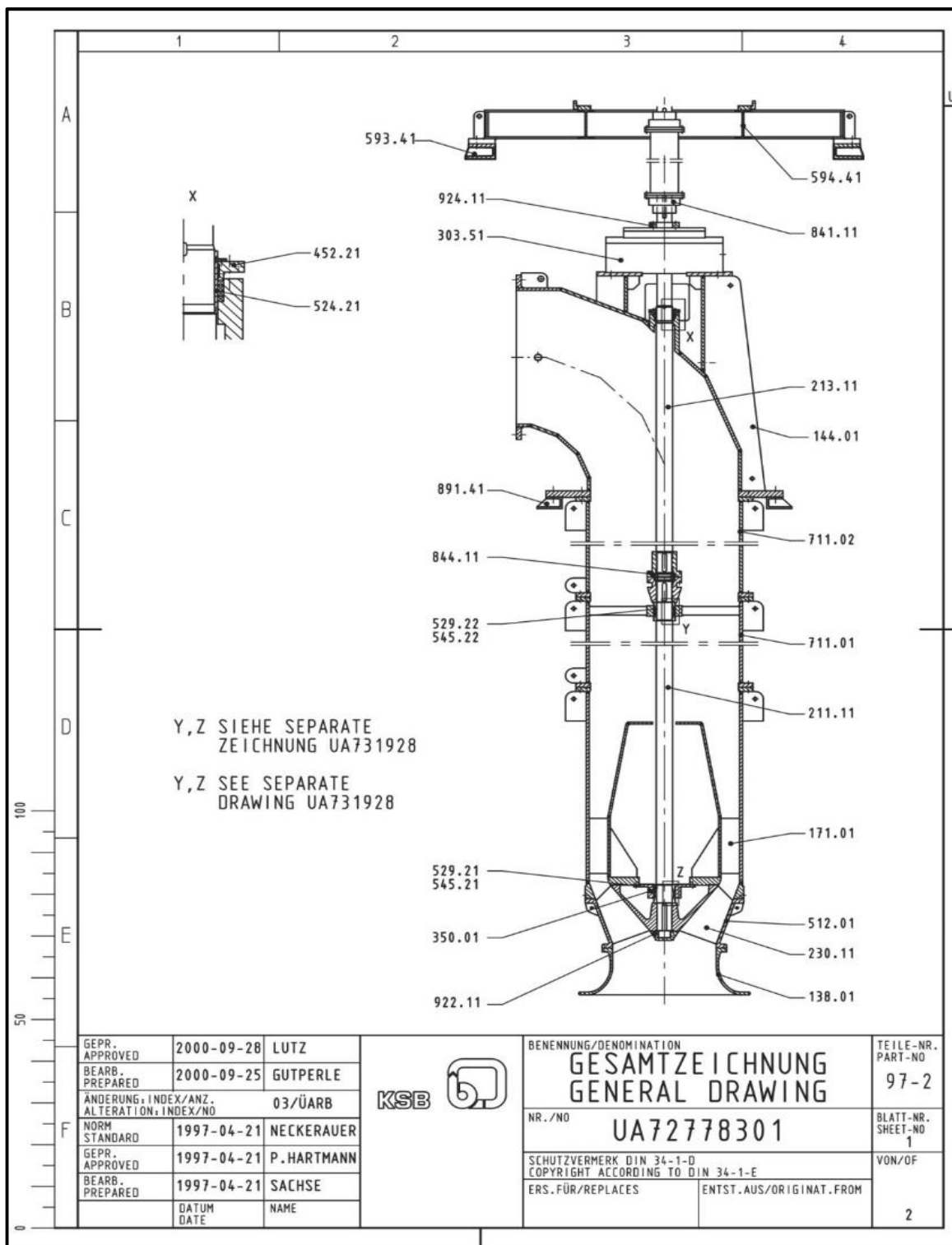


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## Sectional Drawing



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| Part No. | Part                      | Material                                          |
|----------|---------------------------|---------------------------------------------------|
| 138      | Bellmouth                 | A283 GR.B or S235JR                               |
| 144      | Discharge Elbow           | A283 GR.B + SA240 (M)Type 316L or S235JR + 1.4404 |
| 171      | Diffuser                  | A283 GR.B + SA240 (M)Type 316L or S235JR + 1.4404 |
| 211      | Pump Shaft                | A576 GR 1045 or C45+N                             |
| 213      | Top Shaft                 | A576 GR 1045 or C45+N                             |
| 230      | Impeller                  | A743 GR CF-3M or 1.4409                           |
| 303      | Thrust and Radial Bearing | KSB, Turbolink, Michell, Renk                     |
| 350      | Bearing Housing           | A105 or P250GH                                    |
| 452      | Gland                     | KSB Standard                                      |
| 512      | Wear Ring                 | SA240 (M)Type 316L or 1.4404                      |
| 524      | Shaft Protecting Sleeve   | A743 GR CC-50 or 1.4138                           |
| 529      | Bearing Sleeve            | A743 GR CC-50 or 1.4138                           |
| 545      | Bearing Bush              | Thordon Bearings                                  |
| 593      | Rail                      | A283 GR B or S235JR                               |
| 594      | Support Frame             | A283 GR B or S235JR                               |
| 711      | Column Pipe               | A283 GR B or S235JR                               |
| 841      | Drive Coupling            | KTR Radex (all-steel coupling) or equal           |
| 844      | Disc Coupling, Rigid      | A105 or P250GH                                    |
| 891      | Baseplate                 | A283 GR B or S235JR                               |
| 922      | Impeller Nut              | A473 Type S32950 or 1.4462                        |
| 924      | Adjusting Nut             | A473 Type 431 Condition T or 1.4057+QT800         |

## ZULASSIGE DRUCKSTUTZENKRAFTE UND MOMENTE

DIE TABELLE ZEIGT DIE ZULASSIGEN STUTZENKRAFTE UND MOMENTE FÜR GLEICHZEITIGE BELASTUNG IN DEN DREI EBENEN, GÜLTIG FÜR EB-, EJ- UND EM-AUFSTELLUNG.

AUF KRÜMMER IN CD-AUFSTELLUNG DÜRFEN GRUNDSÄTZLICH KEINE ÄUßEREN KRAFTE UND MOMENTE WIRKEN ( $F_x = 0, M_x = 0$ ).

DIE ANGEgebenEN KRAFTE UND MOMENTE GELTEN FÜR GLEICHZEITIGE BELASTUNG IN DREI EBENEN.

DIE SUMME DER AUFTRETENDEN KRAFTE UND MOMENTE, Z.B. RESULTIEREND AUS DRUCK- UND TEMPERATURDEHNUNGEN DER ROHRLEITUNGSKOMPONENTEN SOWIE DER GEWICHTSKRÄFTE, DIE AXIALE KRAFT  $F_p$  UND DIE REAKTIONSKRAFT  $F_R$  DÜRFEN DIE MAXIMAL ZULASSIGEN KRAFTE ( $F_x, F_y, F_z$ ) UND MOMENTE ( $M_x, M_y, M_z$ ) AM DRUCKSTUTZEN NICHT ÜBERSCHREITEN. DIES IST VOM ANLAGENPLANER / KSB-VERTRAGSPARTNER SICHERZUSTELLEN.

KRÄFTE UND MOMENTE, DIE ÜBER DIE GRENZWERTE HINAUSGEHEN, SIND DURCH GEEIGNETE MASSNAHMEN AN DER DRUCKLEITUNG AUFZUFANGEN.

BEI GEGEBENER STEIFIGKEIT DES AUSLAUFKRÜMMERS VERSCHIEBT SICH DER DRUCKSTUTZEN UNTER DER MAXIMAL ZULASSIGEN AXIALE KRAFT  $F_p$  UM 0,3 mm. EINE GRÖßERE VERSCHIEBUNG IST UNZULÄSSIG.

DIE AXIALE KRAFT  $F_p$ , DIE DURCH INNENDRUCK IM AUSLAUFKRÜMMER ENTSTEHT, UND DIE REAKTIONSKRAFT  $F_R$  AUS DER STROMUNGSMULENKUNG IM AUSLAUFKRÜMMER, MÜSSEN VON DER DRUCKLEITUNG UND DÜRFEN NICHT VON DER PUMPE AUFGENOMMEN WERDEN.

| DN   | $F_i$ [N] | $M_i$ [Nm] |
|------|-----------|------------|
| 700  | 14000     | 2800       |
| 800  | 17800     | 3550       |
| 900  | 23100     | 4550       |
| 1000 | 29000     | 5600       |
| 1100 | 34800     | 6750       |
| 1200 | 41850     | 7850       |
| 1300 | 48900     | 9100       |
| 1400 | 56000     | 10300      |
| 1500 | 64000     | 11800      |
| 1600 | 71000     | 13300      |
| 1800 | 88000     | 16300      |
| 2000 | 106450    | 19350      |
| 2200 | 124300    | 22250      |
| 2400 | 143400    | 25350      |

$$F_x = F_y = F_z \\ M_x = M_y = M_z$$

## PERMISSIBLE DISCHARGE NOZZLE FORCES AND MOMENTS

THE TABLE LISTS THE MAXIMUM ALLOWABLE FORCES AND MOMENTS ON THE NOZZLE ACTING SIMULTANEOUSLY IN ALL THREE PLANES. VALID FOR EB- EJ- AND EM- ARRANGEMENT.

AS A RULE, THERE SHALL NOT BE ANY EXTERIOR FORCES OR MOMENTS ACTING ON THE CD-ELBOW ( $F_x = 0, M_x = 0$ ).

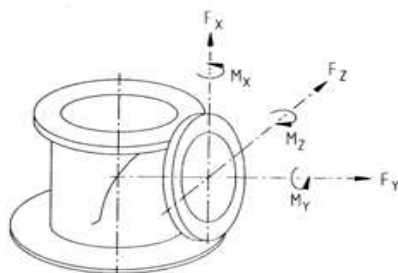
THE INDICATED FORCES AND MOMENTS ARE FOR SIMULTANEOUS LOADING IN THE THREE PLANES

THE TOTAL OF THE FORCES AND MOMENTS GENERATED, E.G. RESULTING FROM PRESSURE AND TEMPERATURE-INDUCED EXPANSIONS OF THE PIPING COMPONENTS AS WELL AS THE FORCE DUE TO WEIGHT, THE AXIAL FORCE  $F_p$  AND THE REACTIVE FORCE  $F_R$ , MUST NOT EXCEED THE MAXIMUM PERMISSIBLE FORCES ( $F_x, F_y, F_z$ ) AND MOMENTS ( $M_x, M_y, M_z$ ) AT THE DISCHARGE NOZZLE. THIS HAS TO BE ENSURED BY THE PLANT ENGINEERING CONSULTANT / KSB'S CONTRACTUAL PARTNER.

ANY FORCES AND MOMENTS EXCEEDING THE LIMIT VALUES SHALL BE ABSORBED BY APPROPRIATE MEASURES ON THE DISCHARGE PIPE.

AT A GIVEN STIFFNESS OF THE DISCHARGE ELBOW THE DISCHARGE NOZZLE SHIFTS BY 0.3 mm UNDER THE MAXIMUM PERMISSIBLE AXIAL FORCE  $F_p$ . A LARGER DISPLACEMENT IS IMPERMISSIBLE.

THE AXIAL FORCE  $F_p$  GENERATED BY THE INTERNAL PRESSURE IN THE DISCHARGE ELBOW AND THE REACTIVE FORCE  $F_R$  RESULTING FROM THE FLOW DEFLECTION IN THE DISCHARGE ELBOW MUST BE ABSORBED BY THE DISCHARGE PIPE; THEY MUST NOT BE ABSORBED BY THE PUMP.



KOORDINATENSYSTEM  
SYSTEM OF CO-ORDINATES

## Nozzle Forces



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### Maximum Allowable Forces and Moments on the Nozzle

|                                     |       |
|-------------------------------------|-------|
| Nozzle Forces $F_x, F_y, F_z$ [N]   | 23100 |
| Nozzle Moments $M_x, M_y, M_z$ [Nm] | 4550  |

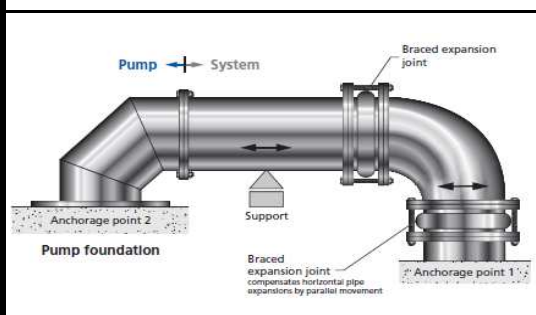
### Project specific Forces must be absorbed by the discharge Pipe

|                                              |        |
|----------------------------------------------|--------|
| $F_p$ generated by the pressure [N]          | 298962 |
| $F_r$ resulting from the flow deflection [N] | 24939  |

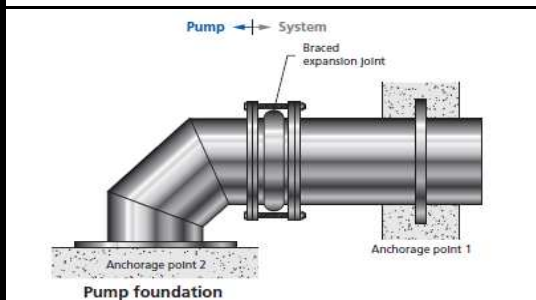
Sum of Forces that has to be absorbed by the discharge Pipe: **323901** N

Only necessary for EB,EM and EJ installation Type:

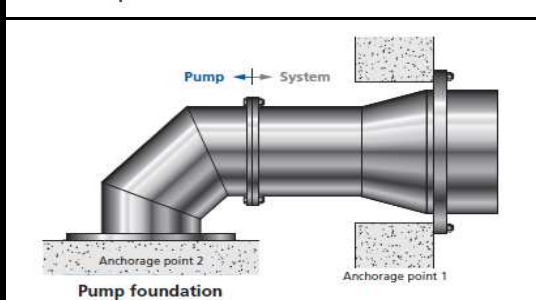
KSB propose to use a fix point behind the Pump to absorb the project specific forces, otherwise it can lead to damages of the pump. Some examples are\*:



Two expansion joints



Wall anchorage point with expansion joint

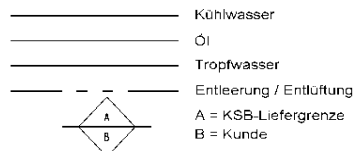


Anchorage point without expansion joint

\* Ask KSB for further Information if necessary

## LEGENDE

Symbole nach DIN 2429



## Lieferumfang:

Zum KSB-Lieferumfang gehören nur die örtlichen Instrumente. Bei Instrumenten zur Fernüberwachung liefert KSB das Gebergerät, einen lokalen Klemmenkasten und die Verkabelung zwischen Gebergerät und Klemmenkasten.

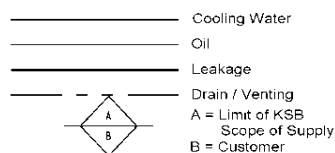
## KKS - System Pumpenanlage:

PACX0 = Hauptkühlwassersystem  
 PGBX0 = Kühlwassersystem  
 PAVX0 = Ölversorgungslösungen

X = 1 für Pumpe 1  
 X = 2 für Pumpe 2  
 X = 3 für Pumpe 3

## LEGEND

Symbols acc. to DIN 2429

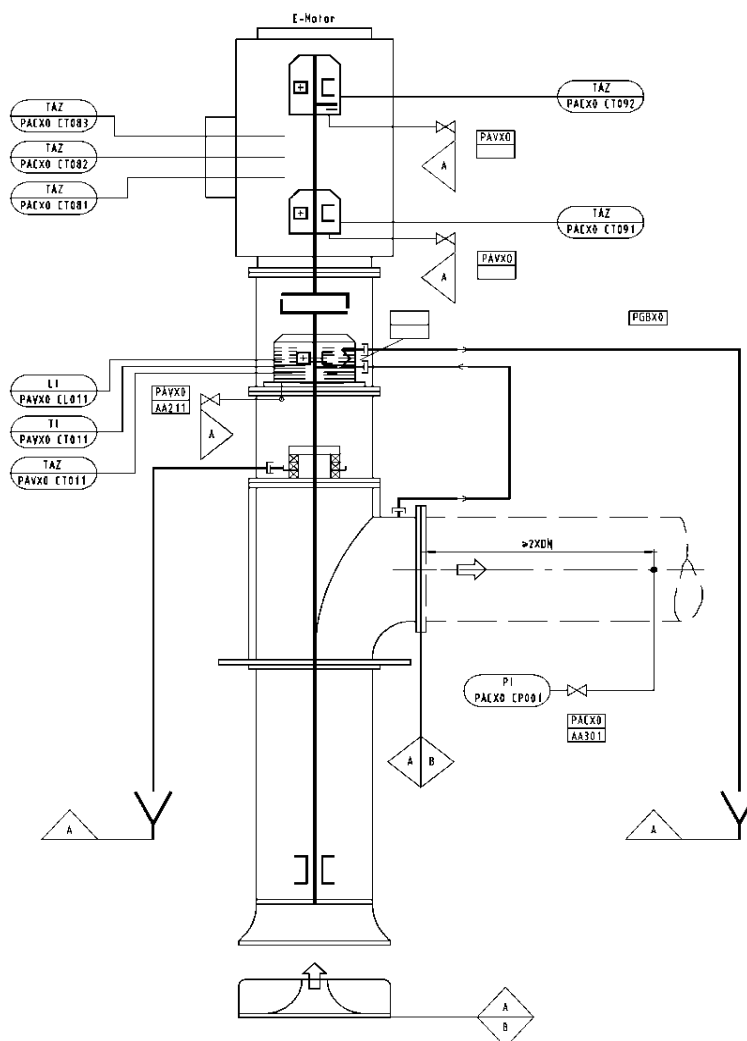


Scope of supply:  
 KSB's scope of supply is limited to local instruments. In the case of instruments to allow remote monitoring then transducer, local terminal box and cabling between them will be supplied by KSB.

## KKS - System Pumping Set:

PACX0 = Main Cooling Water System  
 PGBX0 = Cooling Water System  
 PAVX0 = Oil System

X = 1 for pump 1  
 X = 2 for pump 2  
 X = 3 for pump 3



Nur für Angebot / Anfrage  
 Technische Änderungen vorbehalten

For Offer / Inquiry Only  
 Technical Modifications Reserved

Zugehöriges Messstellenverzeichnis: M  
 Zugehöriges Armaturenverzeichnis: A

Reference List Of Measuring Points: M  
 Reference List Of Valves: A

\*The PuID can show instruments that are not scope of supply for this offer therefore please note the Instrumentation list attached to this offer



# Technical Curves

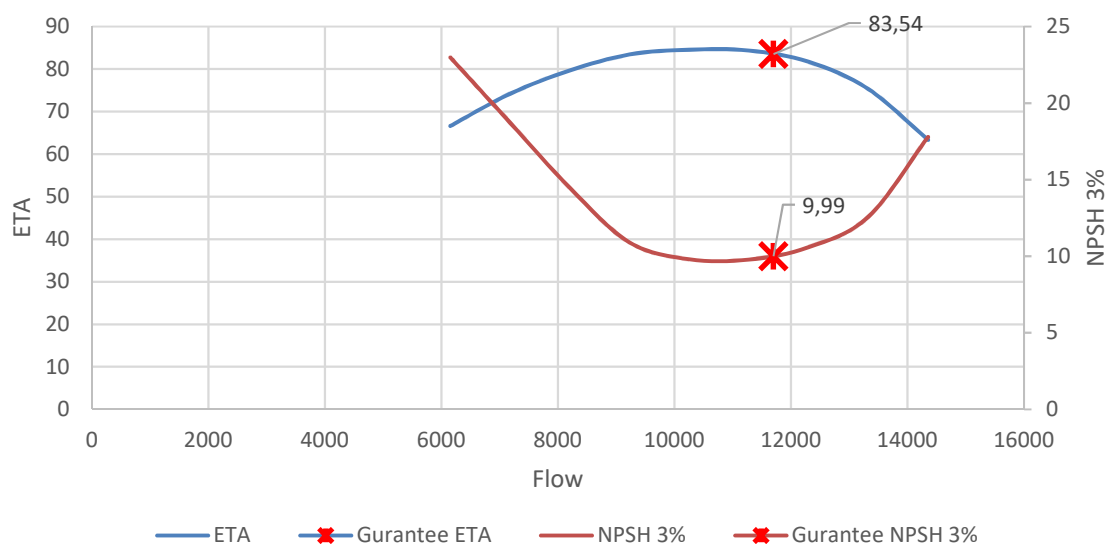
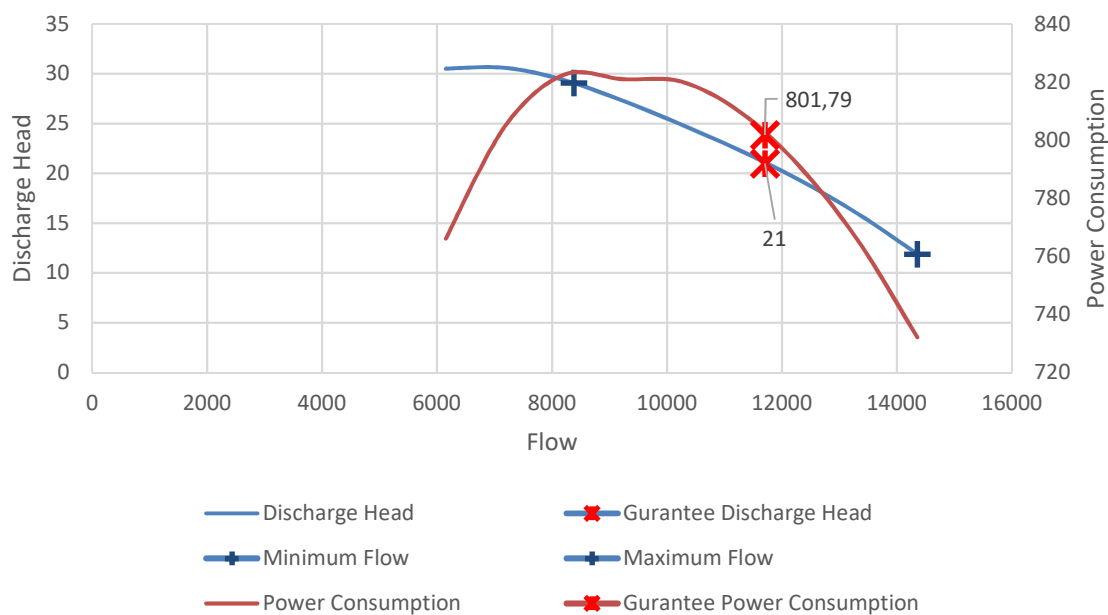


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## Units

|         |                   |          |    |
|---------|-------------------|----------|----|
| Flow    | m <sup>3</sup> /h | NPSH3%   | m  |
| D. Head | m                 | Power C. | kW |

\*Operating only allowed > Qmin

| Curve | Impeller Diameter [mm] |
|-------|------------------------|
| 1     | 853,92                 |
|       |                        |
|       |                        |
|       |                        |

|                              |     |
|------------------------------|-----|
| Speed [1/min]                | 740 |
| Temperature [C]              | 20  |
| Density [kg/m <sup>3</sup> ] | 998 |

# Technical Curves



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**Operation is only allowed between Min. Flow and Max. Flow.**

**NPSHA values can limit the operating range of the pump.**

| Nomination    | Zero Capacity | Min. Flow | Guarantee Point | Max. Flow | Run Out | Max. Power |
|---------------|---------------|-----------|-----------------|-----------|---------|------------|
| Q [m3/h]      | 0             | 8379,57   | 11700           | 14353,59  |         | 8379,57    |
| H [m]         | 47,87         | 29,08     | 21              | 11,89     |         | 29,08      |
| Eta [%]       | 0             | 80,49     | 83,54           | 63,36     |         | 80,49      |
| P [kW]        | 968,1         | 822,88    | 801,79          | 732,1     |         | 822,88     |
| Speed [1/min] | 740           | 740       | 740             | 740       |         | 740        |
| NPSH [m]      | 48,54         | 13,73     | 9,99            | 17,79     |         | 13,73      |

# Start - Up Curve



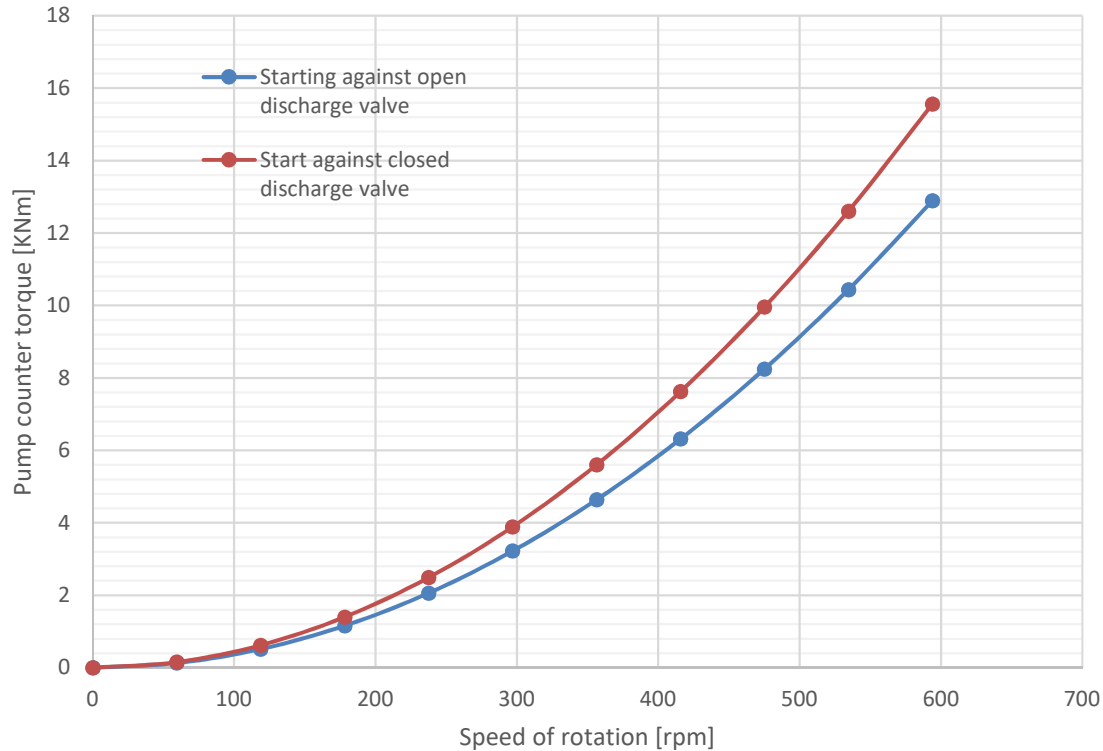
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| Q [m³/h] | H [m] | ETA [%] | P <sub>0</sub> [kW]* | P <sub>N</sub> [kW]** | n <sub>N</sub> [rpm] |
|----------|-------|---------|----------------------|-----------------------|----------------------|
| 11700    | 21    | 83,54   | 968,1                | 801,79                | 594                  |



|                          |     |       |
|--------------------------|-----|-------|
| Mass moment of inertia   | 35  | kg*m² |
| Weight of rotating parts | 900 | kg    |

## Information about Thrust Bearing

Thrust Bearing has to be in the motor: No

Maximal axial thrust for continious operation: 164000 N

Maximal axial thrust upwards (short operation) 16400 N

Radial Force 16400 N

Maximum Torque by starting against closed discharge valve\*\*\* 15,563 KNm

Maximum Torque by starting against open discharge valve 12,89 KNm

\* Power at zero flow

\*\* Power at nominal flow

\*\*\*KSB SEZ Pumps are only allowed to start up against open valve or gradually opening valve. Start up against closed valve only on request.

Standard Quality Documents\*



|     |            |
|-----|------------|
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|     |            |

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|           |                 | Material Tests    |                    |                   |                         |                         |                    |               |           |
|-----------|-----------------|-------------------|--------------------|-------------------|-------------------------|-------------------------|--------------------|---------------|-----------|
| Nr.       | Component       | Chemical Analysis | Tensile Test at RT | Impact Test at RT | Alloy Verification Test | Dimensional Examination | Visual Examination | Marking Check | Balancing |
| 144       | Discharge Elbow | 2.1/M             |                    |                   |                         |                         |                    |               |           |
| 171       | Diffuser        | 2.1/M             |                    |                   |                         |                         |                    |               |           |
| 211 / 213 | Shafts          | 3.1/M             | 3.1/M              | 3.1/M             | 3.1/M                   | 3.1/M                   | 3.1/M              | 3.1/M         |           |
| 230       | Impeller        | 3.1/M             | 3.1/M              |                   | 3.1/M                   | 3.1/M                   | 3.1/M              | 3.1/M         | 3.1/H     |
| 512       | Wear Ring       | 3.1/M             | 3.1/M              |                   | 3.1/M                   | 3.1/M                   | 3.1/M              | 3.1/M         |           |
| 711       | Column Pipe     | 2.1/M             |                    |                   |                         |                         |                    |               |           |

|                                              | Certification |
|----------------------------------------------|---------------|
| Balancing according acc. ISO 1940 G6.3       | 3.1/H         |
| Pressure Test acc. DIN EN 12162 (30 Minutes) | 3.1/H         |
| Performance Test                             | KSB Report    |
| Final Inspection and Marking Check           | 3.1/H         |

\*For more or detailed Information about possible certificates feel free to contact us

M = Material Manufacturer  
H = Pump Manufacturer

## Instrumentation List



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*Pump\**

| Nr       | Description                                                                        | Standardtype                                      | Included |
|----------|------------------------------------------------------------------------------------|---------------------------------------------------|----------|
| <b>1</b> | <b>Thrust Bearing</b>                                                              |                                                   |          |
| 1.1      | Local oil level indicator                                                          | Acc. Thrust bearing manuf.                        | x        |
| 1.2      | local thermometer for oil temperature                                              | Acc. Thrust bearing manuf.                        |          |
| 1.3      | 1 x PT 100 element 3 wire dual type for oil temperature                            | KSB Standard                                      | x        |
| 1.4      | 1 x PT 100 element 3 wire dual type for rolling element or rather main thrust pad  | KSB Standard                                      |          |
| 1.5      | 1 x PT 100 element 3 wire dual type for journal thrust pad                         | KSB Standard                                      |          |
| 1.6      | Redundant design for PT 100 elements                                               |                                                   |          |
| 1.7      | preparation for oscilation pick up device / vibration sensors                      | Standard is two M8 threads at the bearing housing |          |
| 1.8      | Oil heater if necessary and applicable                                             | Acc. Thrust bearing manuf.                        | x        |
| <b>2</b> | <b>Oscilation pick up device</b>                                                   |                                                   |          |
| 2.1      | Oscilation pick up devive with two sensors for x and y direction                   | KSB Standard (Prueftechnik Vibrex)                |          |
| <b>3</b> | <b>Others</b>                                                                      |                                                   |          |
| 3.1      | Local pressure measuring (pressure gauge)                                          | KSB Standard                                      | x        |
| 3.2      | Pressure sensor located at the discharge elbow                                     | KSB Standard                                      |          |
| 3.3      | Sensor for rpm and rotation direction                                              | KSB Standard                                      |          |
| <b>4</b> | <b>Junction Box / Terminal Box</b>                                                 |                                                   |          |
| 4.1      | Junction Box where all instruments are prewired with transmitters (4-20 mA Output) | KSB Standard                                      |          |

*Motor Engine Standard (Additions at request)*

| Nr | Description                             | Standardtype         |
|----|-----------------------------------------|----------------------|
| 1  | Two PT 100 elements per motor phase     | acc. Engine Supplier |
| 2  | One PT 100 element at the guide bearing | acc. Engine Supplier |
| 2  | Standstillheater (If necessary)         | acc. Engine Supplier |

\*For special instrumentation requests feel free to contact us

|             |                   |                                                                                     |                |
|-------------|-------------------|-------------------------------------------------------------------------------------|----------------|
| Vendor List |                   |  |                |
| SEZ         | N 9-70 / 1        | Doc. Nr.                                                                            | 4005826330 -12 |
|             |                   |                                                                                     |                |
| Nr.         | Part Description  | Vendor                                                                              |                |
| 1           | Thrust Bearing    | Turbolink, Michell, Renk, KSB                                                       |                |
| 2           | Coupling          | KTR, Siemens                                                                        |                |
| 3           | Motor Engine      | ABB, Siemens, Teco, HHI, Hyosung, Schorch, WEG                                      |                |
| 4           | Radial Bearings   | KSB, Thordon Bearings                                                               |                |
| 5           | Material Sourcing | Global Material sourcing acc. to KSB quality without limitation                     |                |
|             |                   |                                                                                     |                |

| Documentation List                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                |  |                     |                         |     |                                  |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------|---------------------|-------------------------|-----|----------------------------------|-----|
| SEZ                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | N 9-70 / 1     | Doc. Nr.                                                                            |                     |                         |     | 4005826330 -13                   |     |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Included (1.1) | Document Delivery                                                                   | Pennalty Doc. (1.3) | Hold for Approval (1.4) | QTY | Incl. in IOM Manual              |     |
| <b>Drawings</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                |                                                                                     |                     |                         |     |                                  |     |
| Outline drawing including allowable forces and moments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Yes            | 8                                                                                   | WAO                 | NO                      | NO  | E                                | YES |
| Cross sectional drawing (including bill of materials)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Yes            | 8                                                                                   | WAO                 | NO                      | NO  | E                                | YES |
| Performance test plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Yes            | 8                                                                                   | WAO                 | NO                      | NO  | E                                | NO  |
| Motor catalogue drawing                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | If applicable  | 10                                                                                  | WAO                 | NO                      | NO  | E                                | YES |
| Motor wiring / connection diagram (1.5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | If applicable  | 10                                                                                  | WAO                 | NO                      | NO  | E                                | YES |
| Coupling outline drawing (incl. bill of materials) (1.5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | If applicable  | 14                                                                                  | WAO                 | NO                      | NO  | E                                | YES |
| Thrust Bearing outline drawing (incl. bill of materials) (1.5)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | If applicable  | 14                                                                                  | WAO                 | NO                      | NO  | E                                | YES |
| <b>Documents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                |                                                                                     |                     |                         |     |                                  |     |
| Predicted performance curve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Yes            | 6                                                                                   | WAO                 | NO                      | NO  | E                                | NO  |
| Spare parts list                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Yes            | In IOM                                                                              | In IOM              | NO                      | NO  | In IOM                           | YES |
| <b>Test results and NDE</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                |                                                                                     |                     |                         |     |                                  |     |
| Certified pump performance test data                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | If applicable  | 1                                                                                   | WAT                 | NO                      | NO  | E                                | YES |
| Certified hydro test (If included in scope of supply)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | If applicable  | In IOM                                                                              | In IOM              | NO                      | NO  | In IOM                           | YES |
| Motor test report (If included in scope of supply)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | If applicable  | In IOM                                                                              | In IOM              | NO                      | NO  | In IOM                           | YES |
| <b>Final manuals</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                |                                                                                     |                     |                         |     |                                  |     |
| IOM Manual                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Yes            | 2                                                                                   | WAD                 | NO                      | NO  | E for approval<br>2H + 1CD final | NO  |
| <div> <div> IOM Installation, Operation &amp; Maintenance Manual<br/> WAD Weeks after Delivery<br/> WAO Weeks after receipt of acceptable purchase order<br/> WAT Weeks after test<br/> ARAD After Receipt of approved drawings<br/> ARO After Receipt of order<br/> E Electronic<br/> CD Compact Disc<br/> H Hard Copy </div> <div> <b>Notes:</b><br/> 1.0 The note "if applicable" means that the specific item was sold with the feature<br/> 1.1 All formats will be in KSB / Vendor Standard format<br/> 1.2 Binder and paper size for standard packages are DIN A4<br/> 1.3 If agreed during commercial negotiations<br/> 1.4 If agreed during commercial negotiations<br/> If any documents are selected "YES" then the pump delivery time quoted must be ARAD<br/> If all documents are selected "NO" then the pump delivery time can be quoted ARO<br/> 1.5 Or promised delivery time of certified sub vendor document + 4 weeks, whichever is longer<br/> 1.6 4 WAO then every 4 weeks </div> <div> <b>Adders:</b><br/> * Extra hard copy for non API is 70 €, for API is 180 €<br/> * Extra CD 25 €<br/> * For Customer own format documents add 55 €<br/> * All packages to be supplied in one binder, if differen add 20 € per extra binder<br/> * KSB will submit documents 1 time, and 1 re-submittal is free of charge, each additional resubmittal will be charged with 325 €<br/> * For any additional documents not listed above contact KSB for price adders </div> </div> |                |                                                                                     |                     |                         |     |                                  |     |

# Pump Pressure Information

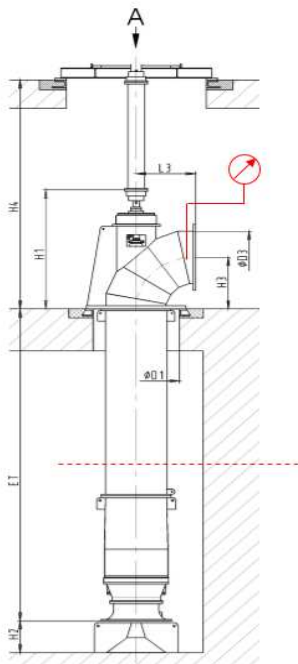


SEZ

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Level Pressure Gauge

0,9 m

Minimum Waterlevel

-1,2 m

|                                 |       |                   |
|---------------------------------|-------|-------------------|
| Density of the medium           | 998   | kg/m <sup>3</sup> |
| Gravity                         | 9,81  | ft/s <sup>2</sup> |
| Level difference                | 2,1   | m                 |
| Normal flow rate                | 11700 | m <sup>3</sup> /h |
| Diameter discharge port         | 0,9   | m                 |
| velocity at the discharge port  | 5,109 | m/s               |
| Pressure losses due to velocity | 1,331 | m                 |

**Normal head of the pump** 21 m

**Display pressure gauge** 17,57 m  
1,720071862 bar

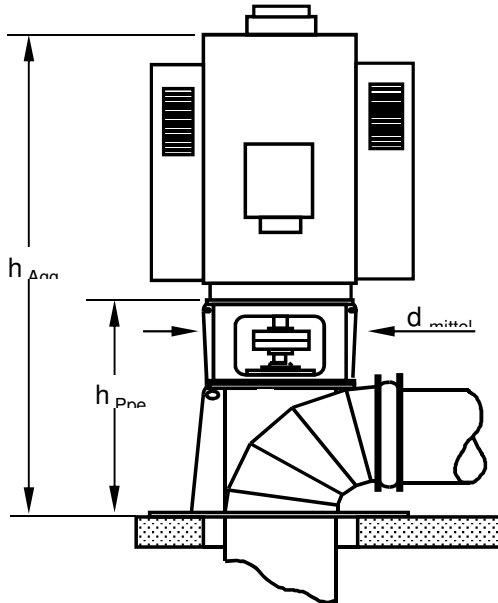


SEZ N 9-70 / 1

Doc. Nr.

4005826330 -15

Acoustic values of the pump (without motor engine)



|                 |        |
|-----------------|--------|
| P Pump [kW]     | 801,79 |
| Speed n [1/min] | 740    |
| h Ppe [m]       | 2,5    |
| d m [m]         | 1,5    |

Sound pressure level LpA [dB]

**83,45**

Envelop. surface dimension Ls [dB]

**17,9**

Sound power LWA [dB]

**101,35**

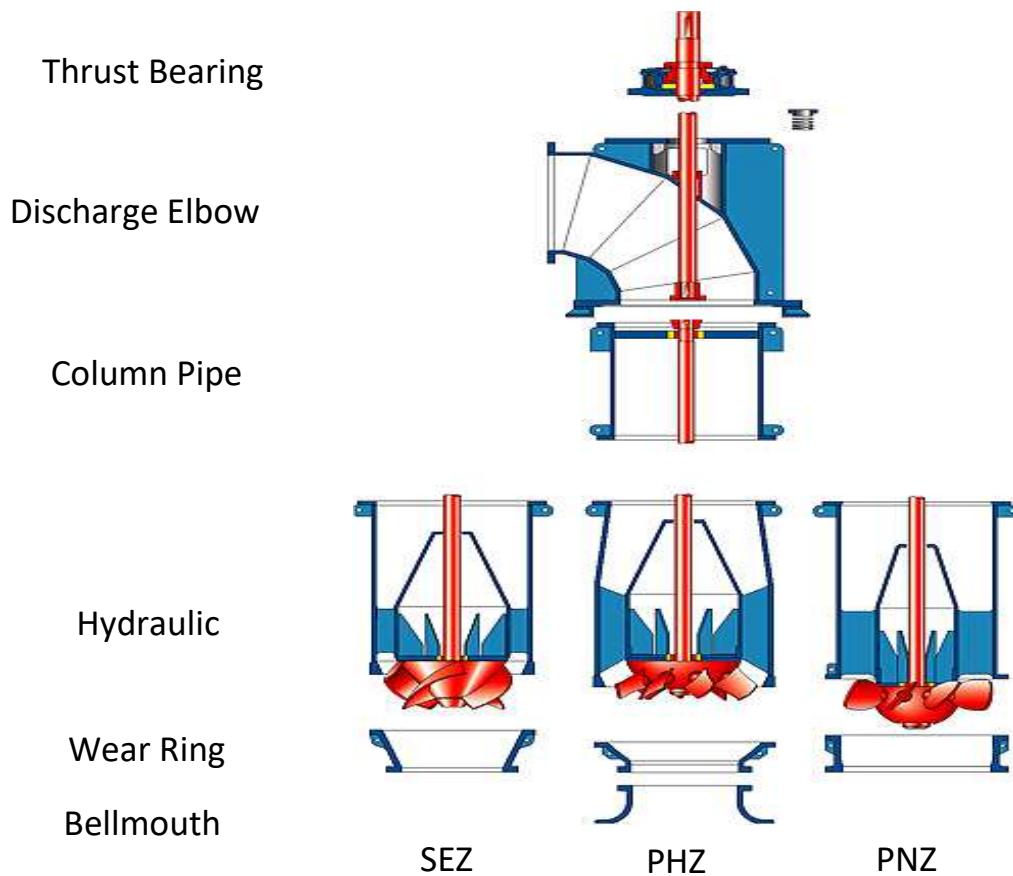
| Octave spectrum fm [Hz] | Lp [dB] |
|-------------------------|---------|
| 63                      | 77,45   |
| 125                     | 79,45   |
| 250                     | 83,45   |
| 500                     | 81,45   |
| 1000                    | 79,45   |
| 2000                    | 75,45   |
| 4000                    | 67,45   |
| 8000                    | 71,45   |

To lower the noise level a noise absorption hood can be delivered by KSB (Cost increaser)

## 1. Pump type

For Your requirement, we have planned the following pump type with positive proven results and tested over a long time:

Vertical tubular casing pump, type "SEZ", with mixed flow hydraulic and horizontal discharge elbow. The pump's other main components are impeller, diffuser, pump, shaft, shaft bearings and column pipes.

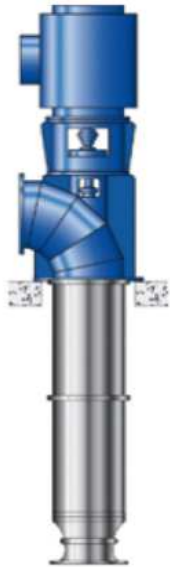


## 2. Hydraulic data and material selection

The data concerning Q and H and material selection of the pump offered are based on the requirements specified in Your inquiry and have been entered in the attached data sheet. Please also note the attached pump pressure information attached to these offer.

### 3. Type of installation

The type of installation is "EJ", this means the discharge nozzle is arranged above floor. The pump is suspended beneath the discharge elbow and above floor. The drive is mounted on a second floor.



EB



EJ



EM



CD

### 4. Impeller design: open mixed flow impeller

The hydraulic system of the offered pump type is based on the required operating data and results in an open mixed flow impeller with multiply curved blades.

The impeller runs in a wear ring, the required clearance can be adjusted by lifting and lowering the impeller.

The impeller is balanced at the manufacturer's works to achieve smooth running.

### 5. Number of stages

Based on the operating data specified, we have selected a single-stage hydraulic system.

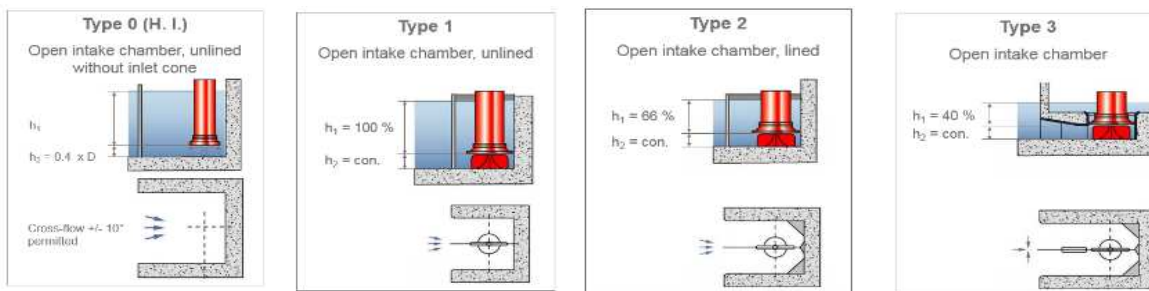
## 6. Intake chamber

For inflow, an open intake chamber has been specified. This is a type with special additional fittings (Not in KSB Standard Scope- but can be offered). The pump immersion depth selected ensures

operation without air-entraining vortices and cavitation.

If required, an entry cone will be installed (In KSB Scope).

KSB's preselected dimensions are given in annex "Intake Chamber".



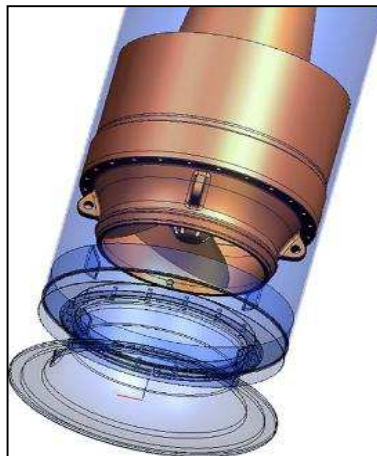
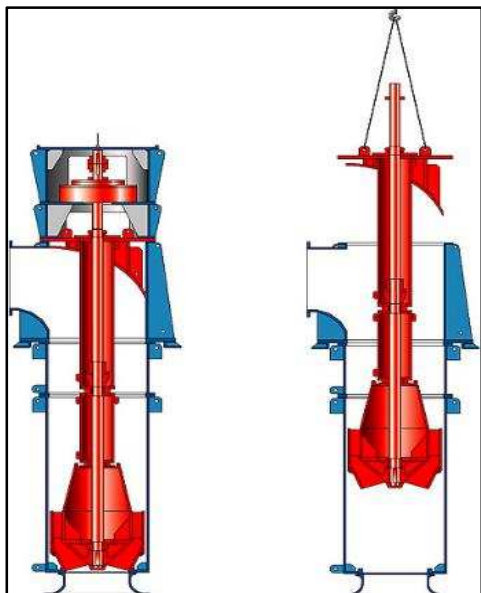
## 7. Entry cone

In order to ensure a smooth pump operation, a uniform inflow is an absolute requirement. Therefore, an entry cone will be arranged underneath the inlet nozzle of the pump. The entry cone has to be grouted into concrete. If there is already an intake chamber which can not be emptied a special entry cone which is mounted under the bellmouth can be delivered.

## 8. Non-pull-out design vs pull-out design

The rotating and non-rotating components of the pump constitute an assembly unit. For inspection of internal pump components, the pump is lifted out and dismantled.

Presentation pull out design



#### 9. Drive Coupling

The drive coupling between pump drive and pump is included in KSB's scope of supply. KSB use curved tooth type or flexible disc type coupling which exhibits the following properties: transmission of the existing torque based on the specified speed.

The double-cardanic design allows for compensation of axial, radial and angular displacements. The coupling is balanced prior to the first operation of the pump. The coupling manufacturer will be choosed by KSB.

#### 10. Pump foundation

The pump is arranged on a foundation ring embedded in concrete. In case the water level is above the height of the installation floor of the pump, sealing by an O-ring between the foundation ring embedded in concrete and the installation flange of the pump is considered. The foundation ring structure is provided with screws/bolts for levelling the foundation ring during setting in concrete and for fastening the foundation ring in the foundation.

### 11. Shaft guide bearings

The radial guide bearings are lubricated by the medium handled and do not require any separate, external lubricating water. The rotating shaft protecting sleeves are made of corrosion-resistant CrNi steel, the non-rotating bearing bushes of Thordon.



Thordon Bearing



KSB Residur Bearing

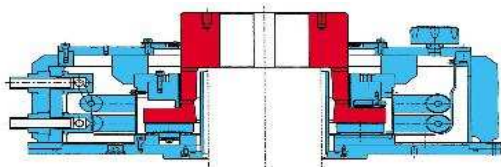
## 12. Thrust Bearing

The thrust bearing will be installed between pump and pump drive for absorption of the axial forces. The thrust bearing can be designed as an oil-lubricated segmental bearing or as an anti friction bearing. KSB will choose the best solution according to the requested operation data.

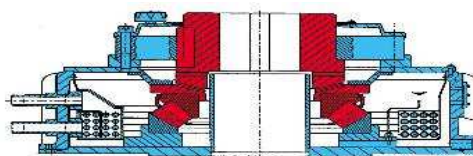
Cooling is effected continuously by a self-cooling water system supplied by the pump discharge.

The shaft nut, which the impeller clearance is adjusted with, is situated above the bearing housing. The adjustment can be performed without dismantling of pump components.

The bearing is designed on the basis of the operating conditions specified and in consideration of the hydraulic axial thrust as well as the weights of the rotating pump components.



Tilt pad bearing



Anti friction bearing

## 13. Non-Reverse ratchet

The cooling water pump offered is not equipped with a non-reverse ratchet.

Starting must be clarified with the motor manufacturer under any circumstances since the reverse speed may be higher than the normal speed.

This must be considered by the motor manufacturer.

## 14. Instruments

The instruments required for safe operation of the pumps are in accordance with KSB's standard instruments (see attached instrumentation list).

## 15. Coating

For coating Information see attached data sheet

#### 16. Drive

The pump is driven by a direct-drive electric motor not included in KSB's scope of supply. The technical data and geometric connection dimensions of the motor will be clarified by you and shall be available to us at the time of contract award.

We assume that the motor's exhaust air is dissipated in a way that the pump's thrust bearing arranged underneath the motor is not heated up. If the motor has inlet or exhaust air openings at the bottom, it is important that these openings are not covered by KSB's support structure.

The weights and flange dimensions indicated in the installation plan are based on KSB's presumptions. Significant deviations require the corresponding price corrections.

The motor manufacturer shall ensure that harmful currents (due to shaft voltage, unipolar voltage) do not flow into the pump via the drive coupling, which would lead to destruction of, for example, drive coupling and/or thrust bearing.

#### 17. Material Variant

The material combination of the pump components has been selected on the basis of the specified medium handled, the associated water chemistry and Your specifications.

The attached "parts list" and "sectional drawing" show the essential pump components which come or do not come into contact with the medium handled and indicate the selected materials.