



Specification

Subject	2 - Purchasing Terms		
Specification	2.4 – Specifications for Special Vehicles		
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Purchaser in document is Sør-Norge Aluminium AS



Specification

1. General

1.1 General

All equipment shall be delivered in compliance with current laws and regulations. Pay special attention to regulations from Labor Inspections (Arbeidstilsynet). The most important regulations are:

Machine Regulations (order no. 522)
Regulations on the use of work equipment (order no. 555)
Regulations on noise in the work place (order no. 398)
Instructions on Noise Data for machines and equipment (order no. 422)
Regulations about Safeguards against mechanical vibrations (order no. 582)
Regulations on technical devices (order no. 221)

Vehicle Regulations
Working Environment Act (Arbeidsmiljøloven)

The machine shall be delivered with conformity declaration and CE marking.

The supplier shall present a plan for quality assurance for the designated project, which shall be approved by the purchaser.

1.2 Standards

Components and dimensions in accordance with Norwegian Standard (Norsk Standard) and established standards shall be used for the delivery.

Attention should be drawn to the following:

When choosing components, it is mandatory to use components that are being used in existing equipment at Sørøal, unless they are non-existent or otherwise specified.

1.3 Maintenance

Equipment shall be designed in order for maintenance to be performed in a safe and secure manner.

The equipment should be prepared to ensure safe traffic access, platforms, railings, etc. Especially for work that is to be performed high above the ground.

2. Chassis

2.1 Dimensions

Determined by vehicle type and area of operation.

Unless otherwise specified, the maximum width shall not exceed 1800mm and the maximum height shall not exceed 3700mm.

2.2 Tow Hold

A Tow Hold shall be mounted for lifting and towing which is adapted for Sørøal's Tow Yoke at the front and the back of the machine.

3. Cab



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3.1 Dimensions

Unless otherwise specified, the inner length shall be minimum 1400mm and the inner width shall be minimum 1200mm.

The cab must be ergonomically correct for personnel of different sizes. Special consideration must be taken for room and space in rotating cabs.

3.2 Windows

Laminated, heat reflective windows (5mm thickness) shall be mounted. In hot work areas, for example pot rooms, thermopane windows with reflective properties shall be used.

For use in corrosive environments, the windows shall be delivered with foil on the outside.

Use of tempered glass with foil shall be agreed upon with the buyer.

3.3 Insulation

The parts of the cab that are facing the pot shall be heat insulated and the outside shall have a heat reflective surface. The insulation shall be secured with perforated or smooth sheets. Use of other sheet types can only be used if agreed upon by the buyer.

3.4 Window Wipers

Vehicles being used in the electrolysis hall shall not normally have window wipers.

The exception is electrolysis vehicles that are also being used for work outdoors.

Other vehicles shall always have window wipers.

3.5 Driver's Seat

Unless otherwise specified, Grammer seats with air suspension or BE-GE 9000 with suspended undercarriage and lower back support shall be used. ISRI can be used in certain situations.

The pedestal must be height adjustable to at least 100mm. A retractable safety belt shall be mounted.

The driver's seat shall be equipped with a seat switch that hinders forward movement of the vehicle when the seat is unoccupied.

3.6 Cooling System

The cooling system must be of stainless design. Cooling capacity in the cab shall be 3kW/m³ minimum.

Controls for the cooling and fresh air system must be agreed upon by the purchaser. Cooling Systems used at Sørøal includes HY2000 and MK650 (Mosjøen Kulde og Klimaservice AS).

The choice of the cooling system shall be approved by the purchaser.

3.7 Fresh Air System

The Fresh Air system shall be of stainless design.

The design of the fresh air system shall be agreed upon with the purchaser.



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3.8 Cab Tilt

The cab and engine cover shall be tiltable with a 12/24v electro hydraulic aggregate of type: Bosch

The Aggregate must also be capable of being used as a backup for operation of the work hydraulics.

In the upward tilt position, the cab and the engine cover shall be secured with a support rod or a chain. Safety Pilot Valves shall be mounted.

3.9 Entering and Exiting

The vehicle shall be arranged with the necessary steps and handrails to make entering and exiting simple and secure. Step height shall not exceed 300mm and the steps shall be equipped with an anti-slip covering. For vehicles used in electrolysis, the handrails shall be electrically isolated from the vehicle.

3.10 Ergonomical Design

For the ergonomical design of the cab area, see attach. 01.

4. Diesel Engine

4.1 General

Type: Deutz
Perkins
Other types may be delivered upon agreement with the purchaser.

The engine shall be placed for optimal access for maintenance and service.
A Ball Valve shall be mounted for the draining of engine oil.

4.2 Air Filter

Type: Fleetguard AH 19066
AH 19068
AH 19072
AH 19074
Donalson
Mann

The size of the air filter shall be double the air requirement for the engine.
The size of the pre-cleaner shall be the normal air requirement for the engine.

4.3 Engine Oil Filter

The diesel engine shall have a full-flow filter (Fleetguard) or the original from the engine manufacturer.

In addition, a bypass filter (Fleetguard LF 777) shall be mounted.

4.4 Ascension Ability

The vehicle must be able to ascend 6° or ~10% with full load and between 1800-2000 rpm without problems.



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4.5 Monitoring

The engine shall be equipped with a monitor that has an automatic stop for high temperature and/or low oil pressure.

An Automatic Oil Filling System (Murphy) that can only be operated when the ignition is switched off shall be mounted.

4.6 Governor

To be agreed upon for each instance.

It shall be possible to adjust the drive speed down to a maximum of 12 km/hr for vehicles to be used in the electrolysis.

5. Hydraulics

5.1 General

When mounting the test points for measurement of hydraulic pressure, test nipples of the following type shall be used: Parker Series 3, test nipple with threaded couplings (M16x2).

Procedure for cleaning the hydraulic system shall be included.

Unless otherwise agreed with purchaser, ISO standard valves shall be used.

5.2 Drive Hydraulics

Unless otherwise agreed upon with purchaser, the following shall be used:

Drive Pump: Bosch Rexroth or Sauer Danfoss
Wheel Motor: Bosch Rexroth or Sauer Danfoss
Distributing gear: Brevini Reggiana or Teknodrive

5.3 Work Hydraulics

Unless otherwise agreed upon with purchaser, the following shall be used:

Variable Pump: Bosch Rexroth or Sauer Danfoss
Constant Pump: Bosch Rexroth
Constant Motor: Bosch Rexroth
Directional Valves: Sauer Danfoss, Parker or Bosch Rexroth

The Directional Valves shall be equipped with pressure limiting valves. The valves shall be proportionally controlled. The A and B port shall be capable of being pressure-regulated.

5.4 Tank

All tanks shall have a sealed lid and manhole.

The tanks shall have a Breathing Filter (Mahle PI0114Sm-L 3μ) with a replaceable element (852507), the use of other filters shall be agreed upon with the purchaser.

The breather filter shall be mounted with approx. 40cm pipe extension.

The tank shall have easy access for the draining of oil with a closing valve and a hose towards the center of the vehicle. A Level Gauge shall be mounted.

All fasteners shall be double plated to the tank plates.

Quick Couplings of type: Hann ISO 7241-1A ½ for filling of oil through the return filter shall be mounted.



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Elevated tanks shall have closing valves on the outlets.

5.5 Hoses

All hydraulic hoses and couplings shall be fabricated by Hi-Flex or Parker, with crimped, 37° JIC swivel couplings attached.

Only straight couplings shall be used. In places with 90° or other angles, Triple-Lock 37° collar couplings shall be used.

5.6 Pipes and Fittings

Hydraulic fittings for pipes shall be type Triple-Lock 37° collar couplings.

Pipe shall be used as much as possible in the hydraulic system and all pipes shall be cleaned according to NS 5910 "Cleaning of Hydraulic Pipes Systems" or better. Flushing Procedure shall be included.

Use of EO2 shall be agreed upon with the purchaser.

5.7 Filter

The size of the filter(s) shall be according to NS 2084 "General Rules for Selection and Dimensioning of Hydraulic Filters" or better.

Requirements for level of cleanliness are 17/15/12 (ISO 4406).

Requirements for operation temperature 40-60 °C

Environmental factor of 1.5 shall be chosen for dimensioning of filtering capacity.

Filter density of 3µ.

Type of Filter Indicator shall be agreed upon with purchaser.

Standardized filter housings and filters (DIN 24550) shall be used.

High Pressure Filters over 5" shall be delivered with drain in the bottom of filter pot.

Filters fabricated by Mahle shall be used.

Filters used by SØRAL:

High Pressure Filter:

0-120 l/min	Pi-40016-012	Complete
	Pi-21016-DN	Element
120-300 l/min	Pi-40025-012	Complete
	Pi-21025-DN	Element

Return Filter:

Tank Mounted	0-150 l/min	Pi-50016-057	Complete
		Pi-22016-RN Smx	Element
Pipe Mounted	150-300 l/min	Pi-50040-057	Complete
		Pi-22040-RN Smx	Element
	0-250 l/min	Pi-20025-057	Complete
		Pi-22025-DN Smx	Element

5.8 Cylinders

Fabricated by: Klinsby, LJM and Bosch Rexroth

The Cylinders' Base Eye shall be through-welded.



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5.9 Distribution Gear for Pumps

All hydraulic pumps shall be mounted on the distribution gear directly on the engine. Fabricated by: Teknodrive or Brevini-Reggiana. All other instances of mounting, for example register mounting, shall be agreed upon with the purchaser.

5.10 Couplings

Axel Couplings fabricated by: Bowtex, Rotex, Ortiflex or Centaflex.

6. Wheels and Axels

6.1 Wheel Hub

Wheel Hubs and wheel axels shall preferably be manufactured from one piece, rather than several elements welded together.

6.2 Tires

All rubber qualities and wheel dimensions shall be agreed upon. Tires and rims that are currently being used on vehicles at Søråal shall preferably be used.

6.3 Drive Axel

Drive Axels shall be fabricated by Hurth. All other brands shall be approved by purchaser.

6.4 Front Axel

To be agreed with purchaser.

6.5 Back Axel

To be agreed with purchaser.

6.6 Steering

Vehicles shall have hydraulic steering of type Danfoss Orbitrol. All other brands shall be approved by purchaser. The steering wheel shall be up/down, backward/forward adjustable to customize the driver's needs. The steering wheel shall have approx. 4 rotations from the left side maximum turn to the right side maximum turn.

6.7 Brakes

Hand Brakes shall be of the self-activated type, i.e. that the brakes shall be activated in case of engine failure and/or brake failure. In addition, ordinary drive brakes shall be mounted.

6.8 Suspension

Requirements for Suspension and choice of type shall be agreed upon with purchaser. Hydraulic Suspension of the same type that is currently being used on vehicles at Søråal shall preferably be used.

7. Electrical Equipment



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7.1 Mounting

Electrical installation shall be performed professionally. Fuses and relays shall be placed in a cabinet. Only automatic fuses shall be used. All wire passages shall be closed off with PG glands and circular cables.

7.2 Rear Backing Camera

Fabricated by: Mitsubishi with color display. All other brands shall be approved by purchaser.

7.3 Voltage

Vehicles shall have 24v operation voltage. A main electrical switch that is easily accessible on the electrical system shall be mounted. The switch shall be shielded against heat radiation.

7.4 Chargers

The capacity of Battery Chargers shall be 20% (1/5) of the battery's total capacity. Mains Voltage 3x380v.

7.5 Light Equipment

Lights standard Hella.

Driving Lights: Diode Bulb. Shall be automatically lit when machine is driven forward (hidden on/off switch).

Parking Light: Diode Bulb. Shall be automatically lit when the engine is running

Rear Lights: Diode Bulb. Shall be automatically lit when the engine is running

Blinker Lights: Diode Bulb.

Work Lights: Standard Hella lights with reflectors suspended in rubber.

Backing Lights: Standard Hella lights with reflectors suspended in rubber.

Backing Signal: Shall be mounted.

Rotating Blinker Lights: Shall be mounted. Type shall be agreed upon with purchaser.

7.6 Mirrors

Mirrors with electrical adjustment of type Mekra (Hellanor, SPE 440384 or SPE 430324) shall be mounted on both sides.

7.7 Help Start

Connector for Help Starter shall be placed easily accessible on the vehicle.

The connector shall be shielded from heat radiation.

Type: Gray CB 175 (Bruco Machine, product no. 604911000)

7.8 Battery

The Battery must be easily accessible for service and replacement.

Fabricated by: Exide Sønnak Maxima 900

61501 12V/115Ah

61040 12V/110Ah

64401 12V/144Ah

7.9 Alternator

The Alternator shall have 20% extra capacity when all the consumers are running.

Fabricated by: Valeo, Lucas or Bosch



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7.10 Instruments

Running Hour Counter, tank gauge, control lights for motor oil pressure, control lights for charging, control lights for motor temperature, horn, speed gauge and RPM meter. Separate level switch with control lights for diesel tank.
LCD Instruments are preferred.

The list is not exhaustive and the instrumentation shall be agreed upon with purchaser.

8. Environmental

8.1 Noise

The specifications regarding noise are based on Labor Inspection's (Arbeidstilsynets) regulations:

- 398A Noise at the work place
- 522 Machines

Noise data shall be documented in the user manual, ref. 522 Machines, attachment 1, no.1.7.4, item f

Outside Noise Emitted to the Surrounding Area

Noise Requirements:

Top Value Maximum. 70dB(A) measured with vehicle driving at maximum speed on a flat surface at a distance of 7.5 m.

Inside Noise in Cab

Noise Requirements:

Top Value Maximum. 75dB(A) measured with vehicle driving at maximum speed on a flat surface, with the measuring point close to the driver's ear.

8.2 Noise and Gas

The need and requirements for fresh air system/air quality inside the cab shall be agreed upon with the purchaser in each instance.

8.3 Temperature

The need and requirements for the air cooling system inside the cab shall be agreed upon with the purchaser in each instance.

8.4 Vibration

Vibration data shall be documented in the user manual, ref. 522 Machines, attachment 1, no.3.6.3, item a

8.5 Ergonomics

See attachment 1.

9. Documentation

9.1 General

A User Manual according to regulation 522 Machines, attachment 1, item 1.7.4 and item 3.6.3 shall be included.



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The User Manual shall be in Norwegian.
All documentation shall be updated to "as built" in 3 folders and digital on CDs.
Documentation shall be approved by the purchaser and delivered before or together with the machine delivery.

9.2 Maintenance Manual

A complete maintenance manual, written in Norwegian and intended for specialized personnel shall be delivered.

Typical contents of maintenance manuals:

- Technical Data
- Function Description
- Safety Instructions.
- Towing Instructions.
- Drawing List
- Arrangement Drawing
- Detail Drawing
- Parts List
- Hydraulic Diagrams
- Pneumatic Diagrams
- Electrical Diagrams
- Inspection Routines
- Maintenance Routines
- Lubrication Routines
- Complete spare part list including type and manufacturer.
- Brochures for components such as pumps, valves, filters, coolers, etc.

In brochures for single components which include several dimensions/sizes, actually delivered dimension shall be underlined.

9.3 Spare Parts

The vendor shall prepare a proposition for spare parts for the vehicle with prices .
The list shall include description and manufacturer.

9.4 Drawings

All drawings, tables, diagrams, instructions, etc. that are necessary to prepare, control, adjust, maintain, repair and functional testing of the machine shall be included in the delivery.

The drawings shall be carried out in CAD, preferably AutoCad.

The drawings shall be in standard format and be delivered electronically as dwg files.

9.5 Machine Certificate

Completed Machine Certificate shall be delivered with the machine. See attachment 2

9.6 Lubrication Chart

A specified lubrication chart with specified types of lubrication for the vehicle shall be included

10. Training

10.1 General



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For new machines, the vendor shall perform maintenance training for mechanics/technicians (min. 1 day) and operator training for machine operators. When documented safety training is required, (according to regulation 555 "Use of Work Equipment") the user training shall be performed as documented safety training.

The training shall consist of one theoretical part and one practical part emphasizing:

- Construction and mode of operation
- Safety
- Handling
- Operation and maintenance
- Troubleshooting

11. Surface Treatment

11.1 Color

The machine frame shall be black lacquer. Other parts such as the tank, cab, and engine cover shall be lacquered with the color Chrome Yellow RAL 1028.

11.2 Design

All sharp edges shall be rounded.

The vehicle shall be sandblasted and primed/base coated followed by lacquering.

1 coat base minimum thickness 75µm

2 coats auto lacquer minimum thickness 75µm for both coats.

In addition, screws and edges shall have one coat, brush painted.

12. Lubrication

12.1 General

The design of the lubrication system shall be agreed upon and approved by the purchaser.

Where suitable, central lubrication (Lincoln) shall preferably be used. If not suitable, manual lubrication points shall be considered.

13. Work Equipment

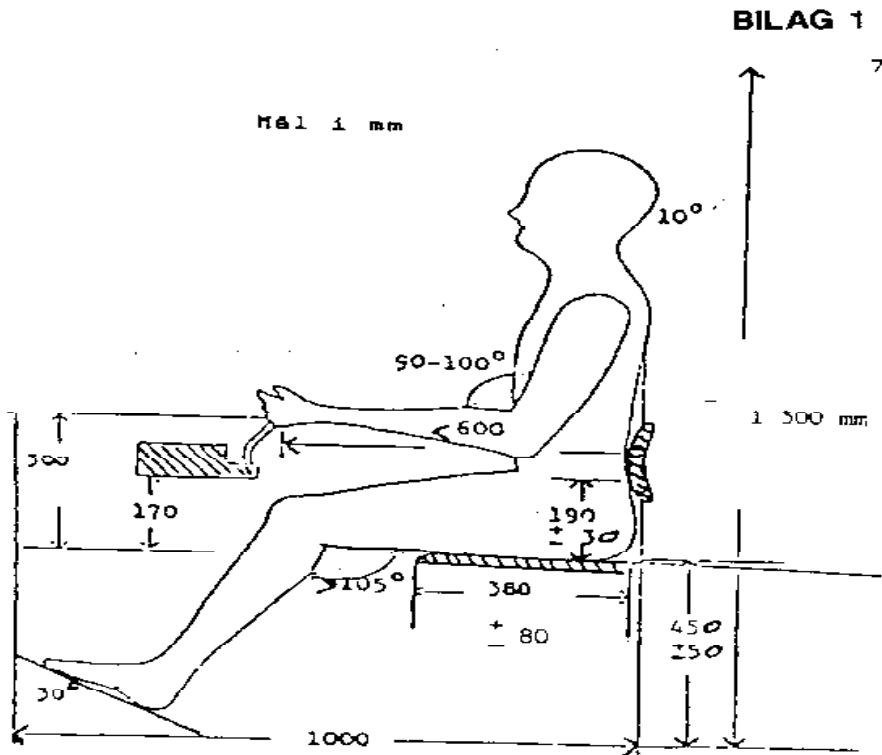
Additional equipment shall be certified and mounted in accordance with current regulations and guidelines.

14. Attachment

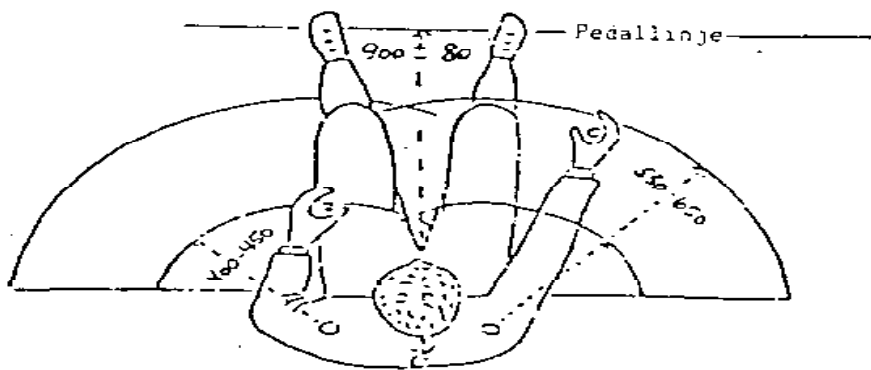
1 Ergonomical Design of Cab Area

2 Machine Certificate for Special Vehicles

Attachment 1. Ergonomical Design of Cab Area



Figur 2



Figur 3



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Attachment 2. Machine Certificate for Special Vehicles

Machine Certificate for Special Vehicles:

<p>Fabricated by:</p> <p>Type :</p> <p>Serial no.:</p> <p>Production year:</p> <p>Supplier:</p> <p>Order no.:</p> <p>Engine Manufacturer:</p> <p>Engine type:</p> <p>Engine no.:</p> <p>Engine output:</p> <p>Alternator:</p> <p>Starter:</p> <p>Battery :</p> <p>Fuel pump:</p> <p>Axel distance:</p> <p>Total length:</p> <p>Total width:</p> <p>Total height:</p> <p>Turning radius:</p> <p>Axel Load F:</p> <p>Axel Load B:</p> <p>Total weight:</p> <p>Payload:</p> <p>Dimension F wheel:</p> <p>Dimension B wheel:</p>	<p>Work hydraulic pump:</p> <p>Drive hydraulic pump:</p> <p>Drive hydraulic motor:</p> <p>Cab lift aggregate:</p> <p>Joy-stick :</p> <p>Hydraulic central :</p> <p>Back Axel :</p> <p>Front Axel :</p> <p>Drive Axel :</p> <p>Communication radio:</p> <p>Cooling System :</p> <p>Cab type :</p> <p>Seat type :</p> <p>Wheel gear :</p> <p>Distribution gear: :</p> <p>Gear/transmission:</p> <p>Air compressor:</p> <p>Filter types :</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p> <p>.....</p>
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