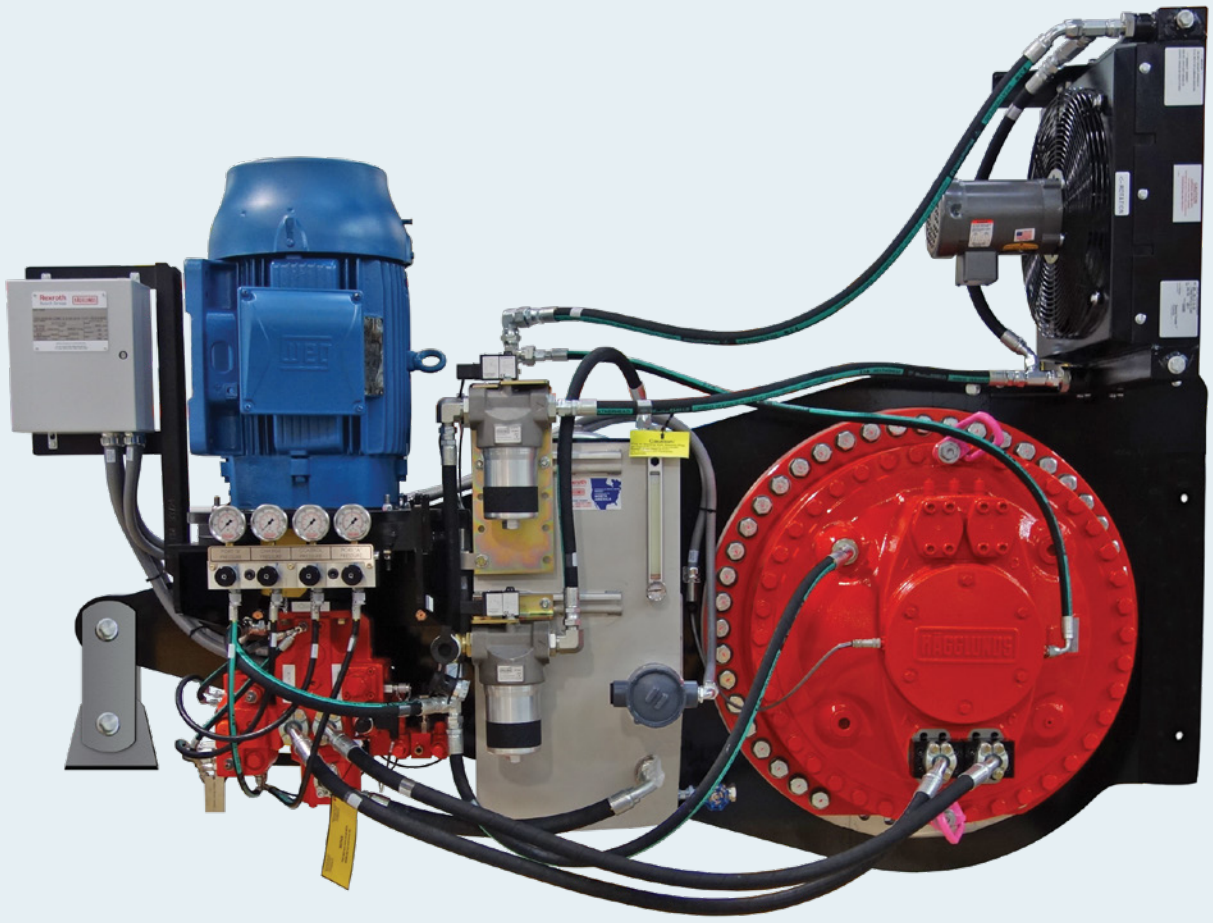
The Drive & Control Company

Rexroth
Bosch Group

Technical appendix for product catalog Hägglunds TADS

Hydraulics Direct Drive System

Technical Appendix
RA 15426-TA/02.2018



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1 Introduction

1.1 Scope

This technical appendix applies to Hägglunds TADS drive system, a hydraulic power unit. It specifies the general requirements for the selection, design, manufacture, supply, inspection and testing of the TADS, and shall be read in conjunction with the sales leaflet, Hägglunds TADS – R999001388.

Any deviation from this specification shall be approved in advance by Bosch Rexroth.

1.2 Codes and standards

The Drive Unit is designed referencing the following organizations:

2014/30/EU	EMC Directive
2014/35/EU	Low Voltage Directive
UL	Underwriters Laboratories
ANSI	American National Standards Institute
NEC	National Electric Code
AWS	American Welding Society
ISO	International Standards Organization

1.3 Safety

This product is made in accordance with the generally accepted state of the art but there is a risk of personal injury and damage to property unless you follow the safety instructions.

1.3.1 Intended use

Hägglunds TADS drive system is classified as a partly completed machine. A partly completed machine is exclusively intended to form an incomplete or a complete machine together with other components or partly completed machineries. The TADS may only be commissioned after it has been installed in the machine/system for which it is intended and the safety of the entire system has been established.

The product is intended for the following use:

- Convert hydraulic energy to mechanical rotation of a shaft.

1.3.2 Improper use

Any use other than that described as intended use shall be considered as improper and is therefore impermissible. Bosch Rexroth shall accept no liability whatsoever for damage resulting from improper use. The user shall bear all risks arising from improper use.

Similarly, the following foreseeable faulty usages are also considered to be improper:

- Using outside the operating parameters approved in the product-specific data sheet or in the order confirmation (unless customer-specific approval has been granted)
- Use of fluids outside of the standards as specified in data sheet RE 15414 Hydraulic fluid quick reference
- Modification of factory settings by non-authorized persons
- Extension or conversion is not permissible and has to be approved by contact at Bosch Rexroth.
- Using the Hägglunds TADS in hazardous environments unless the component or machine/system has been certified as compliant.
- Using the Hägglunds TADS in an aggressive atmosphere without necessary additional measures.

1.3.3 Personnel qualifications

The activities described in this documentation require basic mechanical, electrical and hydraulic knowledge, as well as knowledge of the associated technical terms. For transporting and handling the product, additional knowledge is necessary with regard to working with a lifting device and the corresponding attachment equipment. In order to ensure safe use, these activities may therefore only be carried out by appropriate qualified personnel or an instructed person under the direction and supervision of qualified personnel.

Qualified personnel are those who can recognize possible hazards and institute the appropriate safety measures due to their professional training, knowledge, and experience, as well as their understanding of the relevant regulations pertaining to the work to be done. Qualified personnel must observe the rules relevant to the subject area and have the necessary hydraulic knowledge.
Hydraulic knowledge means, for instance:

- reading and fully understanding hydraulic diagram
- fully understanding in particular the interrelationships regarding safety devices and having knowledge on the function and assembly of hydraulic components.

Bosch Rexroth offers training support. For more information about training, please contact your Bosch Rexroth representative.

2 Technical design

2.1 Functions Hägglunds TADS

The Hägglunds TADS hydraulic direct drive system features an asynchronous electric motor driving a variable stroke axial piston pump. Hydraulic motor speed is controlled by varying the analog signal to the proportional solenoid stroker on the hydraulic pump, which sets the swash plate angle and therefore piston stroke and resultant flow to the hydraulic motor. An optional speed encoder can be supplied to provide full closed loop speed feedback and control. The control system utilizes the speed encoder signal to increase or decrease the flow to the hydraulic motor to maintain speed to accommodate for changes in customer process.

The Hägglunds TADS is available for:

- Power ranges from 15 hp to 100 hp.
- Working pressure max 5076 psi.
- Torque up to 203,000 ft-lbs
- Speed up to 60 rpm

The Hägglunds advanced control system, Spider, is a microcontroller-based system, configurable to suit different application needs. The Spider has a large variety of configurable functions to simplify the control and health monitoring of the TADS.

The connections to sensors and actuators are distributed via terminals with a multi cable on the control system/junction box side and connectors on the sensor/actuator side, see *Fig. 1*. The conductors have an insulation with PVC that is not halogen free.

All internal sensors are pre-wired to the control system. Monitoring of the drive unit sensors is handled internally according to *Fig. 2*.

TADS sensors and actuators are connected to the unit's control system through an intermediate junction box. Connections are made via direct wiring and customer connections are pre-wired to the intermediate junction box for ease of installation and commissioning. All TADS instrumentation is pre-wired and pre-configured from the factory. Wiring for TADS units utilizes wiring contained within oil, abrasion, and sunlight resistant flexible conduit to further protect the wiring.

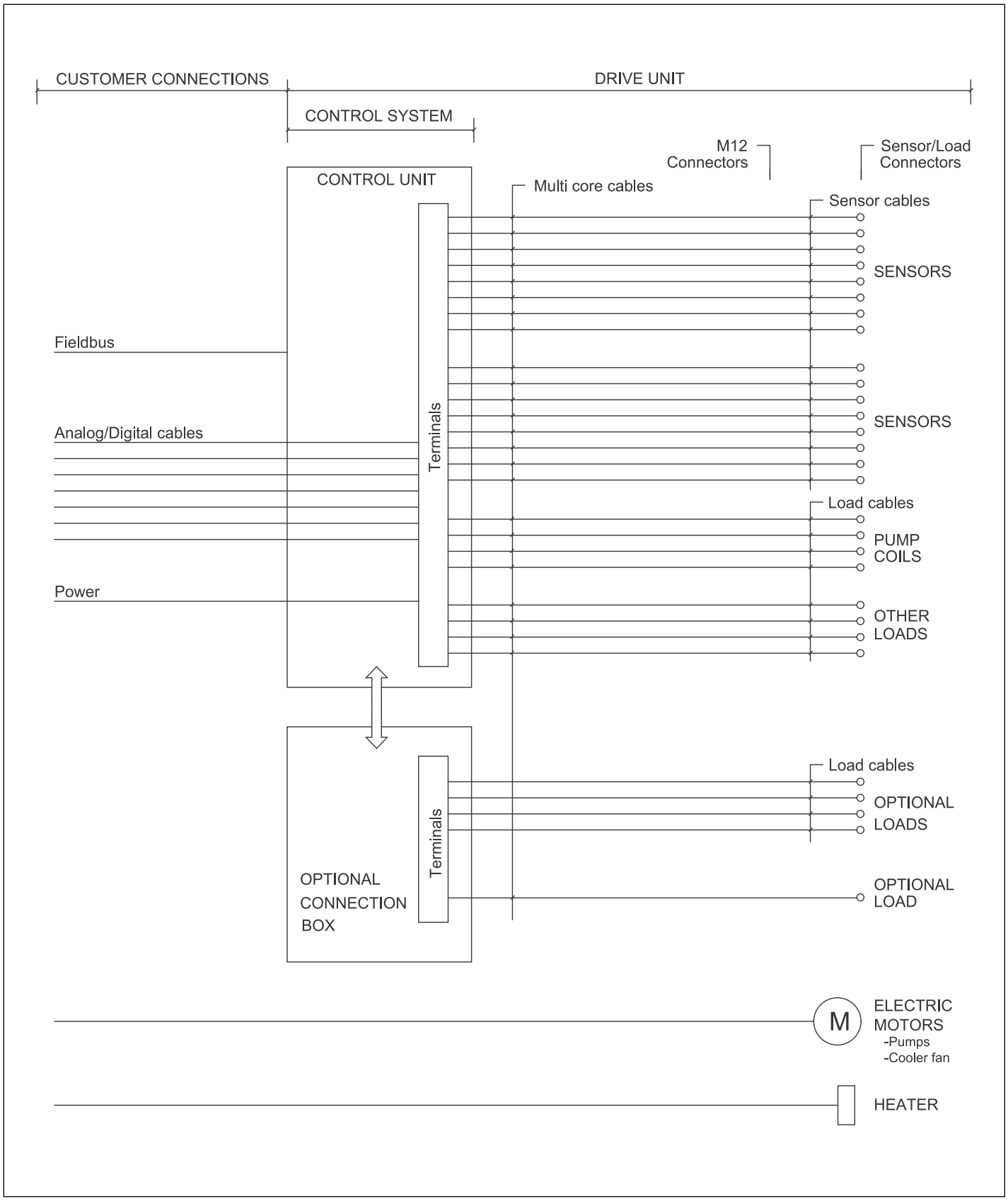

Fig. 1: Electric overview

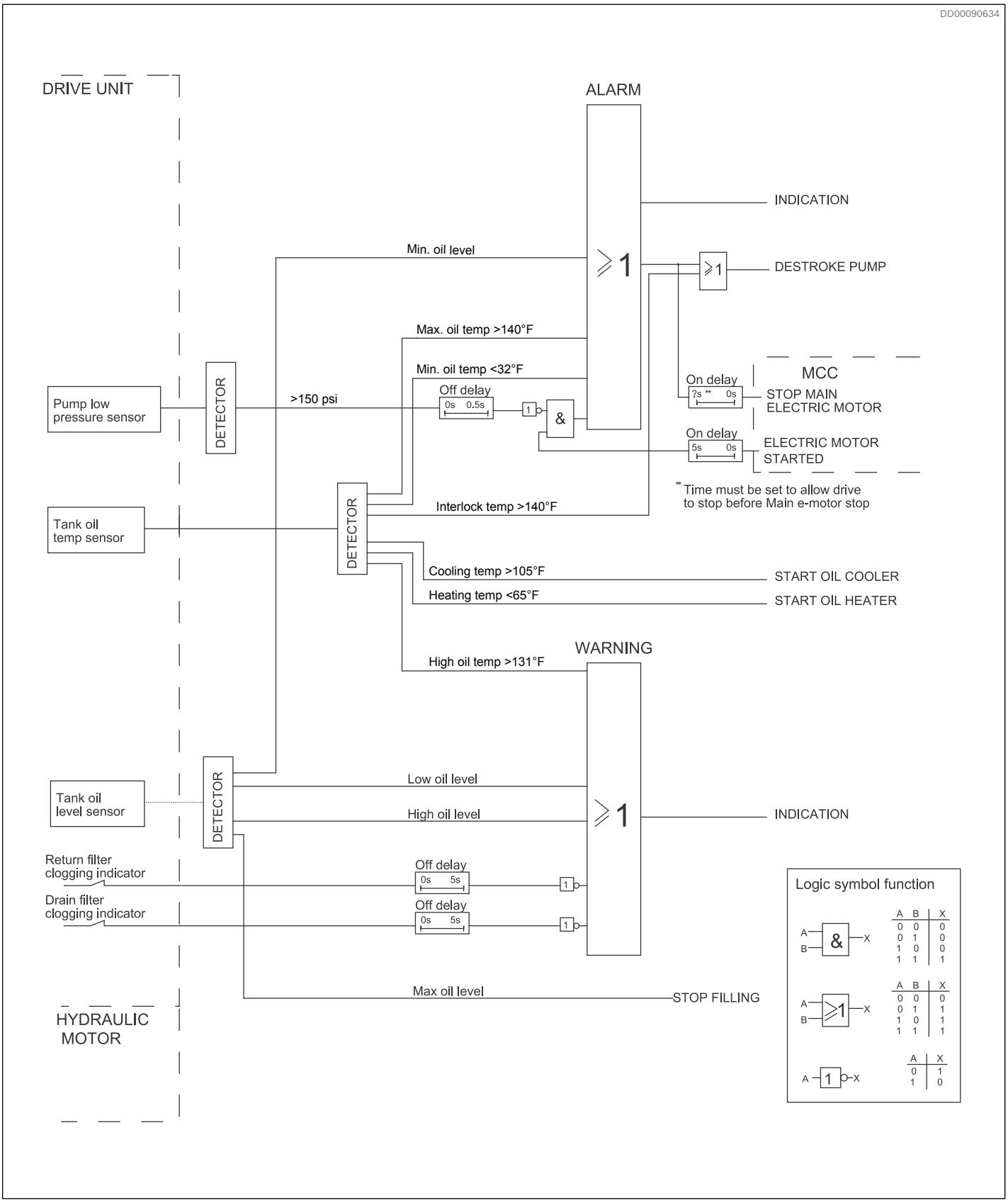

Fig. 2: Monitoring logic diagram

2.2 Site Conditions

2.2.1 Ambient temperature

Hägglunds TADS can be used in environments with ambient temperature from –40 °F to +122 °F. For temperatures outside the range of 32 °F to +105 °F, adjustments will be done to the drive unit.

2.2.2 Altitude

Hägglunds TADS can be used at altitudes up to 16,400 fasl. For altitudes above 3280 fasl, adjustments will be done to the drive unit.

2.2.3 Hazardous environment

Upon request, Hägglunds will engineer and construct a drive system to meet or exceed NEC requirements for the specific area classification as prescribed in NFPA 70, Article 500. This includes the use of rated instrumentation and equipment that is intended for use in classified hazardous areas.

Remote mounting (outside of the classified area) of the Hägglunds standard controls system, as well as utilization of proper Intrinsically Safe (IS) isolation practices provides control and monitoring interface from the customers control system to the Hägglunds TADS.

To ensure the TADS meets this requirement Hägglunds will utilize third-party consultation to approve equipment and instrumentation, and to provide final as-built testing to ensure the unit meets requirements for use in hazardous areas. Once the TADS unit passes testing, the third-party company will certify the unit as acceptable for installation into the required classified area.

2.2.4 Sound levels

Hägglunds low speed hydraulic motors generate very low sound levels due to the low speed. The dominating sound sources in a hydraulic drive system are air cooler and pump. Sound levels below are an average and do not include external piping.

- TADS – 85-90 dB(A)

Sound levels are calculated for drive units with air cooler.

2.3 Design life

Application drive data and expected design life are parameters that will determine the configuration and design of the TADS.

Design life for a TADS are determined by one of its main components, the hydraulic pump.

2.4 Hazardous substances – Asbestos content

All Hägglunds products are free from asbestos when delivered from Bosch Rexroth.

3 System description

3.1 Control system

Part	Description		Property	Brand
Control unit				**Hägglunds**
	Material		Stainless steel, EN 1.4301	
	Dimension		400x300X145 (WxHxD)	
	Protection class		IP65	
	Power supply		90...264VAC, 50...60Hz	
	Power consumption		Max. 300 VA	
	+24 VDC outlets		Fused	
	Electric motor interlock		3 x Relay contacts 3 A, 30VDC / 250VAC, Closed = OK, to interlock relay in MCC	
	Digital inputs		47 x 24 VDC	
	Analog inputs		9 x 4-20mA	
	Digital outputs		13 x Relay contacts 3 A, 30VDC / 250VAC	
	Encoder inputs		2 x Quad incremental	
	Fieldbus slave Card		Profibus DP Modbus RTU ControlNet EtherNet IP ProfiNet DeviceNet Modbus TCP CC-Link	HMS Anybus
	Space heater		PTC, < 30°C, moisture prevention	
	Terminals		One row spring clamp type, max 2.5 mm^2	Phoenix contact
	Cable gland plate		Multigate MC 25	Trelleborg
	Communication		CAN	
	Corrosion protection		VCI Emitter	Cortec
Filter indicator				**Hägglunds**
	Supply voltage		10-30VDC	
	Max switching power		20W	
	100% switching pressure	Drain and Return	32 psi ± 3.2 psi	
	Funtion of output,	100%	Normally closed, opens above set pressure	
		75%	Normally open, close above	
	Cold start suppression		<30 °C	
	Electrical connection		Type C	
	Protection class		IP65	

Part	Description		Property	Brand
Level / Temperature sensor				**Gems**
	Protection class		IP65	
	Electrical connection		DIN 43651	
	Tank level output signal		Switch	
	PT 100 Sensor element		Pt 100	
	Temperature measuring range		-40 °F to 250 °F	
	Tank temperature output signal		4-20 mA	
Pressure transducers				**Rexroth**
	Sensing method		Thin film	
	Material in contact with media		Stainless steel, EN 1.4542, NBR sealing	
	Measuring ranges	Charge pressure	0...725 psi	
		Work pressure	0...5800 psi	
	Supply voltage Ub		16...36VDC	
	Output signal		4-20mA	
	Max load		(Ub-8,5V)/20mA	
	Accuracy to IEC 61298-2		< ± 0.5 %	
	Housing materials		V4A (EN 1.4404), PEI, HNBR	
	Electrical connection		M12x1 4-pin	
	Protection class		IP67	

3.2 Electrical system

Electrical scope of supply, TADS

Part	Description	Property	Brand
Low voltage induction motors			**WEG**
	Sizes	15–100 hp	
	Type	Squirrel cage	
	Energy class	IE3	
	Operation duty	S1 – Continuous duty	
	Cooling	Fan cooled TEFC	
	Protection class	IP55	
	Insulation class	F	
	Painting	ISO 12944 "C2"	
	Sound pressure	≤ 70 dB(A)	
Cables, Internal			
	Earth cables, internal	Green/yellow	
	Sensor cable	Multi core cable 22 AWG, black PVC	
	Internal control cables	20 AWG, black	
	Internal AC cables	16 AWG, black	
Cables, Customer connection			
	Control cables	20 AWG, shielded	
	Control power cables	16 AWG, shielded	
	Earth cable, Frame	Min. 12 AWG	
	Earth cables, internal	16 AWG	
	Heater	Min. 14 AWG	
	Line cables, electric motors	Depends on motor power	
	Earth cable, electric motors	Depends on motor power	
Oil heater			**Chromalox**
	Material tubular element	Steel sheath	
	Head	Cast iron	
	Protection class	IP54	
	Power	1500 W max.	
Hydraulic pumps			**Hägglunds**
	Type	Variable displacement pump	
	Operation	Closed circuit, bi-directional	
	Displacement	40 – 125 cm^3/rev	
	Type of control	Electrical control with proportional solenoid	
	Nominal pressure	5076 psi	
	Peak pressure	6091 psi	
	Operating viscosity range	40 cSt to 150 cSt	
	Viscosity limits	Min. 10 cSt to Max. 2000 cSt (short term on cold start)	
	Minimum level of fluid cleanliness	Acc. to ISO 4406 18/16/13, NAS 1638 class 7	

3.3 Hydraulic system

Part	Description		Property	Brand
Oil filters				**Hägglunds**
	Material of housing (Single)		Aluminum	
	Material of housing (Duplex)		Aluminum	
	Material of filter element		Synthetic glass fibre material	
	Function		Single or Duplex type w. switchover function	
	Filtration grade		10 µm absolute	
	Indication	Drain and return	Visual + electrical at 32 psi; bypass at 43 psi	
Reservoir breather				**Hydac**
	Material of housing		Glass fiber reinforced polyamide	
	Material of filter element		Foam	
	Filtration grade		10 µm	
Air cooler – air oil heat exchanger				**Thermal Transfer**
	Material of matrix		Aluminum	
	Material of fan blades		Plastic	
	Material of fan housing/gaurd		Steel	
	Max work pressure		250 psi	
	Electric motor		Insulation: F	
			Cooling: Fan cooled TEFC	
			Protection: IP55	
			Efficiency: IE3	
Pressure gauges (optional)				**Bosch Rexroth**
	Material of housing		Stainless steel	
	Material of sight-glass		Acrylic	
	Scale		psi/bar	
	Pressure gauge fill		Glycerine	
	Size		Ø 2-1/2"	
Hydraulic tubes				**Hägglunds**
	Type		Low pressure, max 1450 psi	
	Material		Stainless steel	
Flexible hoses				**Hägglunds**
	Material	Hose	Steel braided synthetic rubber	
		Fittings	Steel	
Hydraulic fittings				
	Type		JIC 37° flare SAE J514	
	Seals		NBR	
	Material		Steel	
	Surface treatment		Clear zinc trivalent	
Test connections				**Stauff**
	Type		M16x1,5	
	Material		Steel	
	Seals		NBR	
Level sight glass				**Hydac**
	Material	Housing	Aluminum	
		Tube	Polyamide	
	Sealing		NBR	

Part	Description	Property	Brand
Hydraulic motors			**Hägglunds**
	Type	Radial piston	
	Operation	Closed circuit, bi-directional	
	Displacement	77 – 3,370 in^3	
	Torque	Up to 203,000 ft-lbs	
	Speed	Up to 60 rpm	
	Nominal Pressure	5076 psi	
	Peak Pressure	6091 psi	
	Operating viscosity range	40 cSt to 150 cSt	
	Viscosity limits	Min. 10 cSt to Max. 2000 cSt (short term on cold start)	
	Minimum level of fluid cleanliness	Acc. to ISO 4406 18/16/13, NAS, 1638 class 7	

3.4 Mechanical parts

Part	Description		Property	Brand
Torque arm				**Hägglunds**
	Material		ASTM AA36	
Oil reservoirs				**Hägglunds**
	Material		Stainless steel	
	Surface treatment		Welded, cleaned	
	Tank Volumes		100 Liters	
	Tests		Die penetrant	
Bell housing				**Hägglunds, Vescor**
	Material	Hägglunds	Steel, A36, A53 GRB Type E	
		Vescor	Aluminum	
	Other		With inspection hole for shaft coupling	

3.5 Surface treatment

The frame work of the drive unit is painted according to the following requirements:

3.5.1 Paint specification

Torque arm:
Color black RAL 9005

Pre treatment and ground coating:

- S5PC-SP10
  Continued with dust extraction
- Paint catalyzed epoxy primer, thickness dry 2 mils

Finishing painting

- Paint polyurethane enamel, thickness dry 1.5–3 mils

3.5.2 Marine paint specification

Torque arm:
Color black RAL 9005

Pre treatment and ground coating:

- Degrease with alkaline detergent.
- Blast to SSPCSP6/NACE 3. Continued with dust extraction.
- Paint epoxy primer, thickness dry 4.0–6.0 mils

Finishing painting

- Paint Macropoxy epoxy, thickness dry 5.0–10.0 mils
- Paint Macropoxy epoxy, thickness dry 5.0–10.0 mils

3.6 Welding specification

All welding of frame work and tank are in accordance to AWSD1.1 and AWSD1.6.

Weld symbols are in accordance to AWS A2.4.

Where specified, welded components are stress relieved. No further welding shall be permitted after stress relieving unless prior written approval Bosch Rexroth.

Certificates for welding procedure specification and welding procedure qualification records are available on request.

3.7 Hydraulic fluids

The Hägglunds TADS is primarily designed for operation with hydraulic fluids according to ISO 11158 HM.

Table 1: Applicable fluids

ISO 11158	ISO 15380	ISO 12922
Mineral oil based and mineral oil related hydraulic fluids	**Environmentally acceptable hydraulic fluids**	**Fire resistant hydraulic fluids**

Within these standards, not all fluid classes are allowed.

Before the start of project planning, see data sheet RE 15414, Hydraulic fluid quick reference, for detailed information on hydraulic fluids and specific additional demands.

4 Technical material

4.1 Documentation

The documentation listed below is supplied from the production plant for Hägglunds TADS

Table 2: Generic documentation

Document type	Document number	File Format	Language
Installation & Maintenance manual Hägglunds TADS drive system	15426-WA	pdf	English
Instruction Manual – Hägglunds Spider	15330-WA	pdf	English

Table 3: Project specific documentation

Document type	Document number	File Format	Language
GA drawing	order specific	pdf, dwg	English
Hydraulic diagram	order specific	pdf, dwg	English
Electrical schematic	order specific	pdf, dwg	English
Spare part list	order specific	pdf	English
Documentation for Spider II control system	order specific	pdf, docx	English
Spider parameter file*	order specific	s2px	English
Bus configuration table	order specific	pdf, xlsx	English

*also included as text in Documentation for Spider II control system

4.2 Quality

Quality control plan

The quality control plan (QCP) summarizes the set of procedures Bosch Rexroth follows to ensure that the drive units adheres to the defined set of quality criteria. The QCP can be supplied with the project order.

ISO 9001

Bosch Rexroth is awarded certification for ISO 9001, which is the international standard that specifies requirements for a quality management system.

ISO 14001

Bosch Rexroth is awarded certification for ISO 14001, which is an international standard that specifies requirements for an effective environmental management system.

5 Testing

5.1 Delivery test

All Hägglunds TADS are production tested before delivery from the production plant, the purpose of the production test is to verify the customer demands in respect to function, performance and surface finish. The delivery test of Hägglunds TADS are performed by authorized personal and documented in a test protocol, based on technical specification of the TADS. All components are controlled and set so that only minor adjustments are needed at commissioning on site. Setting and control of pressure, voltage, flow, etc. is done with calibrated measurement equipment.

6 Logistics

6.1 General

This chapter describes the standard procedure for packing of Hägglunds TADS with accessories. It also describes how Hägglunds products are shipped and how they should be handled during transportation and installation. It also points out requirements for storage of Hägglunds products on site.

6.2 Shipping

If equipped with a Hägglunds Spider control system or optional axial locking kit, they will be shipped mounted to the shipping stand and will require customer mounting.

6.3 Domestic packaging

Hägglunds products are packed on wooden pallets that give adequate protection against mechanical damage and atmospheric corrosion during shipping, transportation, handling, and storage. Desiccant bags are placed inside the TADS to absorb moisture thus atmospheric corrosion is avoided during shipping and storage.

6.3.1 Packing procedure other items

Items are placed in separate wooden crates or on pallets that give adequate protection against atmospheric corrosion during shipping and storage.

6.3.2 Crates/Pallets

The crates/pallets are made of wood that conforms to ISPM No. 15.

6.4 Export packaging

Hägglunds products are packed in wooden crates according to ISPM No. 15. This will give adequate protection against mechanical damage and atmospheric corrosion during shipping, transportation, handling, and storage. Desiccant bags are placed inside the TADS to absorb moisture thus atmospheric corrosion is avoided during shipping and storage.

6.4.1 Packing procedure other items

Items are placed in separate wooden crates. This gives an adequate protection against atmospheric corrosion during shipping and storage.

6.4.2 Crates

The crates are made of wood that conforms to ISPM No. 15.

6.5 Lifting methods

The TADS package is designed for forklift truck handling and an unpacked TADS can also be lifted with ropes/chains. Items that are delivered in separate crates or on pallets, these are only designed for forklift truck handling and are always marked with the weight.

6.6 Storage conditions at site

The TADS (including parts delivered separately) should be stored indoors. The plastic film in a crate or on a pallet should not be open or removed before installation.

6.6.1 Storage condition on site for TADS

At delivery, the TADS is protected with desiccant bags to absorb moisture and sealed with a plastic film. This provides sufficient atmospheric corrosion protection for indoor storage up to 12 months from delivery date.

If storage time exceeds 12 months, the desiccant bags have to be exchanged. The crate must be opened to access the plastic film.

For long-term storage, contact Bosch Rexroth.

6.6.2 Storage condition on site for other item

At delivery, the separate delivered items are protected with VCI foam pads and sealed with a plastic hood. This provides sufficient atmospheric corrosion protection for indoor storage up to 18 months from delivery date.

If storage time exceeds 18 months, the VCI protection has to be extended.

7 References

	Title	Document no	Document type
🕮	Hägglunds TADS drive system	R933001388	Sales leaflet
🕮	Hägglunds TADS drive system	RA 15426	Data sheet
🕮	Hägglunds TADS drive system	RA 15426-WA	Installation and maintenance manual
🕮	Hydraulic fluid quick reference	RE 15414	Data sheet
🕮	Hägglunds Spider 2 control system	RE 15330-WA	Instruction manual

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