Specifications

Lovat RME142SE / Series 26300 through 26600

Basic Dimensions

Cut Diameter	3,650	mm
Bore Diameter	3,625	mm
Shield Diameter	3,612	mm
Length of TBM	9	m
Length of Back-Up	81	m
Weight of TBM	120	tonne
Weight of Back-Up	120	tonne

Tunnel Lining

Prefabricated Concrete Segments

Configuration: 4 segments + 2 keys	6	No.
Outside Diameter	3,425	mm
Inside Diameter	3,000	mm
Length	1,200	mm

Cuttinghead

Structural

Spokes (Cantilever Structure Design)	4	No.

Cuttinghead and Chamber Features

Abrasion Resistant Plating on Cuttinghead Face and Rim

Face Injection Port Assemblies (Ground Conditioning, independent operation)	5	No.

Cutting Tools (Hard Rock Configuration)

Single Disc Cutters (381mm Diameter)	24	No.
Twin Disc Cutters (381mm Diameter)	2	No.
Centre Quad Disc Cutter Assembly (381mm Diameter)	1	No.
Scraper Tools	32	No.

Main Drive – Variable Frequency Electric Drive

General

Clockwise and Counter-Clockwise Rotation

Variable speed

Inching function for maintenance

Planetary Gear Boxes

Quantity:	4	No.

Water Cooled

Electric Motors

Quantity	4	No.

Water Cooled

Individual Capacity	112	kW
Total Available Power to Cuttinghead	448	kW
Operating Voltage	600	V

Torque Limiters

Quantity	4	No.

Mechanical type

Main Bearing

Triple Roller Bearing

Lubricated by an independent pressurized oil lubrication system

Sampling Points for monitoring of lubrication oil quality

Cuttinghead Drive Speed / Torque after Efficiencies

Maximum Torque	2,245	kN•m
Speed at Maximum Torque	1.8	rpm
Nominal Torque	1,220	kN•m
Speed at Nominal Torque	3.3	rpm
Peak Start-Up Torque	2,807	kN•m

Main Drive Oil Sealing System

Multi stage type

Inner and Outer Diameter Sealing System

Single Lip type Seals

Sealing System “Fail-Safe”, malfunction initiates shutdown of Main Drive

Positively Pressurized Automatic Sealing System controlled by the PLC w/input from Earth Pressure Sensors

Forward Shell

Antiroll Bars on lower 120°

Earth Pressure Sensors in Cuttinghead Chamber	4	No.
Injection Ports in Cuttinghead Chamber	4	No.
Consolidation / Injection Ports on Forward Shell Periphery	4	No.
Personnel Access Hatch into Cuttinghead Chamber	1	No.
Material Access Hatch into Cuttinghead Chamber	1	No.

Rotary Fluid Joint (Swivel)

Fluid transfer to the Cuttinghead Chamber and Face

Penetrations through Pressure Bulkhead for Utilities

Active Articulation System

Connection between Forward Shell and Stationary Shell

Articulation Cylinders	8	No.
Individual Cylinder Capacity	115	tonne
Combined Capacity	920	tonne
Articulation Angle	0 to 2	º
Articulation Cylinder Stroke	150	mm
LDTs – One for each Quadrant	4	No.
Articulation Seal – Dynamic	1	No.

Stationary Shell

Antiroll Bars on lower 120°

Rear Support

Support for Forward Facing Probe Drill

Automatic Tilt Control

Electric Level Switches

Trip point adjustment range between	0.5 to 6	º

Propulsion

Quantity of Cylinders	12	No.
Maximum Capacity of Cylinder	115	tonne
Total Maximum Thrust	1,380	tonne
Operating Pressure at Maximum Thrust	340	bar
Nominal Operating Pressure	241	bar
Propulsion Stroke	2,000	mm
Maximum Retraction Speed – All Cylinders	1,000	mm/min
Maximum Extension Speed – All Cylinders	100	mm/min

Soft Mode for Segment Erection

Self-Aligning Shoes

Operators Station

Located in the Stationary Shell

Controls for TBM mining functions

Controls for TACS tunnel guidance system

Programmable Logic Controller (PLC)

The TBM is equipped with a PLC (Programmable Logic Controller). The PLC is used to control the machine and record information from sensors. Any information in the PLC is sent to and displayed with HMI software (Human Machine Interface). The HMI software, which is run on an Industrial PC located in the TBM or Operators Cabin, can also record the information.

Laptop Computer for PLC System Interface and Diagnostics

A Laptop Computer (Software include) will be supplied for interfacing with the TBM PLC System for diagnostics and troubleshooting.

Industrial Work Station (Located in the TBM)

LCD Color Display

Windows HMI Program for information display and recording

Industrial Work Station (Located on the Surface)

LCD Colour Display

Windows HMI Program for information display and recording

CCTV Monitoring System

Colour Camera, c/w: Sealed Housing	1	No.
High Resolution Colour Monitor	1	No.

Monitoring Point at Trailing Conveyor Discharge

Communication System

Intercom Phones	6	No.

Phone Locations:

- Operators Console (1 No.)
- TBM (1 No.)
- Segment Erector (1 No.)
- Trailing Gantry (3 No.)

Trailing Shield

Injection Ports, fitted with valves	4	No.

Tail Seals

Rows of Wire Brush Tail Seals	4	No.
Invert Grout Flap on Last Row	1	No.

First three rows replaceable from within tunnel

Grout Lines

Grout Lines – Active	4	No.
Grout Lines – Passive	4	No.
Grout Line Area	1126	mm^2
Grout Type	A/B	

Replaceable from within the TBM

Muck Removal System

Screw Conveyor

Nominal Diameter	610	mm
Overall Length	12	m

Tube Wear Protection – Entire Length, Invert only

Auger Wear Protection – Entire Length, Flight OD only

Auger Wear Protection – first 1.5 m, Pulling Side only

Available Power	126	kW

Maximum Speed	18	rpm
Bi-Directional Operation		
Replaceable Auger Tip		
Capacity at 100% Filling	120	m^3/hr
Injection Ports (Ground Conditioning)	3	No.
Earth Pressure Sensors	3	No.
Retractable from Cuttinghead Chamber		
Inspection Ports – located at Auger Joints		
Emergency Closure System for Guillotine		
Rear Discharge		
Guillotine Doors over Rear Discharge		

Trailing Belt Conveyor

Nominal Width	610	mm
Length (10 no. sections)	30	m
Capacity	150	m^3/hr
Belt Speed	0-100	m/min

Front & Rear Drive Roller

Available Power	65	kW
Rubber Lagging		

Sections

Limber Rollers

Rigid Rollers

Belt Scrapers

Frame Mesh Guard on Bottom of Conveyor

Cowling/Hopper to control muck flow

Emergency Stop Pull Cord along entire length of conveyor – both sides		
Mechanical Belt Weigh Scales	2	No.

Segment Handling and Erection Systems

Segment Unloader

Single Segment Ring Capacity

Hydraulic Operation

Controls located at First Gantry Section

Unloading Arms

Segment Transport Beam

Single Segment Lift Operation

Delivers Segment to Erector

Hydraulic Operation and Controls

Vacuum Type Pick Up System

Segment Erector – Bulkhead Type

Vacuum Type Pick Up System

190º Operation in Each Direction

Rotational Speed – Fully variable	0-2	rpm

Inching Function

Hydraulic Powered

Hydraulic Control of all Functions

Warning Lights and Sirens for Operation

Safety Guards

Fixed Operator Station in TBM

Pendant Operator Station

Lock Out to prevent operation from multiple stations

Controls based on Dead Man system – automatically locks in place in case of power loss or release of controls		
Powered Degrees of Freedom	5	No.
Non-powered Degrees of Freedom	1	No.
Fail Safe Brake in case of power loss		

Trailing Gantry

Structural Steel, c/w: welded and bolted connections

Railing Up		
Gantry Sections	12	No.
Structure Type	Open	
Support Type	Bogie Wheel	

Support of TBM Ancillary Equipment

Walkways

Electrical

Transformer: Non-Explosion Proof	1500	kVA
Primary Voltage	13.8	kV
Secondary Voltage	600	V

Gas Monitoring System

Monitoring points at the Screw Conveyor Discharge and in the TBM working area

Gas monitoring system for the following gases:

- Oxygen (O_2)
- Hydrogen Sulfide (H_2S)
- Sulfur Dioxide (SO_2)
- Methane (CH_4)

- Nitrous Oxide (NO)
- Nitrogen Dioxide (NO_2)
- Carbon Monoxide (CO)
- Carbon Dioxide (CO_2)

Lighting System

Heavy Duty Waterproof Fluorescent Lighting

Walkways	30	lux
Work Areas	300	lux
2 Hr. Emergency Back-Up	15	lux

TACS Automatic Tunnel Guidance System

Industrial PC

Video Target

Motorized Total Station

'acs' Software and DTA Calculation

Segmental Ring Module

Video Target Software

Theodolite Communicator

PLC Communicator

Data Communication Software

Ground Conditioning System

Foam Injection Rate (Measured @ Atmospheric Pressure)	1,000	l/min
Polymer Injection Rate	100	l/min

Includes:

- Flow Meter for main water
- Pressure Meters for main water and air line

• Local Analog Control of Injection Pumps	5	No.
• Foam dosing pump, Polymer dosing pump		

Two-Component Grout Injection System

A Component Injection Capacity	15	m^3/hr
B Component Injection Capacity	1.5	m^3/hr
A Component Tank c/w agitator and level sensor	4	m^3
B Component Tank c/w level sensor	1	m^3
Total Injection Points	4	No.

Includes Local Controls and Pressure Sensors

Transfer Pump (from Buyer supplied Grout Car to TBM mounted tank)

Ventilation

Main

Ventilation Cassette Lifting System (to support buyer supplied system)

Auxiliary

Capacity	150	m^3/min

Electric Fan, uni-directional, single speed

Silencer

Fire Suppression

ANSUL Fire Suppression System for Hydraulic Power Packs

Gas Motor Actuator

Dry Chemical Extinguishing Agent

Nitrogen Filled Cartridge

Remote Actuator – manual

Manual Fire Extinguishers (Class A,B,C Fires)	8	No.

Emergency Generator

Installed Power	30	kW
Output Voltage	600	V
Electrical Frequency	60	Hz
Run Time	8	hrs

Systems Powered:

- Control System
- Auxiliary Ventilation
- Dewatering Pumps
- Lighting
- Fire Suppression

(Not all systems can operate at 100% capacity simultaneously)

Bentonite Injection System

Injection Ports on TBM Shield	4	No.
Injection Ports to Cuttinghead Chamber	4	No.
Pump Capacity	10	m^3/min
Agitator Tank Capacity	1.5	m^3

Dewatering System

Settling Tank – Capacity	2.5	liter
Discharge Pump	200	liter/min
Suction Pump	100	liter/min

Water piping on gantry from suction pump to tank

Air Compressor for GCS and Tools

Power	18	kW
Maximum FAD	3,254	L/min
Maximum Pressure	7	bar

Air Receiver	1,000	liter

High Voltage Cable Reel

Capacity	150	m

Water Hose Reel

Capacity	150	m
Rewinding & Automatic Tensioning		

Cooling Water Inlet Requirements

Required Inlet Flow	482	liter/min
Maximum Inlet Temperature	10	ºC
Minimum Inlet Pressure	4	bar
Maximum Inlet Pressure	7	bar