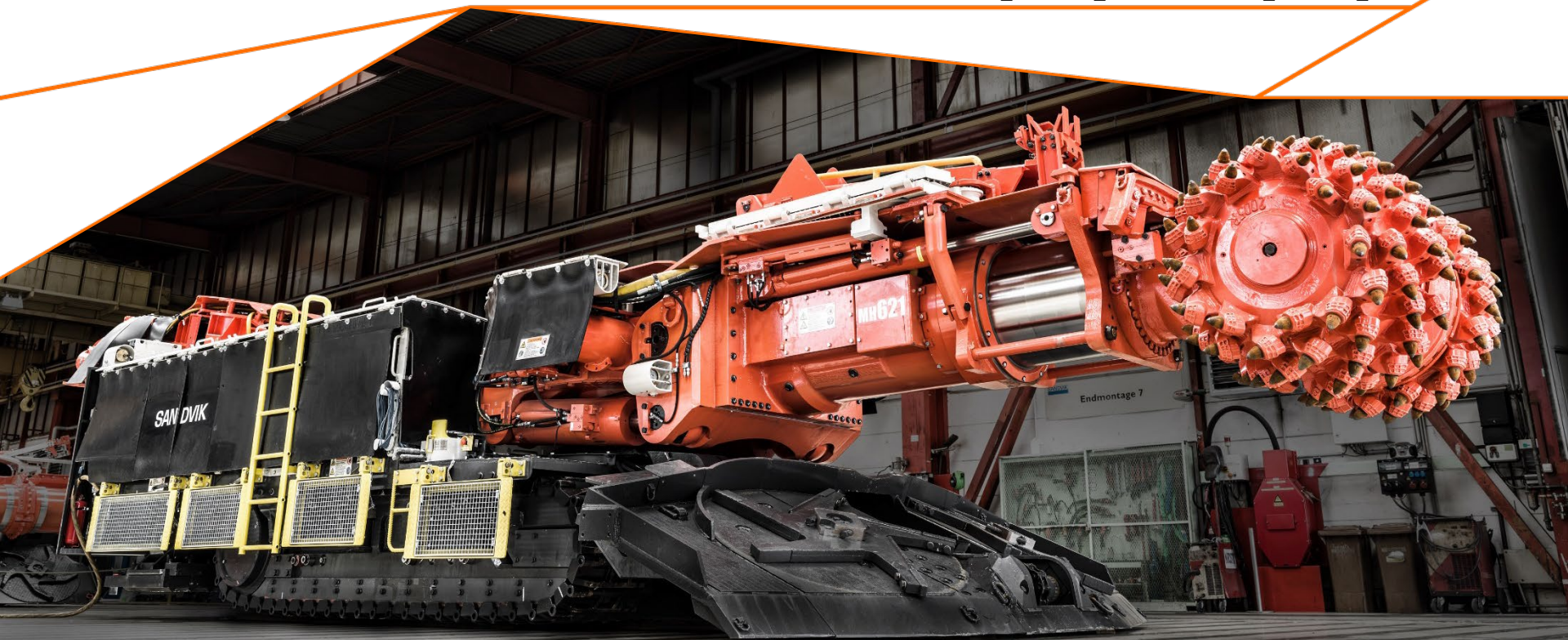


SANDVIK MH621 ROADHEADER

PRODUCT PRESENTATION



REF.NO.: MH621Ex_2021.305_rev1 & MH621nEx_2021.306_rev1



SAFETY FIRST

Sandvik's objective is zero harm to our people, the environment we work in, our customers and our suppliers.



**PROTECTIVE
EQUIPMENT**



**FIRST AID
KIT**



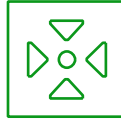
ALARM



**EMERGENCY
NUMBER**



**EMERGENCY
EXIT**



**ASSEMBLY
POINT**



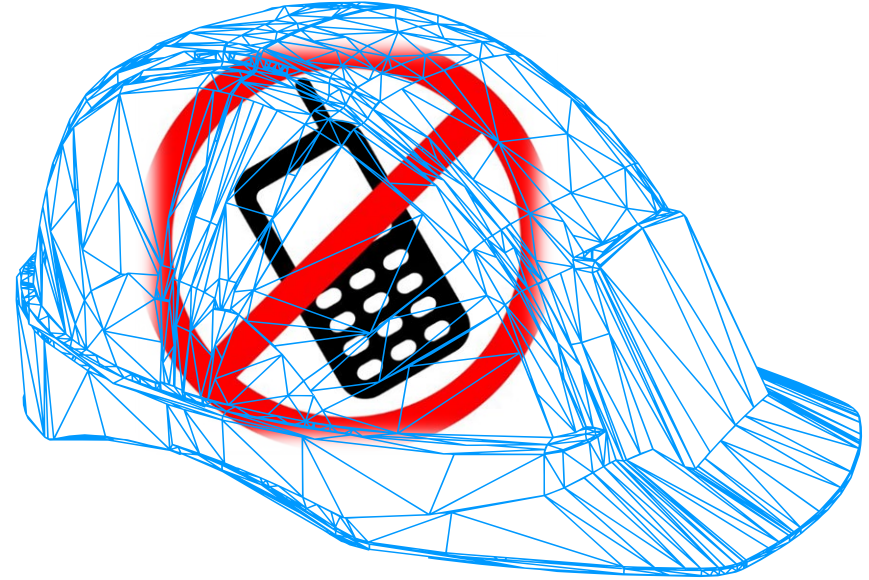
**HEALTH &
WELLBEING**



**PSYCHOLOGICAL
SAFETY**



SITE ZELTWEG
← CLICK ICON FOR MORE DETAILS





COMPLIANCE

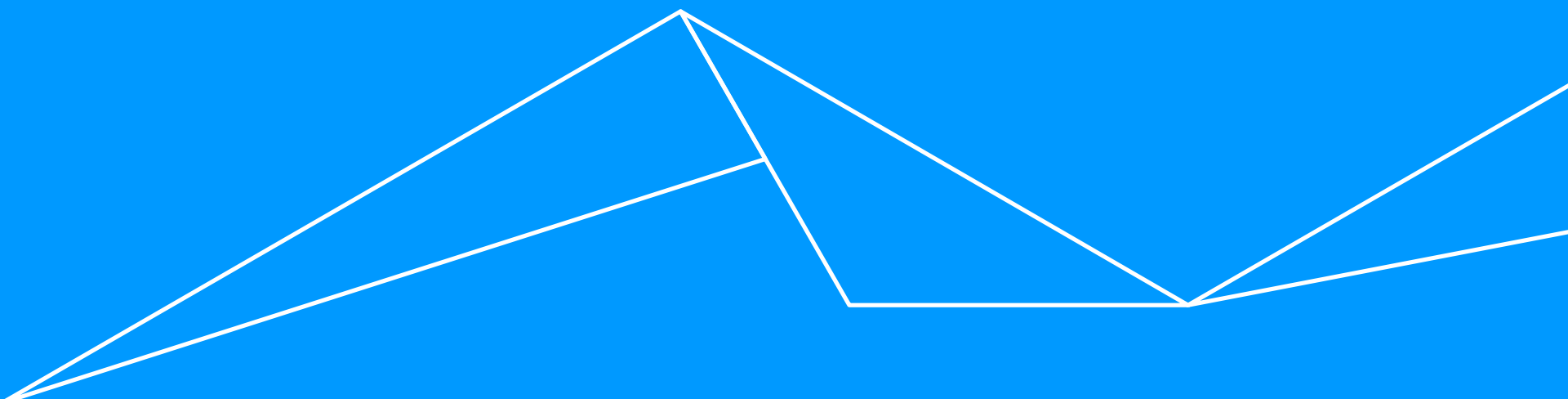
COMPLIANCE

We've always been committed to conducting business with high integrity and in a legal and ethical manner. We embrace our corporate responsibility to combat corruption.

TABLE OF CONTENTS

SANDVIK MH621 ROADHEADER – SMART & STRONG

- BACKGROUND, HISTORY AND PRODUCT FEATURES
- OVERVIEW, WALKAROUND AND MACHINE BASICS
- OVERVIEW OF MACHINE MAIN COMPONENTS
- OVERVIEW OF MACHINE OPTIONAL ITEMS
- SANDVIK MH621 ROADHEADER IN ACTION
- COMPETENCES AND SERVICES
 - ENGINEERING EXCELLENCE
 - TRAINING EXPERIENCE
 - PARTS AND SERVICE SUPPORT
 - SANDVIK 365

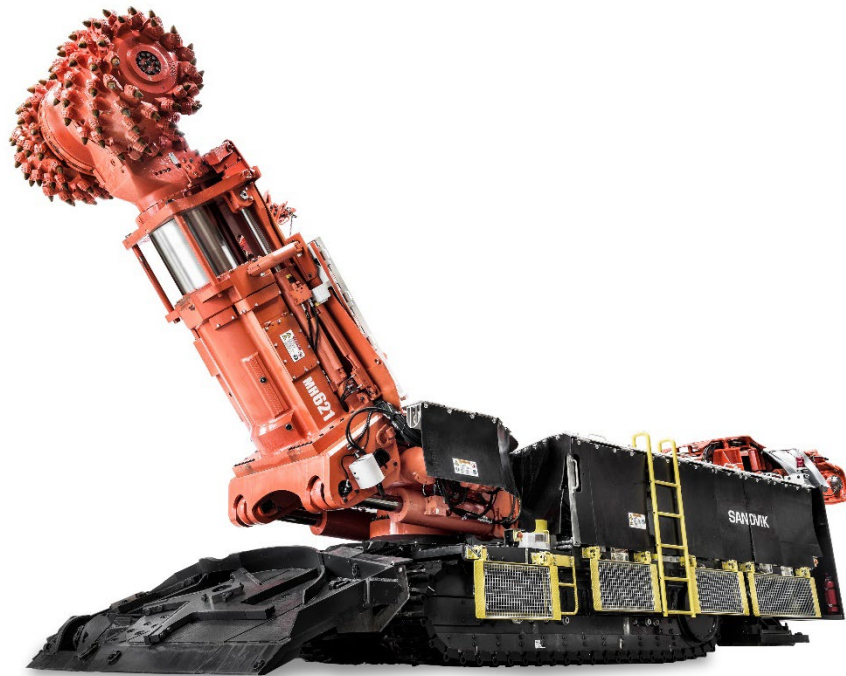


BACKGROUND, HISTORY AND PRODUCT FEATURES

BACKGROUND

SANDVIK MH621 ROADHEADER

- Smart, strong and powerful for optimized excavation of rock $>100\text{MPa}$ uniaxial compressive strength
- Flexibility of cutting various tunnel profile shapes and sizes
- Smooth and accurate excavation without effecting rock mass around tunnel excavation
- Clean operation by using electric power



HISTORY

MR620 FOR COAL AND MH620 FOR HARD ROCK MERGE TO NEW MH621

- MR620 / AM 100 / AM 105

- Mainly used for tunnel development in coal mines
- But also used for soft mineral production in rock salt / potash mines
- And for civil tunnel excavation
- 113 units sold until end of 2018

- MH620 / MT620 / AHM 105-IC

- Mainly used for tunnel development in hard rock mines
- But also for gemstone production in diamond mines
- And for civil tunnel excavation
- 42 units sold until end of 2018



5 REASONS WHY CHOOSE

SANDVIK MH621 ROADHEADER

5



- Improved safety features ensure safe underground working conditions and less operational hazards
- Heavy duty, robust machine design and ICUTROC cutting technology for hard rock application increase machine availability and reduce machine service costs
- Optional machine guidance system significantly improves profile accuracy and decreases tunneling costs
- A number of different cutter heads for a wide range of rock conditions and applications serves for high versatility in machine operation
- Various digitalization options optimize customer value

SANDVIK ROADHEADER

VALUE PROPOSITION



FEATURE	BENEFIT	VALUE TO CUSTOMER
<ul style="list-style-type: none"> Operating machine from safe place via radio remote control FOPS operator cabin (optional) Noise and dust suppressed cabin (optional) Air condition and special filter systems for cabin (optional) 	Improved operator safety and comfort	<p>SAFER WORKING CONDITIONS WITH SAFER MACHINE FOR OPERATIONAL PERSONNEL</p> <p>LESS HAZARDS AND INCIDENTS IN UNDERGROUND WORK</p> <p>IMPROVED SAFETY FOR ALL PERSONS WORKING UNDERGROUND</p>
<ul style="list-style-type: none"> Fire suppression system (optional) 	Reduced risk of fire	
<ul style="list-style-type: none"> Good visibility and efficient lights 	Reduced risk of collisions with other equipment or people	
<ul style="list-style-type: none"> Risk assessment for each machine 	High safety standards	
<ul style="list-style-type: none"> Ground level daily maintenance 	Improved maintenance safety, reducing risk of tripping and falling off the machine	

SANDVIK ROADHEADER

VALUE PROPOSITION



EHS FEATURES



RELIABILITY



OPTIMIZED
PERFORMANCE



TUNNELING
QUALITY

FEATURE	BENEFIT	VALUE TO CUSTOMER
<ul style="list-style-type: none">SANDVIK global competence and local support networkQuality assurance through strict testing and quality management	High quality training, product support, service and spare parts available when required	LESS DOWNTIME
<ul style="list-style-type: none">Robust layout and heavy duty design of machines referring to challenging underground environment	Less breakdowns	GOOD AVAILABILITY & LONG LIFETIME
<ul style="list-style-type: none">SANDVIK's long time competence in mechanical cutting and underground rock excavation	Well proven machine-tool-rock interaction	BEST TOOLS SUPPLY FOR MACHINE AND APPLICATION

SANDVIK ROADHEADER

VALUE PROPOSITION



EHS FEATURES



RELIABILITY



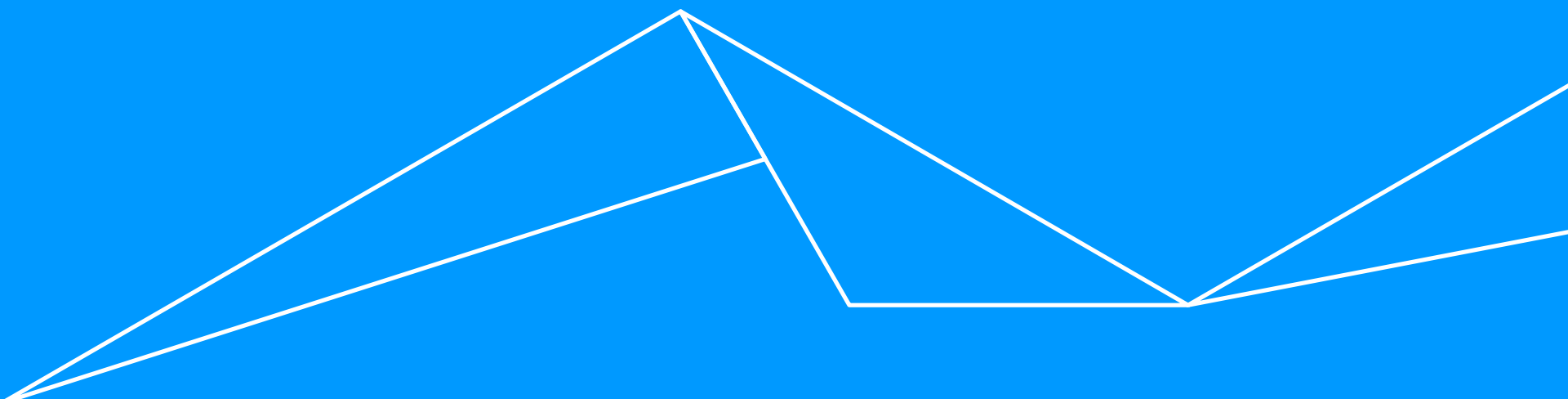
OPTIMIZED
PERFORMANCE



TUNNELING
QUALITY

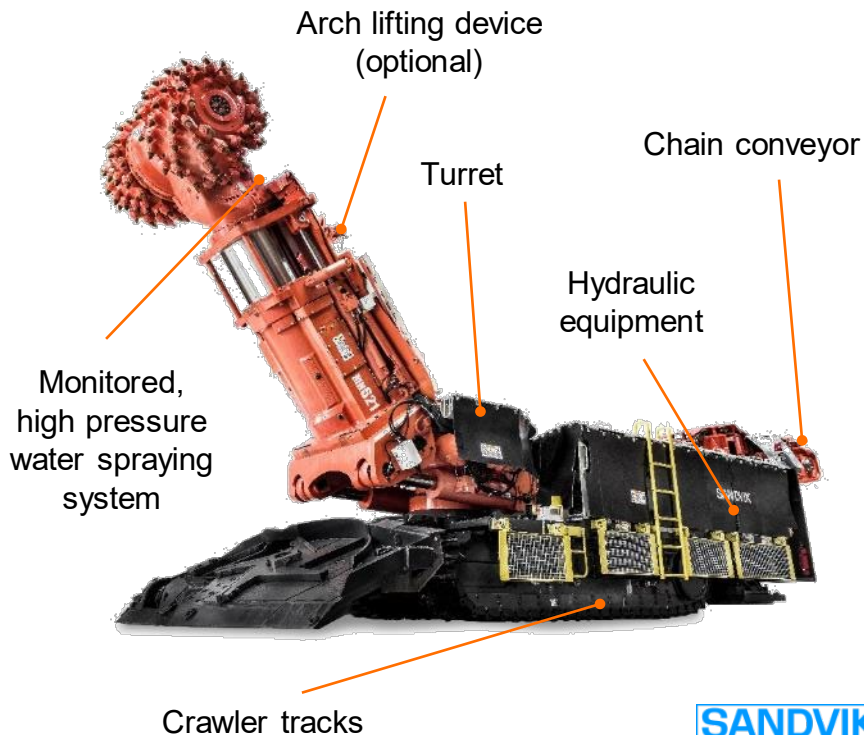
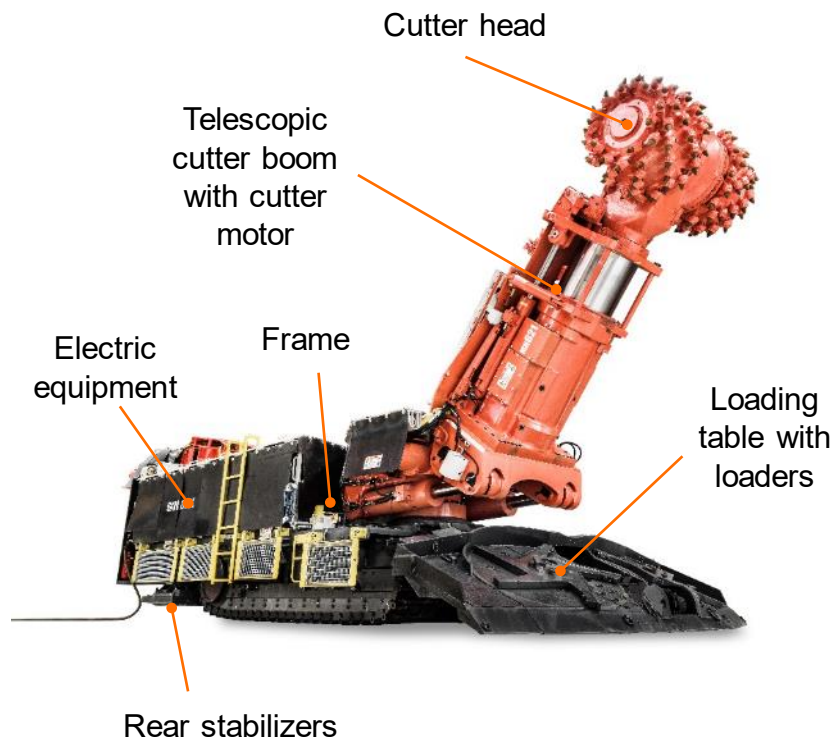
FEATURE	BENEFIT	VALUE TO CUSTOMER
<ul style="list-style-type: none"> Robust layout and heavy duty design for underground environment Easy access to service points 	Less time for service required, less breakdowns	HIGH AVAILABILITY AND REDUCED SERVICE COSTS
<ul style="list-style-type: none"> Capability to mine any face configuration Capability to cut different rock types Continuous excavation Selective cutting 	One machine for different tunnel shapes and applications, no idle time for any adjustments	HIGH VERSATILITY, HIGH UTILIZATION
<ul style="list-style-type: none"> Smooth excavation Precise excavation Low vibration emission 	Better rock mass stability, no blast vibrations, no overprofile, less rock support	COST SAVINGS IN ROCK REINFORCEMENT, SUITABILITY FOR URBAN TUNNELING
<ul style="list-style-type: none"> Multiple activities performed by one machine Availability of many optional features 	No need for extra equipment, adaption to different requirements	"ONE-FOR-ALL-SOLUTION"
<ul style="list-style-type: none"> Self-advancing excavation equipment High mobility Possible to cut full face or sections 	Cutting tunnel face and cross cuts with one unit	ONE UNIT FOR MULTIPLE FACE OPERATIONS AND EXCAVATION SEQUENCES



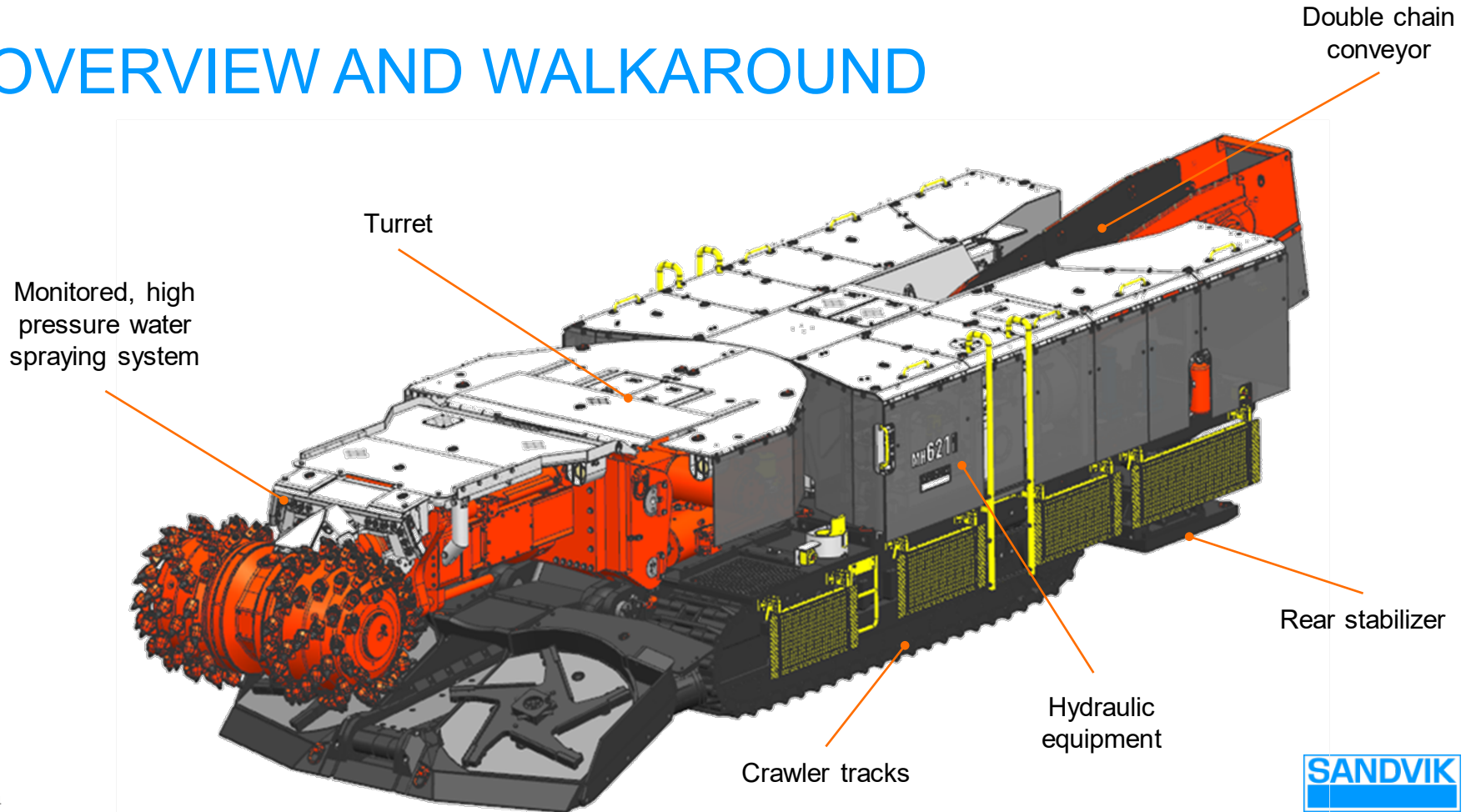


OVERVIEW, WALKAROUND AND MACHINE BASICS

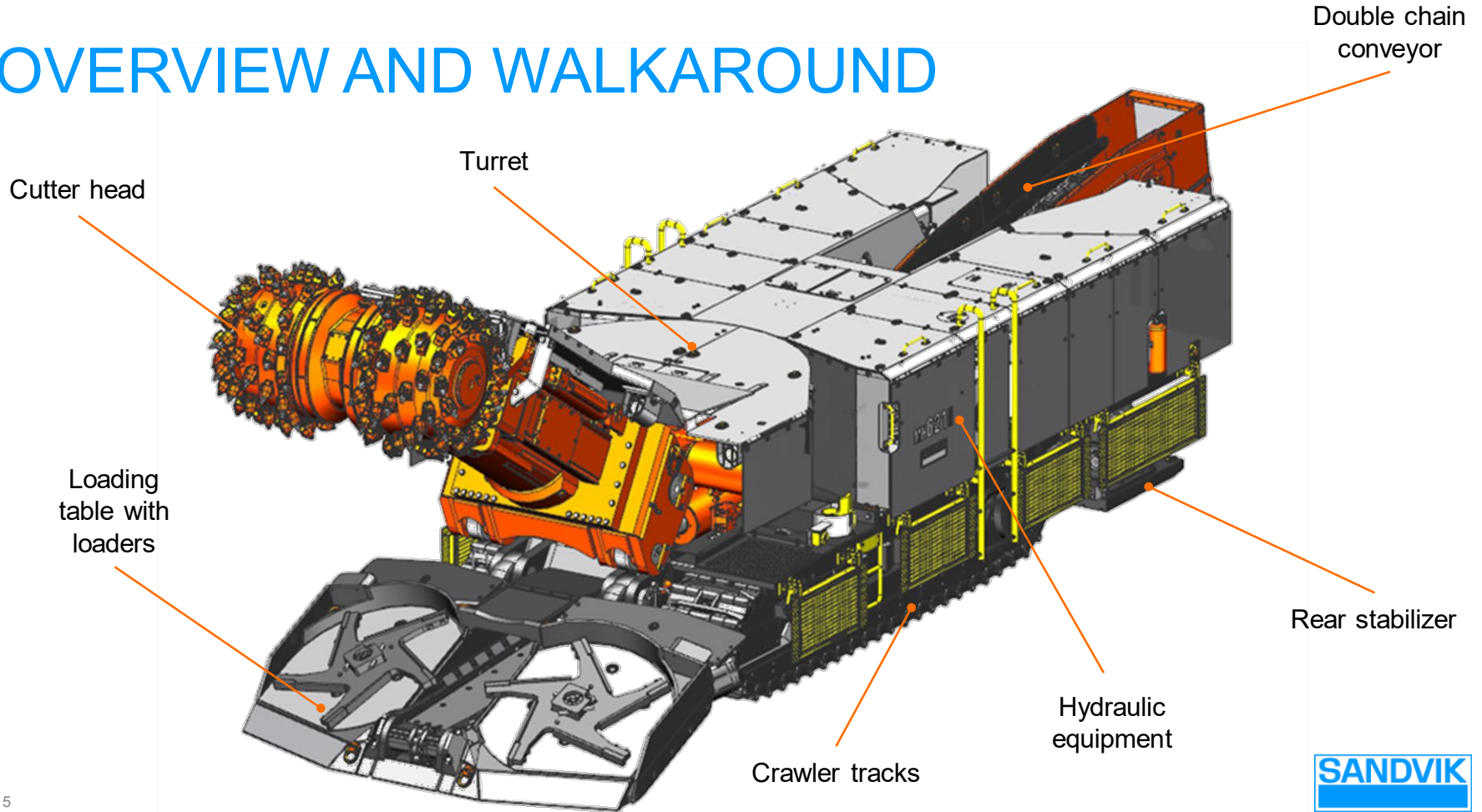
OVERVIEW AND WALKAROUND



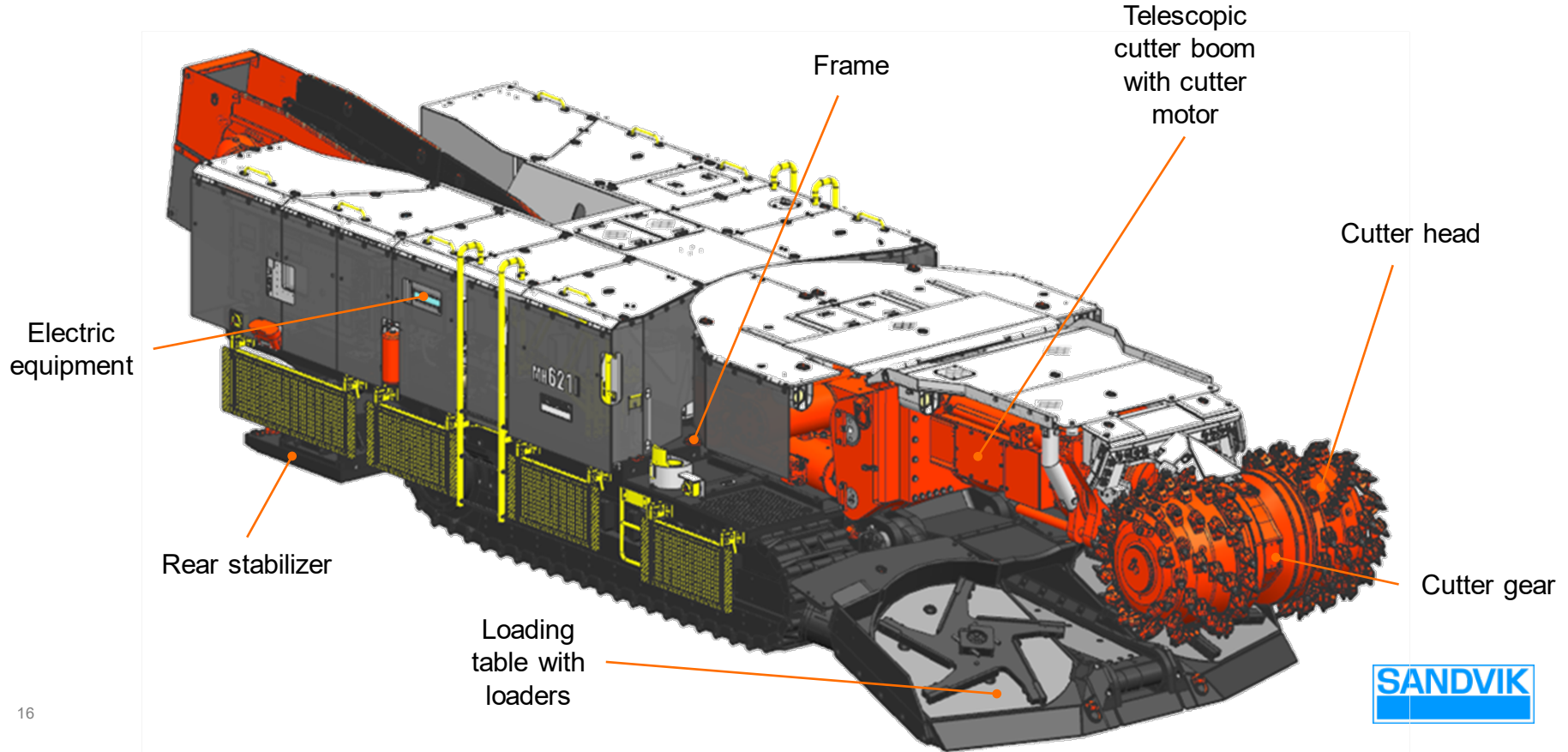
OVERVIEW AND WALKAROUND



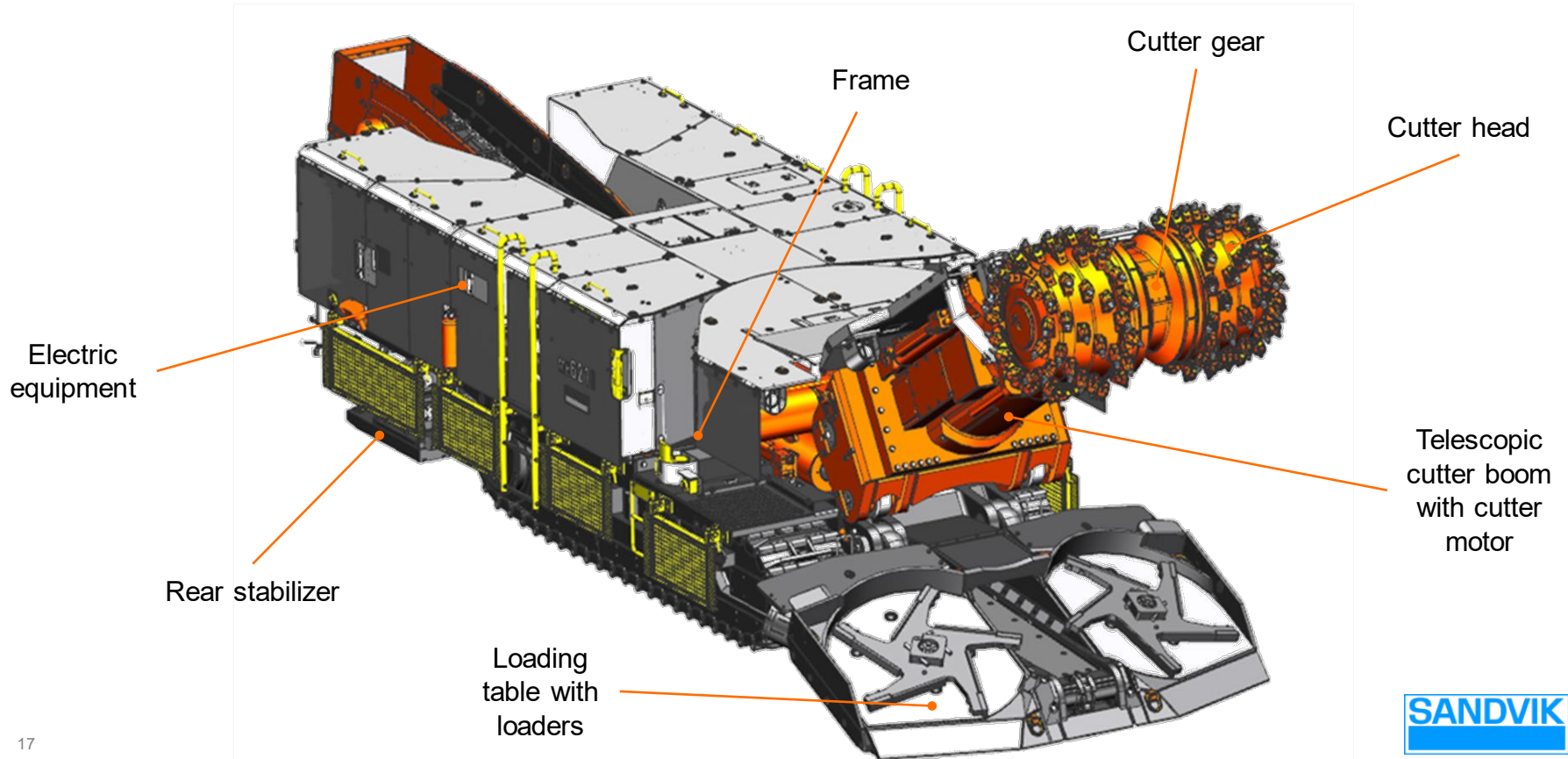
OVERVIEW AND WALKAROUND



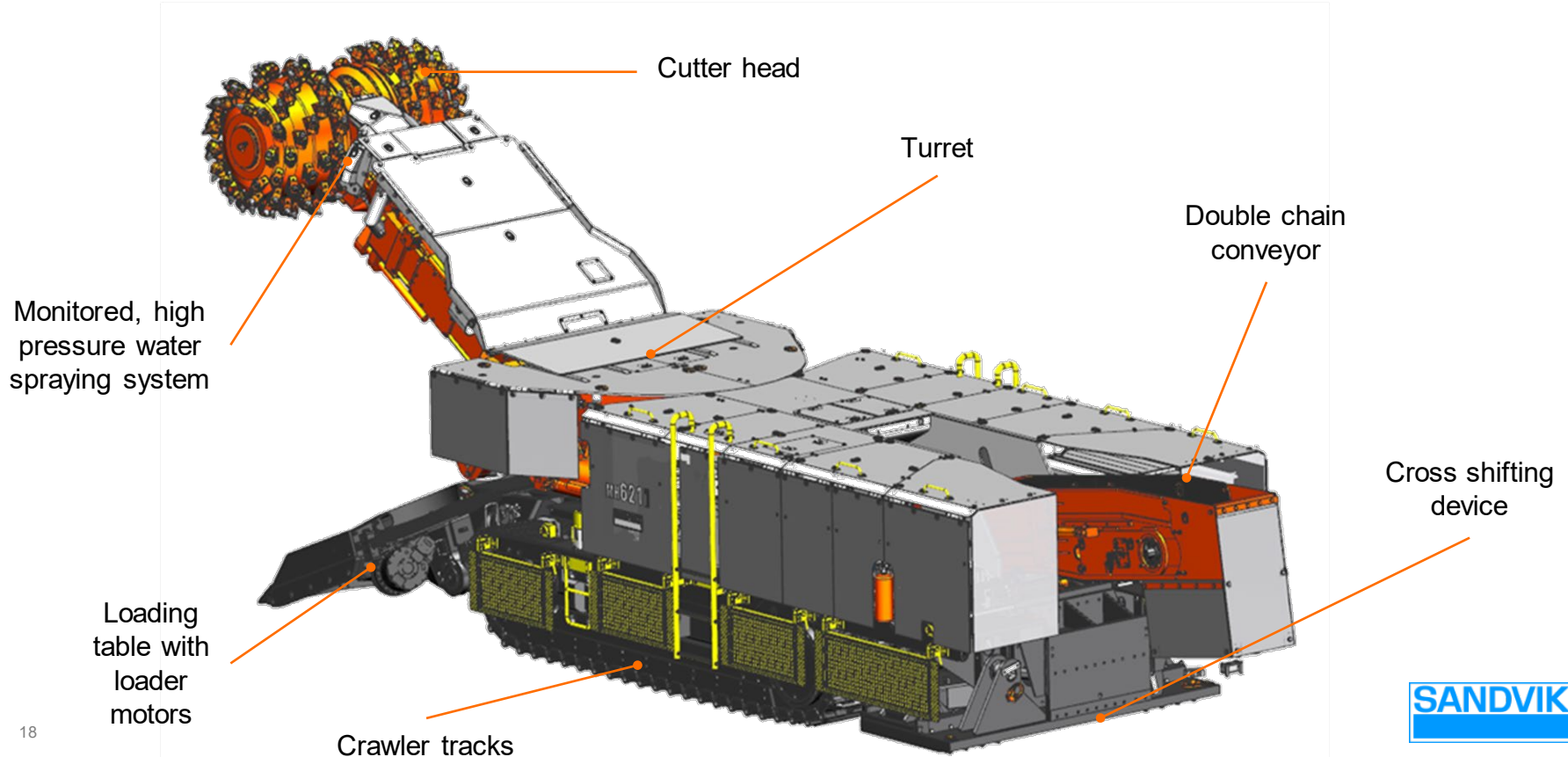
OVERVIEW AND WALKAROUND



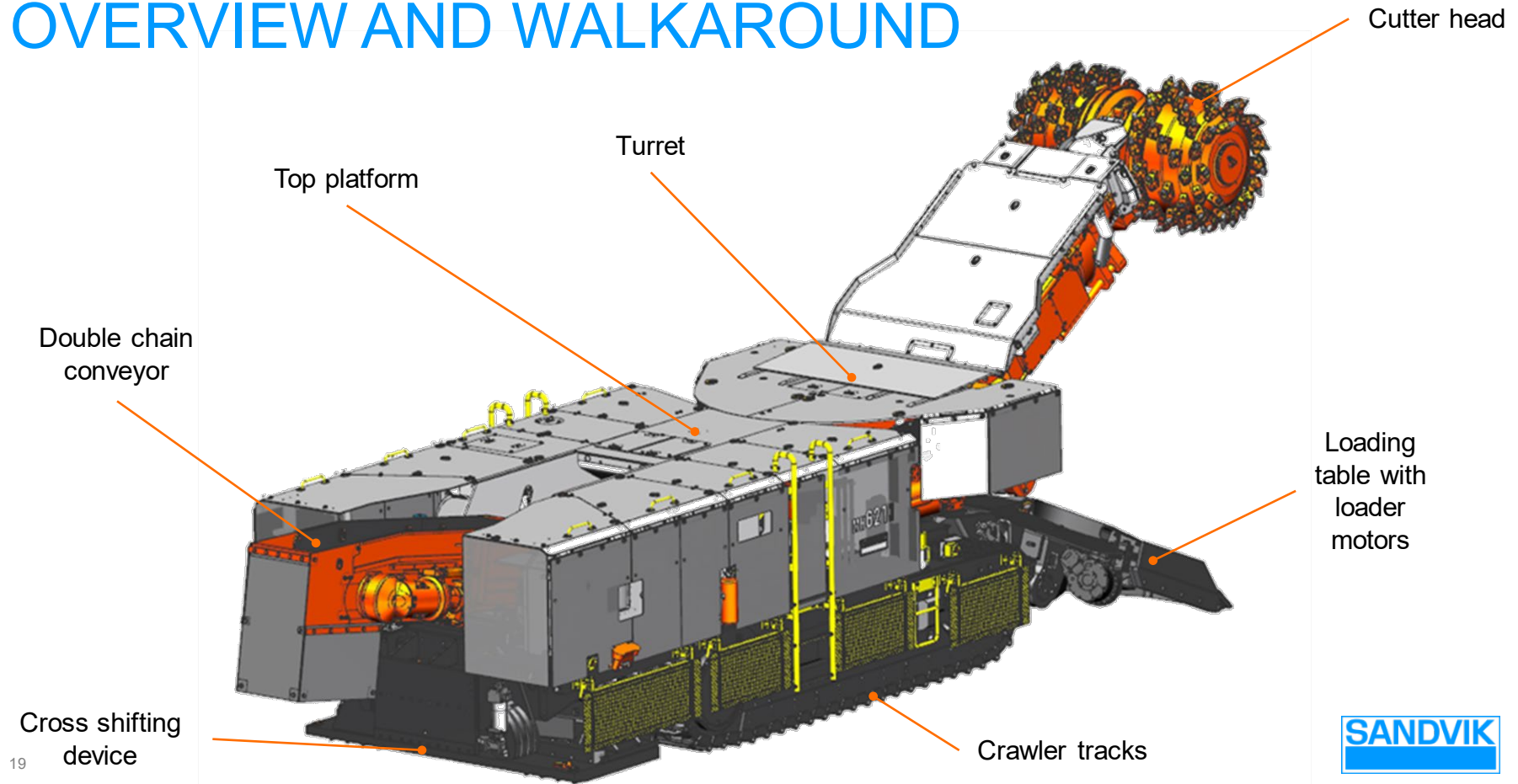
OVERVIEW AND WALKAROUND



OVERVIEW AND WALKAROUND



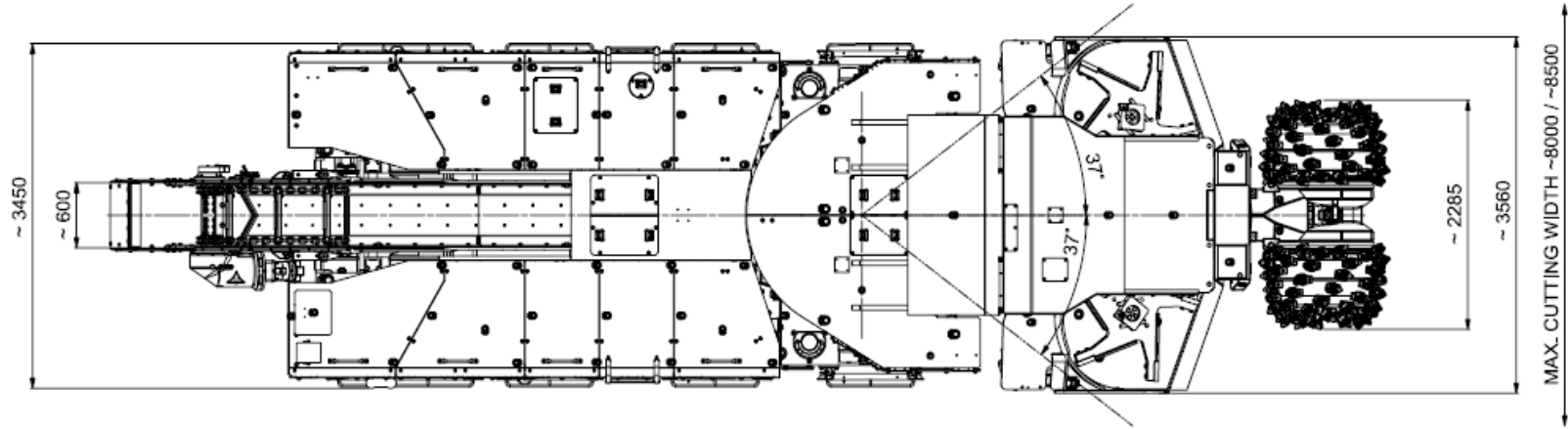
OVERVIEW AND WALKAROUND



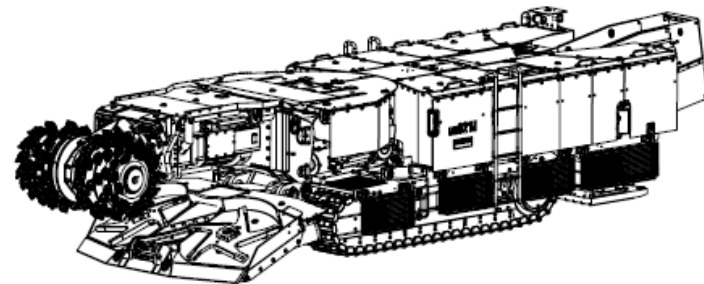
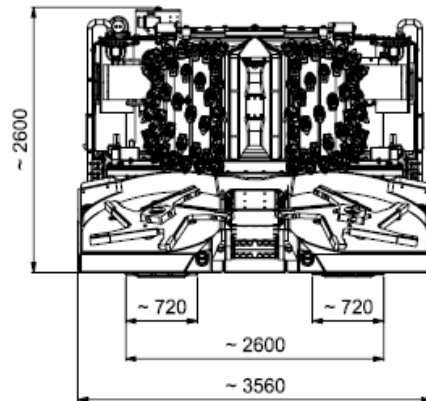
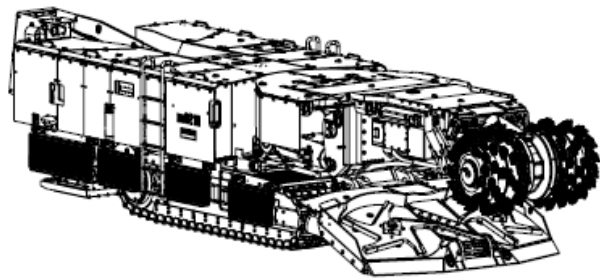
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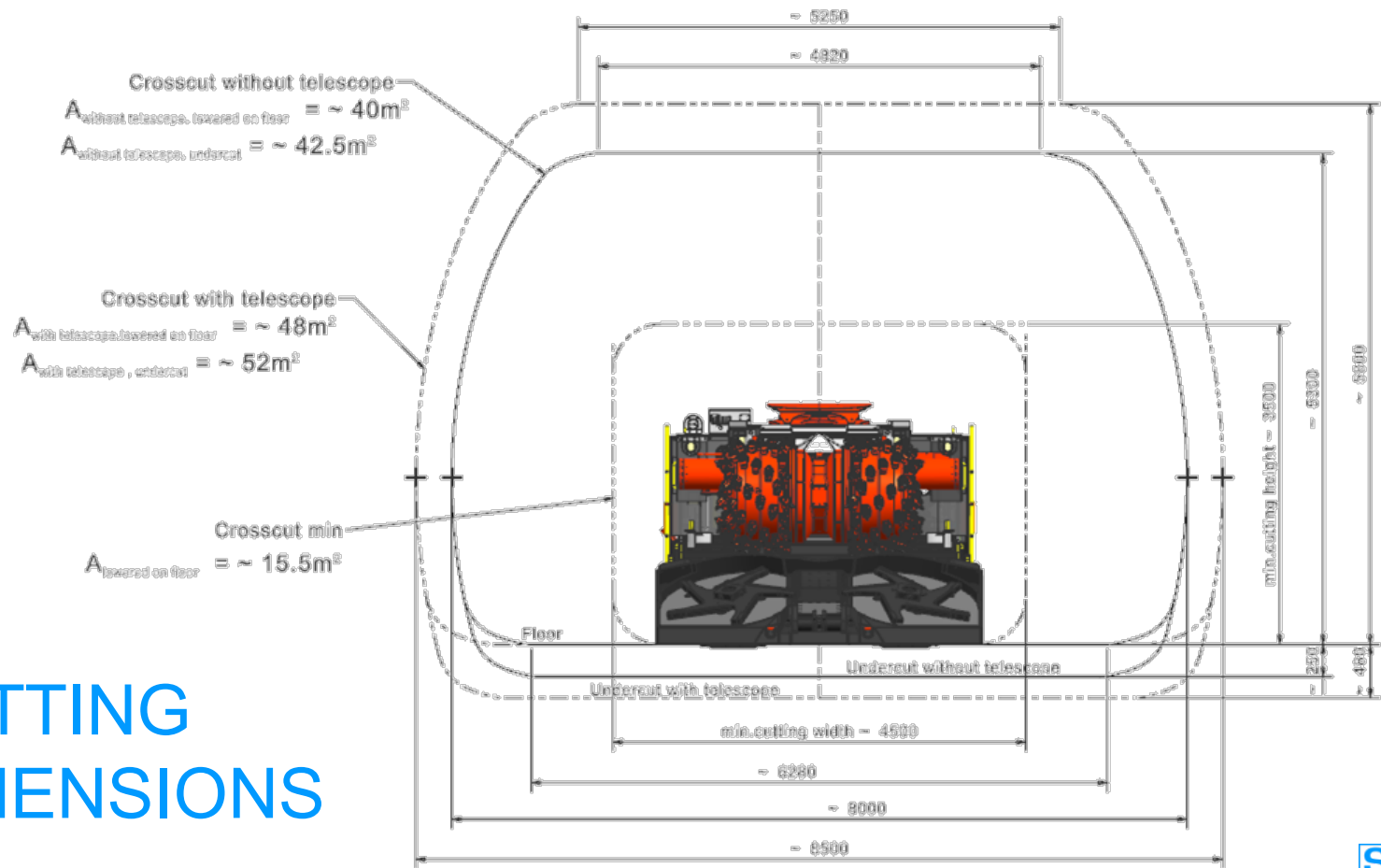
MACHINE DIMENSIONS



MACHINE DIMENSIONS



CUTTING DIMENSIONS



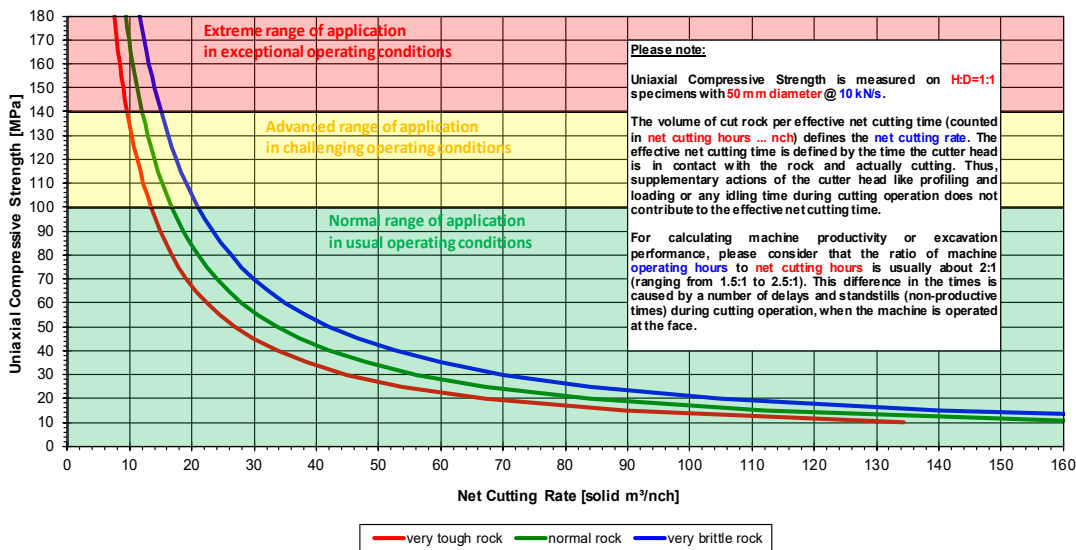
BASICS

Item	Figure	Unit
Weight	~ 120	[t]
Ground pressure	~ 0.19 – 0.23	[N/mm ²]
Total installed power	504 (Ex) / 522 (nEx)	[kW]
Maximum navigable in- & decline gradient	+/- 18	[°]
Maximum navigable side gradient	+/- 5	[°]
Cone / basin radius	~ 25	[m]

INDICATIVE EXCAVATION PERFORMANCE

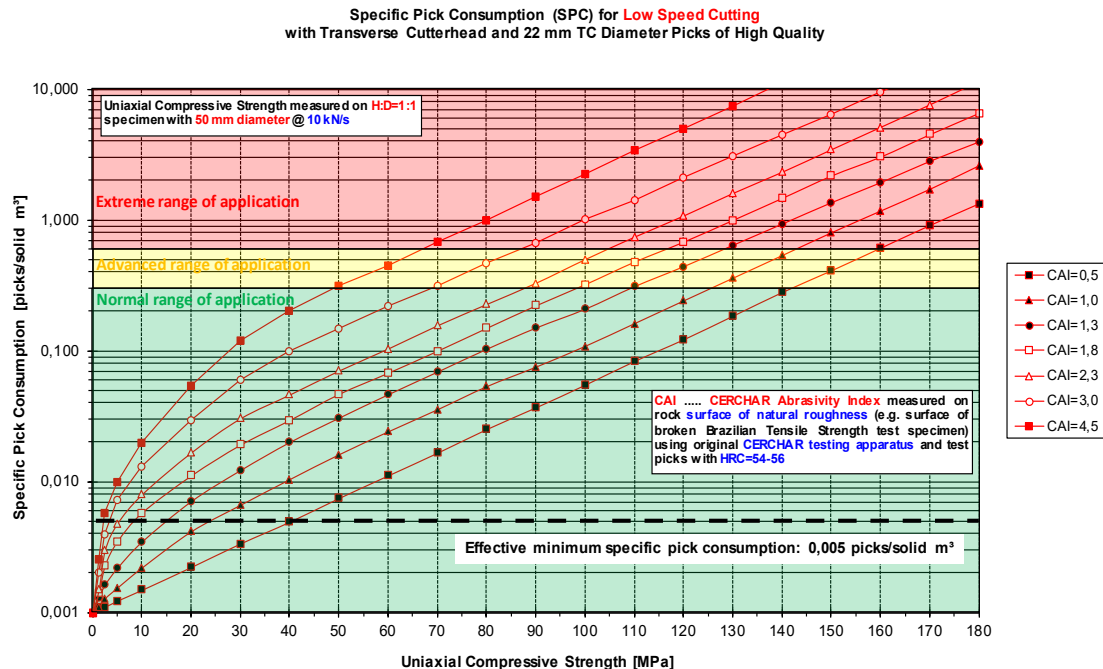
- Net cutting rate graphs available for all types of cutter heads in combination with certain pick types for optimized rock excavation
- Support for excavation performance assessment as special customer service including on-site sampling and in-house rock testing

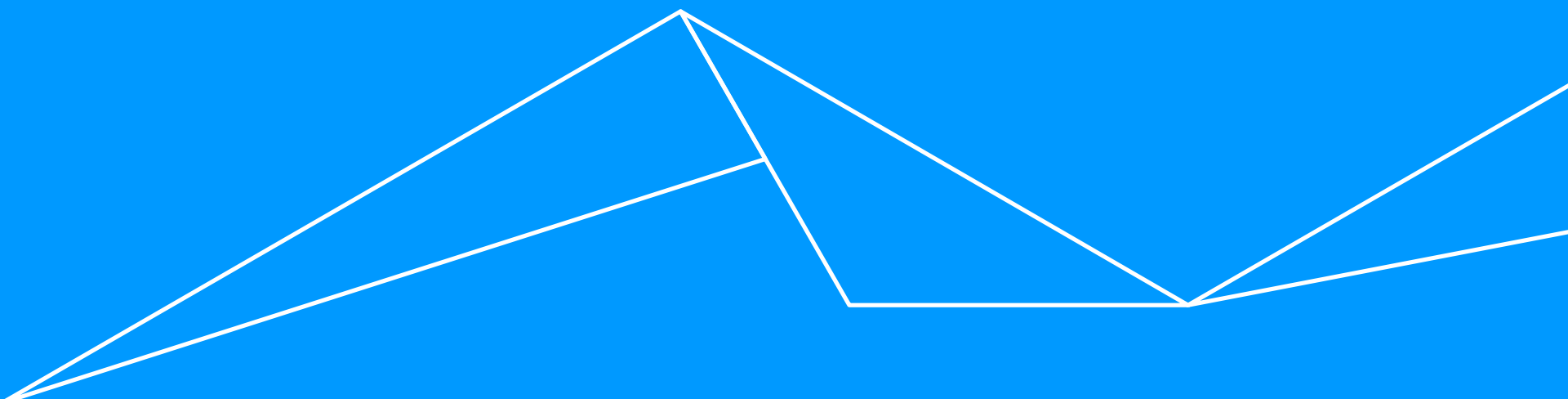
Net Cutting Rate for **MH621** (300 kW installed cutter head power)
equipped with **Cutter Head R425-TC72** and **22 mm TC Diameter Picks**
according to Uniaxial Compressive Strength for Intact to Moderately Fractured Rock Mass
for **Cross Sections < 35 m²**



INDICATIVE TOOL CONSUMPTION

- Specific pick consumption graphs available for certain pick types related to optimized excavation performance
- Support for cutting tool consumption assessment as special customer service including on-site sampling and in-house rock testing



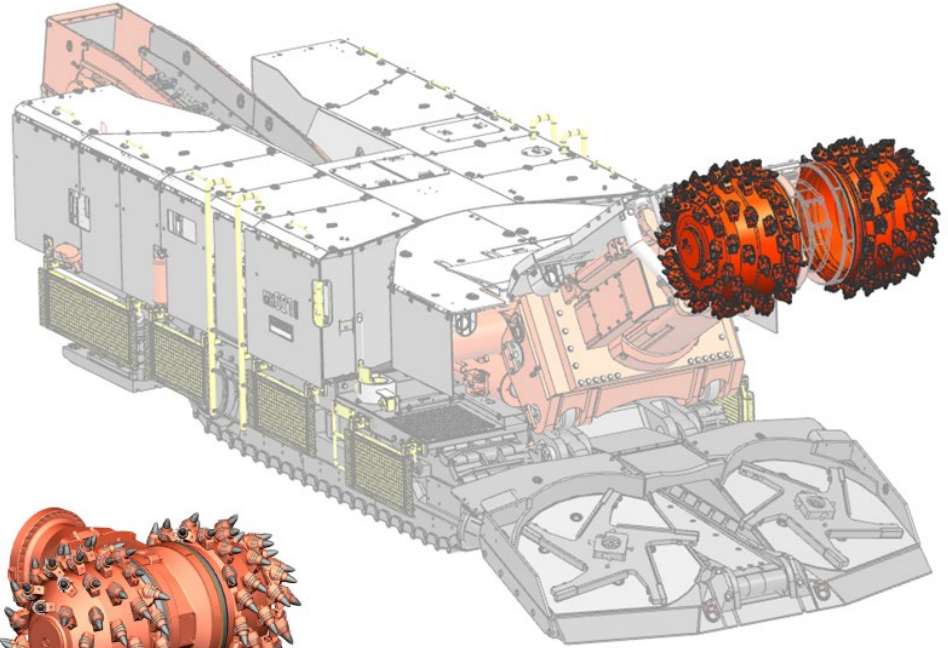
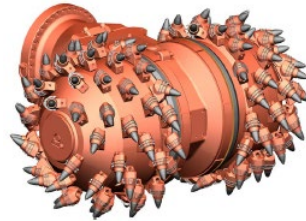
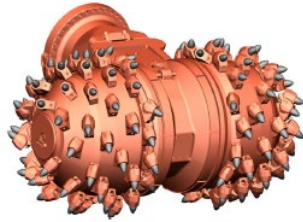


OVERVIEW OF MACHINE MAIN COMPONENTS

CUTTER HEADS INCLUDING CUTTER PICKS

3 types of cutter heads available referring to different rock strength ranges defined by uniaxial compressive strength (UCS):

- R425-TC38: from 10 to 60 MPa
- R425-TC60: from 30 to 100 MPa
- R425-TC72: from 70 to 140 MPa

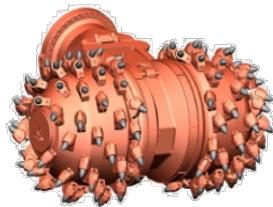


CUTTER HEAD APPLICATION / PERFORMANCE

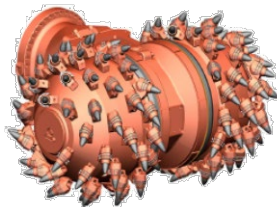
- R425-TC38



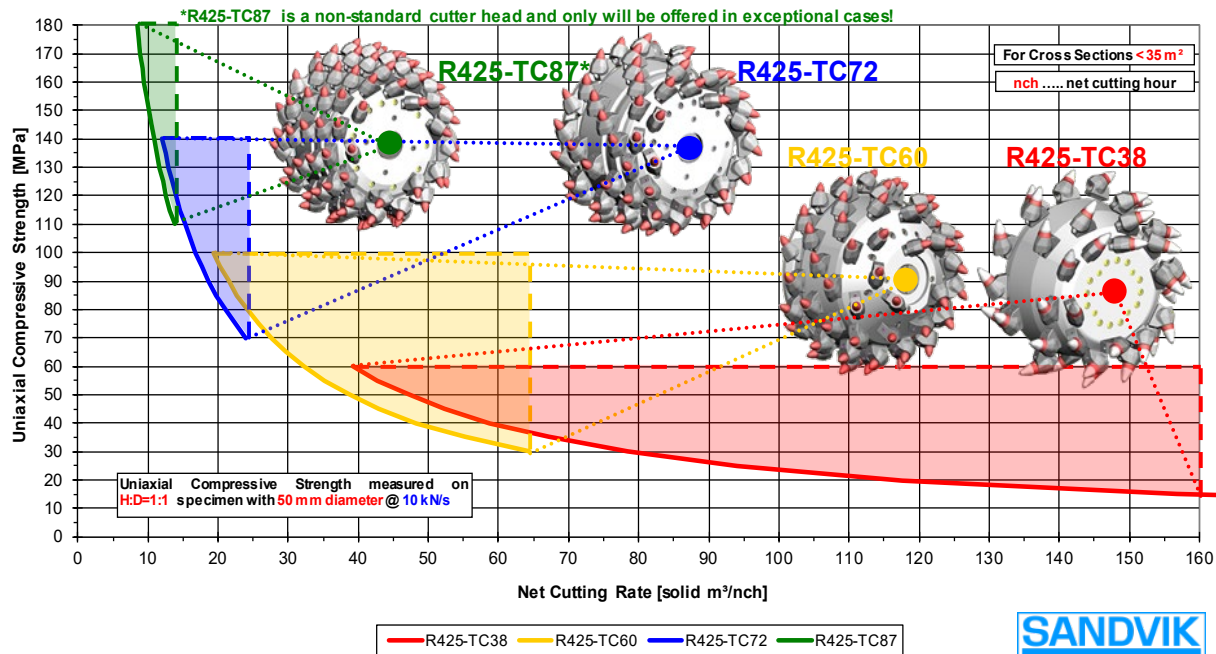
- R425-TC60



- R425-TC72

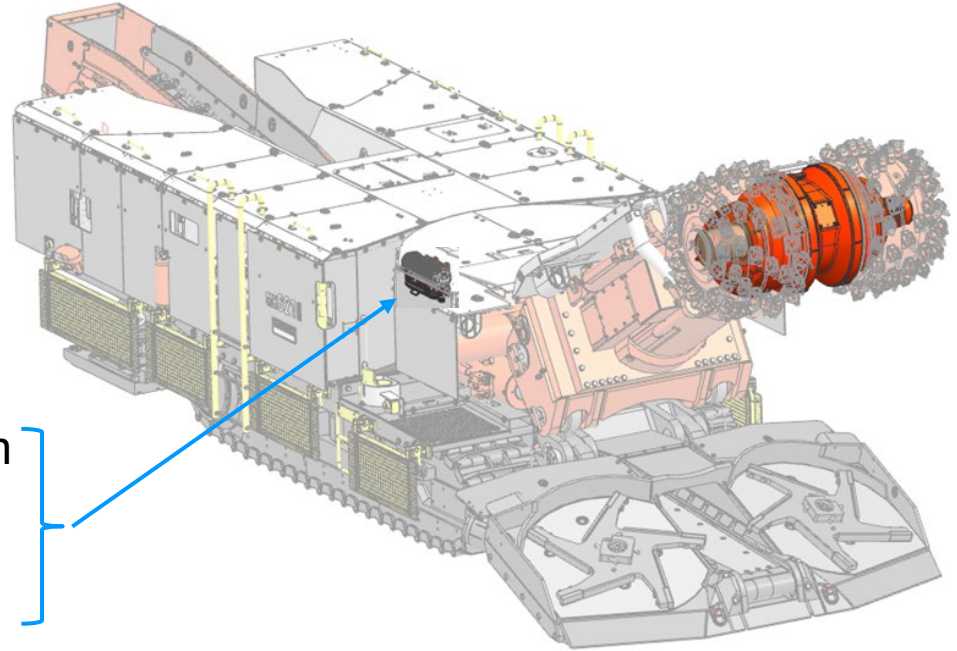


Net Cutting Rate for **MH621** (300 kW installed cutter head power)
equipped with **Different R425-TC Cutter Heads** and **22 mm TC Insert Picks**
according to Uniaxial Compressive Strength for Intact to Moderately Fractured Rock Mass



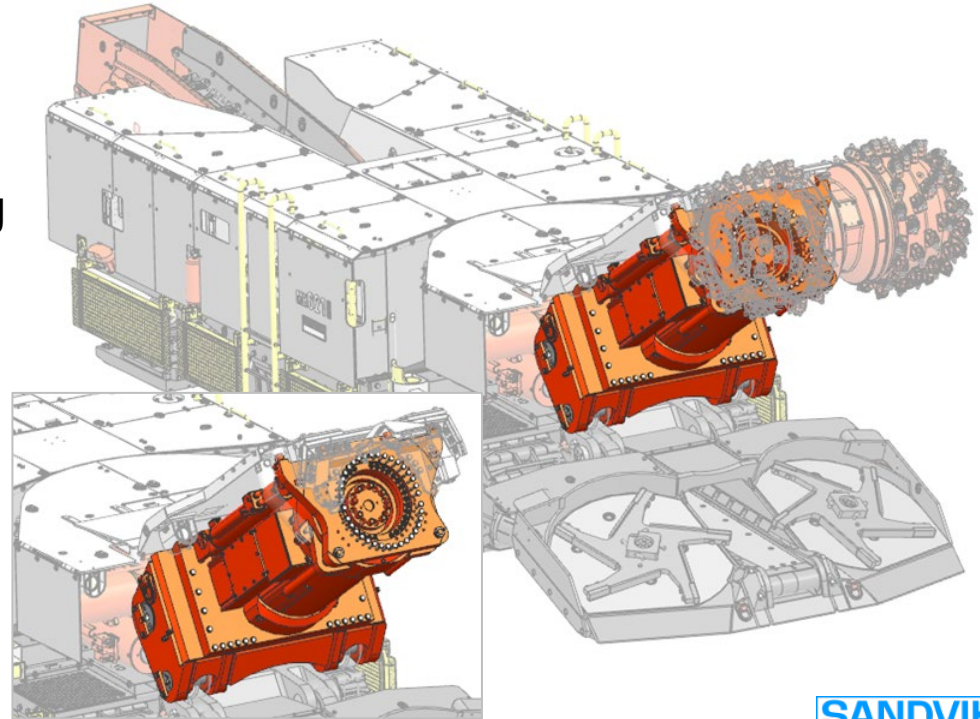
CUTTER GEAR CG425 INCLUDING COUPLING

- Weight: ~ 5.2 t
- Cutting speed:
 - 1.48 m/s @ 50Hz
 - 1.60 m/s @ 60Hz
- Gear oil capacity: ~ 140 l
- Gear oil pump flow system
- Gear oil filtering and cooling system
- Gear oil temperature monitoring
- Gear oil pressure monitoring



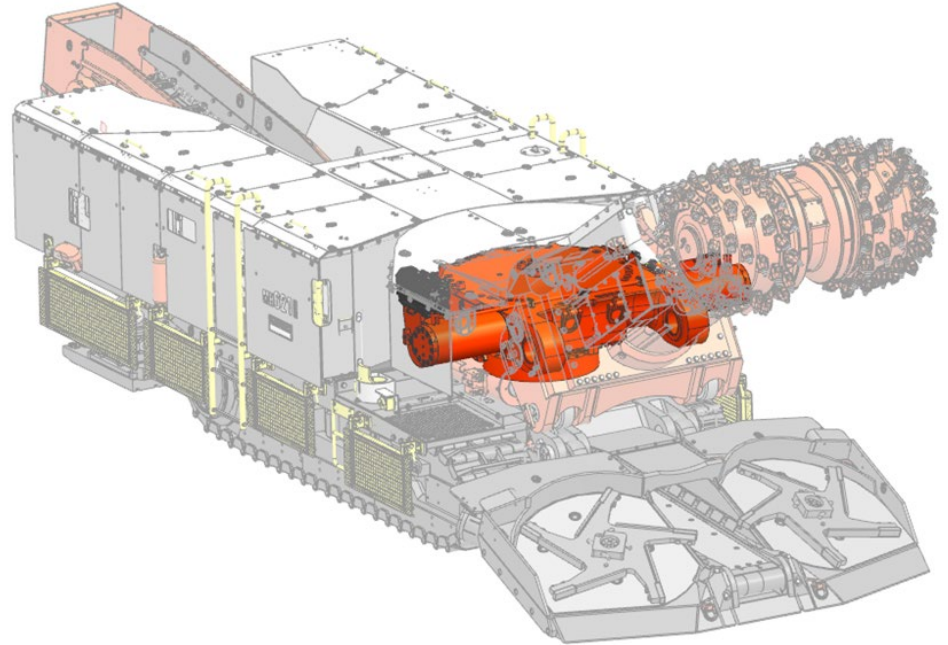
CUTTER BOOM INCLUDING CUTTER MOTOR

- Telescopic cutter boom
 - Extraction distance: 650mm
providing high sump-in force for
stabilized cutting without engaging
crawler tracks
- Cutter motor
 - Power @ S6 mode: 300 kW
 - Water cooled
 - providing high cutting power for
excavating strong rocks



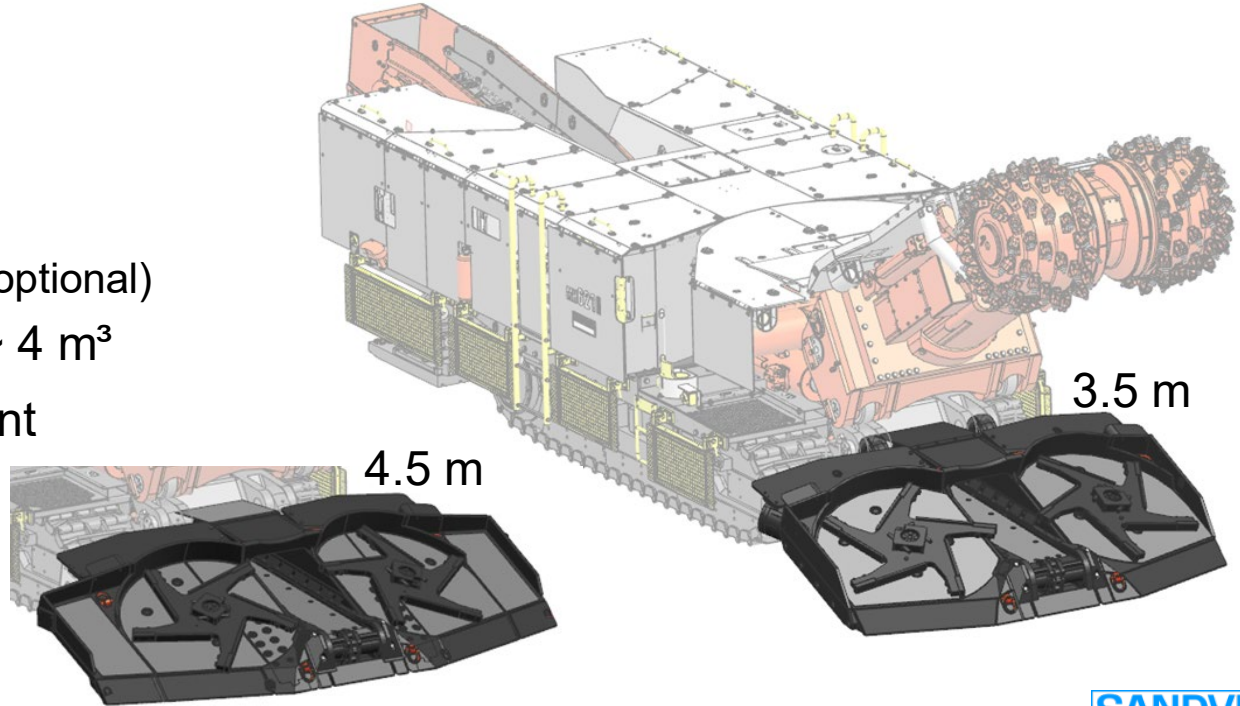
TURRET

- Slewing angle: $\pm 37^\circ$
- Stiff and rigid rack and pinion system providing high slewing force for constant and powerful cutter head operation
- Linear transducers for position control and accurate cutting



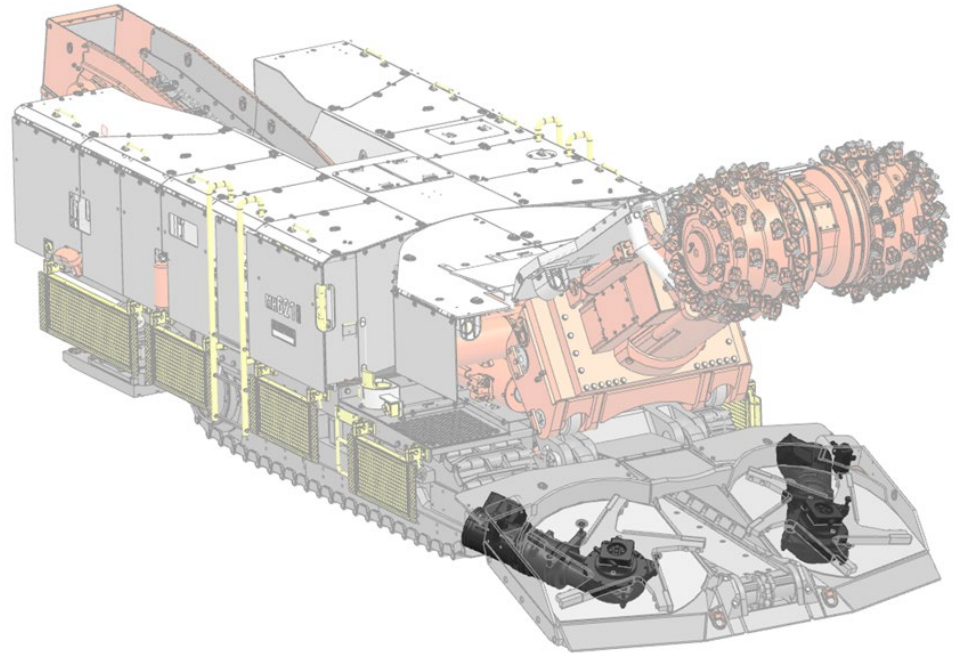
LOADING DEVICE WITH LOADERS

- Rigid or split version
- Loading width:
 - 3.5 m (standard)
 - 4.5 m (optional)
 - 4.6-5.3 m variable (optional)
- Bunkering capacity: $\sim 4 \text{ m}^3$
- Optional wear resistant layout
- Linear transducers for position control



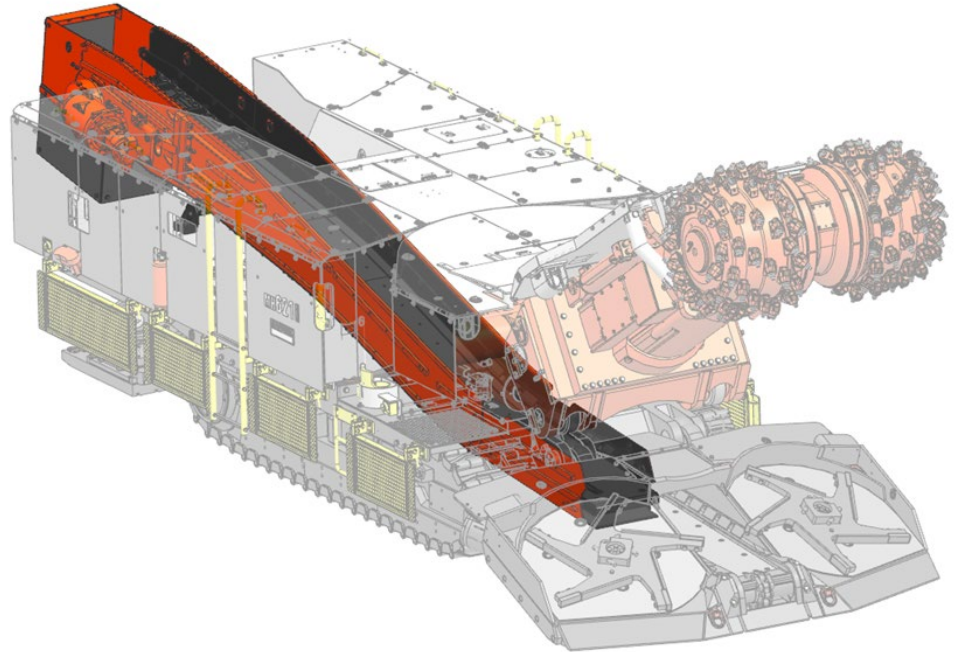
LOADER DRIVE UNIT

- Electrically driven loaders (std.)
 - Loading power: 2 x 36 kW
 - Output speed: ~ 29 rpm
- Hydraulically driven loaders (opt.)
 - Loading power: 2 x 65 kW
 - Output speed: ~ 35 rpm
- Loader gear ratio: 49.78
- Highly effective loading of cut material @ optimized wear behavior of loading unit



STRAIGHT DOUBLE CHAIN CONVEYOR (STD)

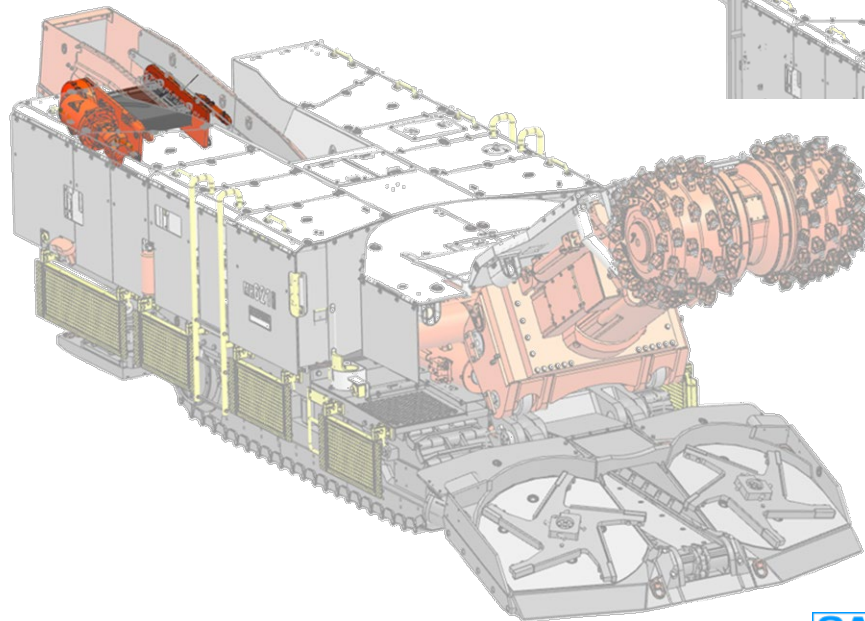
- Wear resistant layout
- Width: ~ 600 mm
- Maximum capacity: ~ 300 m³/h
- Conveyor chain type DIN 22252-2
 - 19 x 64.5 mm
- Running monitoring
- High capacity and variable loading onto different load and haul equipment / vehicles



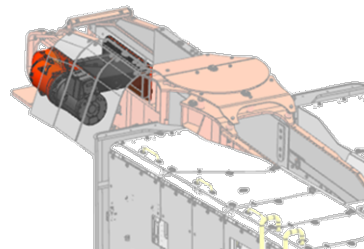
CONVEYOR DRIVE UNIT

- Hydraulic drive (standard)
 - Conveying power: 1 x 65 kW
 - Conveying speed: ~ 0.5-0.9 m/s
 - Pressure monitoring
- Electrical drive (standard)
 - Conveying power: 2 x 36 kW (only together with hydraulic loader drives)
 - Conveying speed: ~ 0.9 m/s
- Constant loading of cut material

Hydraulic

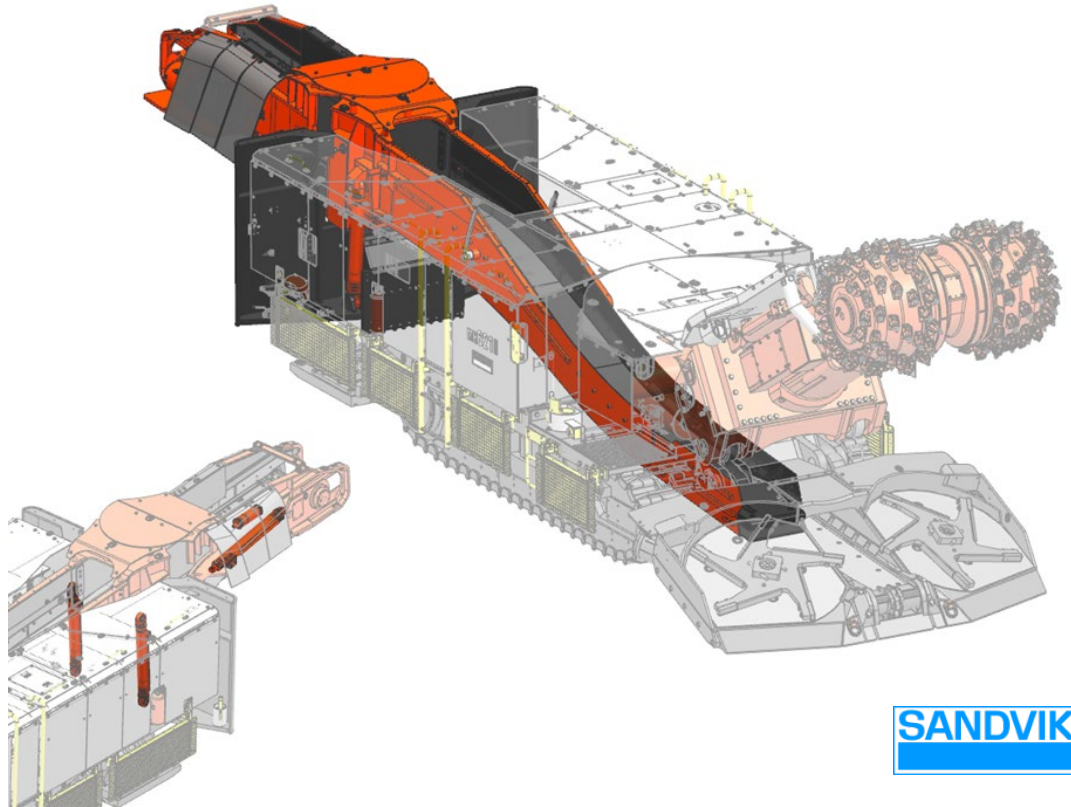


Electric



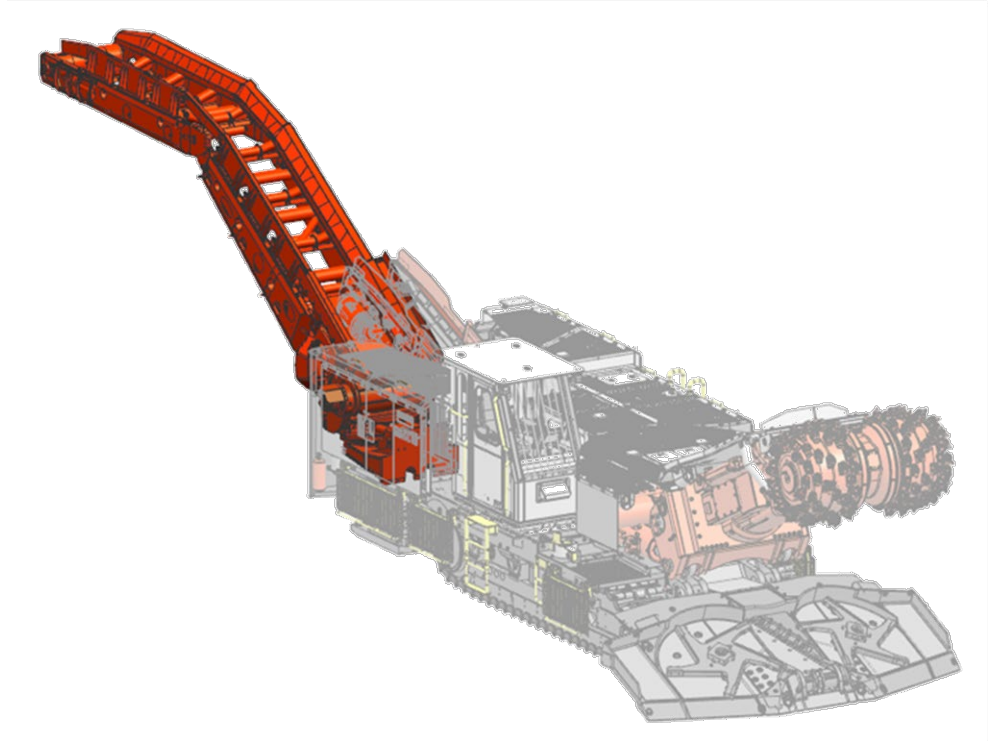
SLEWING SINGLE CHAIN CONVEYOR (OPTION)

- Wear resistant layout
- Width: ~ 600 mm
- Slewing range: +/- 45°
- Maximum capacity: ~ 300 m³/h
- Standard Cincinnati chain
- Running monitoring
- Vertical slewing arrangement (optional)



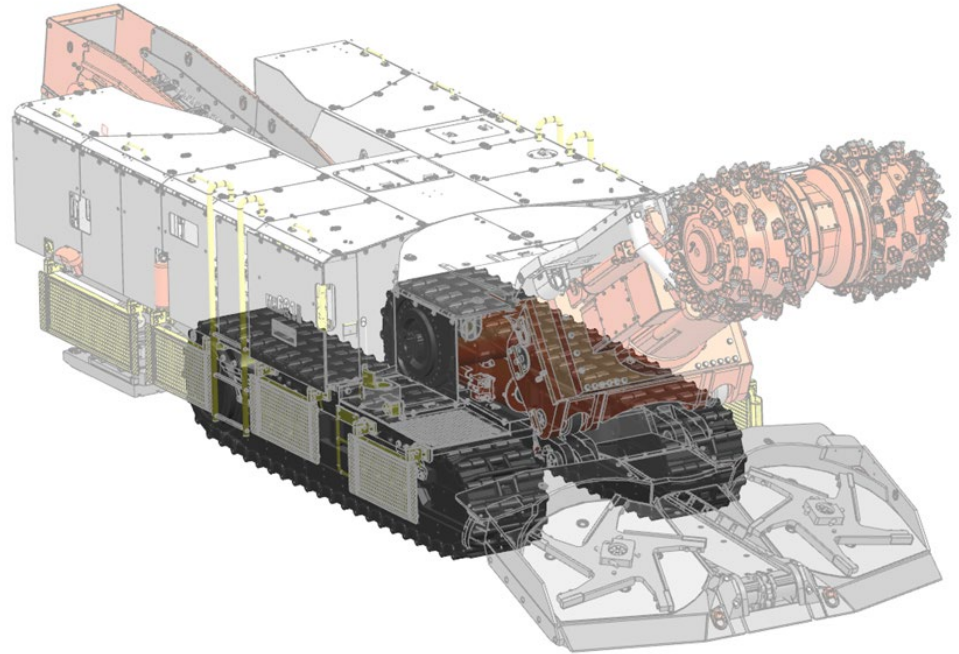
SLEWING BELT CONVEYOR (OPTION)

- Linked to double chain conveyor
- Width: ~ 800 mm
- Slewing range: +/- 37°
- Running speed: ~ 1.6 m/s
- Running monitoring
- Belt slip monitoring
- High capacity and flexibility for loading onto different load and haul equipment / vehicles



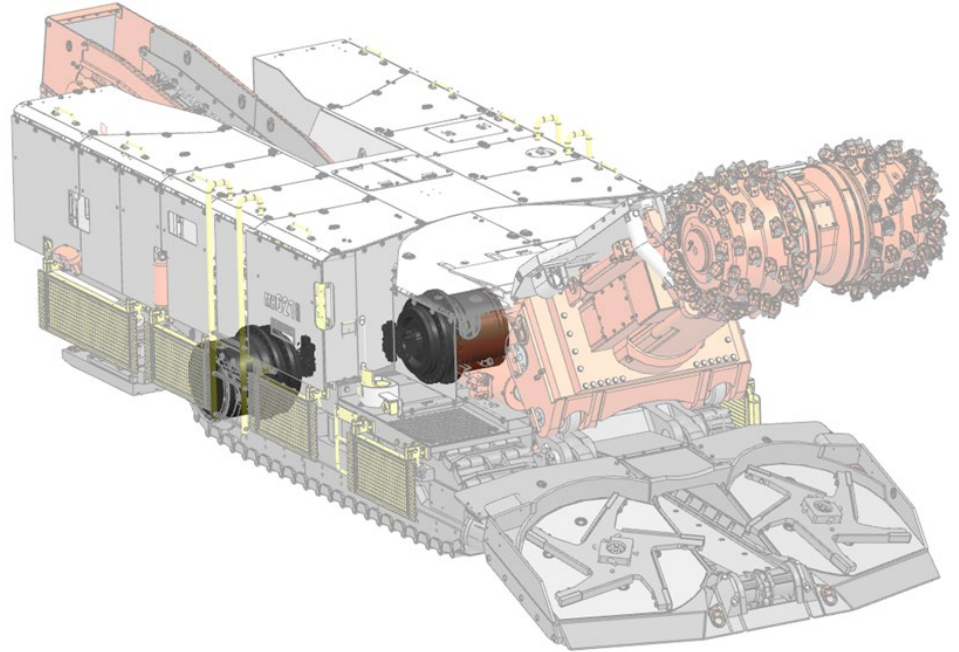
CRAWLER TRACK SYSTEM

- Standard: High crawler track system for quick machine relocation
- Track frame bolted to main frame
- Track chain width: ~ 720 mm
- Track length on ground: ~ 3800 mm
- Track overall width: ~ 2600 mm
- Track tensioning device (2 x)
- Optional: Low crawler track system for installation of integrated dust intake tubes / channels



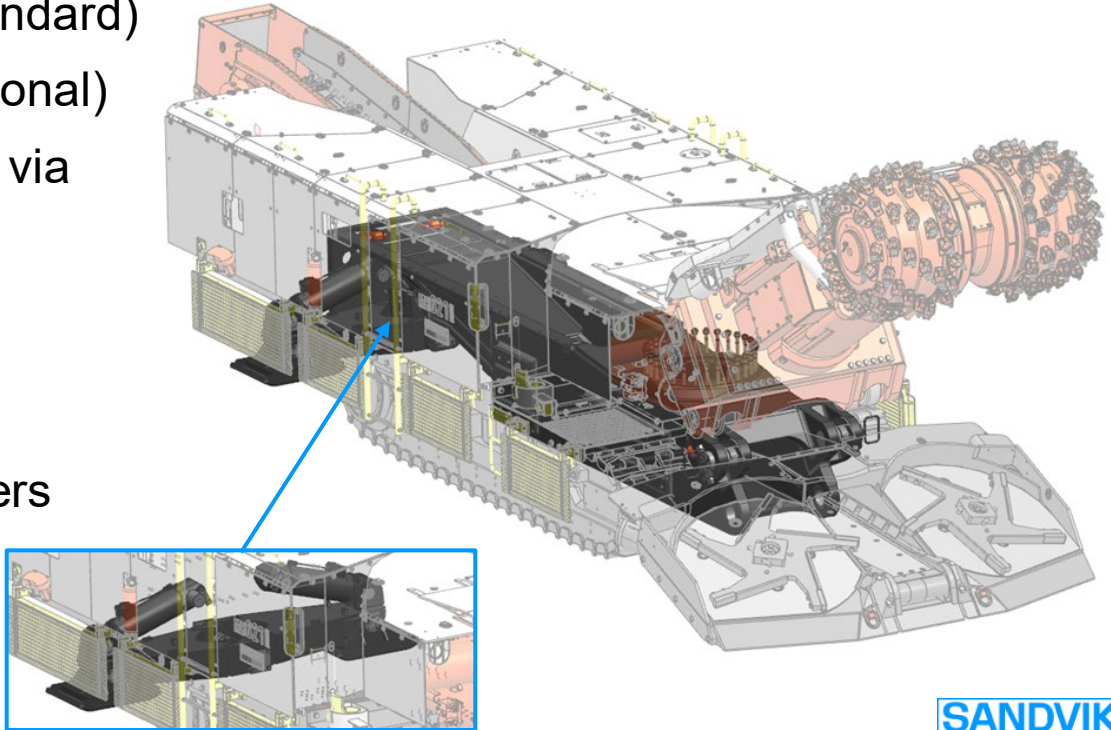
CRAWLER TRACK DRIVE UNIT

- Hydraulic drive (Ex / nEx)
 - Tramming power: 2 x 50 / 70 kW
- Track gears (2 x)
- Tramming speed: ~ 0-17 m/min
- Track brake release (2 x)
- Tramming @ certain speed ranges by 3 stages of tramming power
- Tramming in both directions @ full speed range



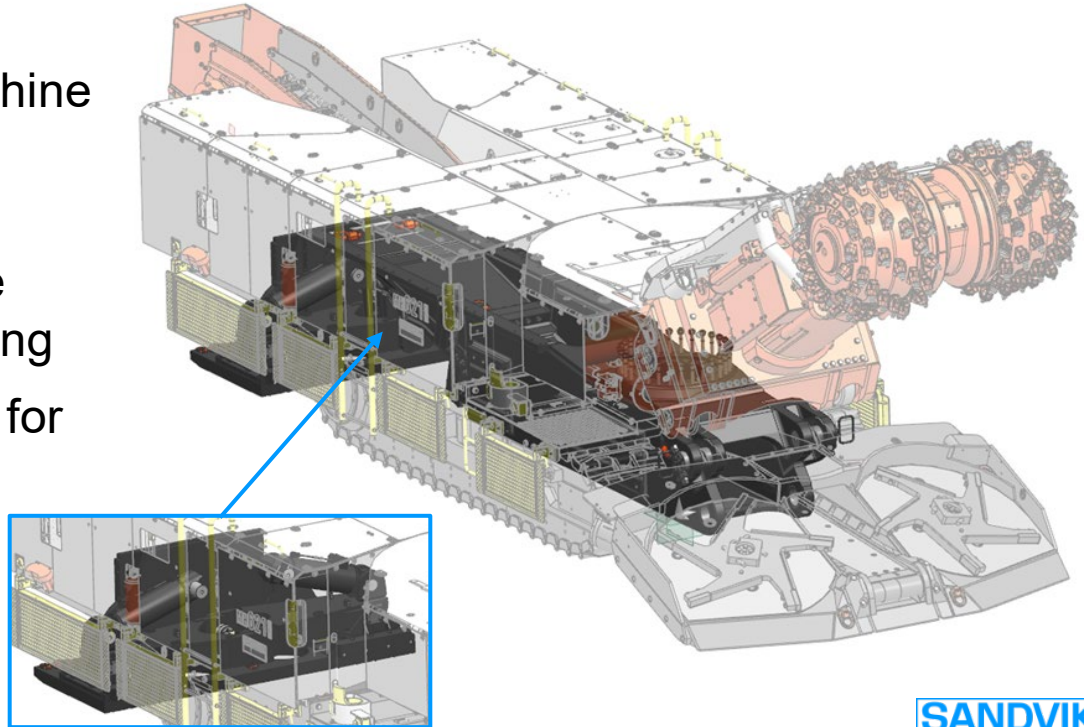
MAIN FRAME WITH STABILIZERS

- Solid frame construction (standard)
- Split frame construction (optional)
- Rear bottom stabilizer linked via pins to machine frame
- Rear bottom stabilizers synchronized movement (1 solenoid)
- Option: Rear bottom stabilizers separate movement (2 solenoids)



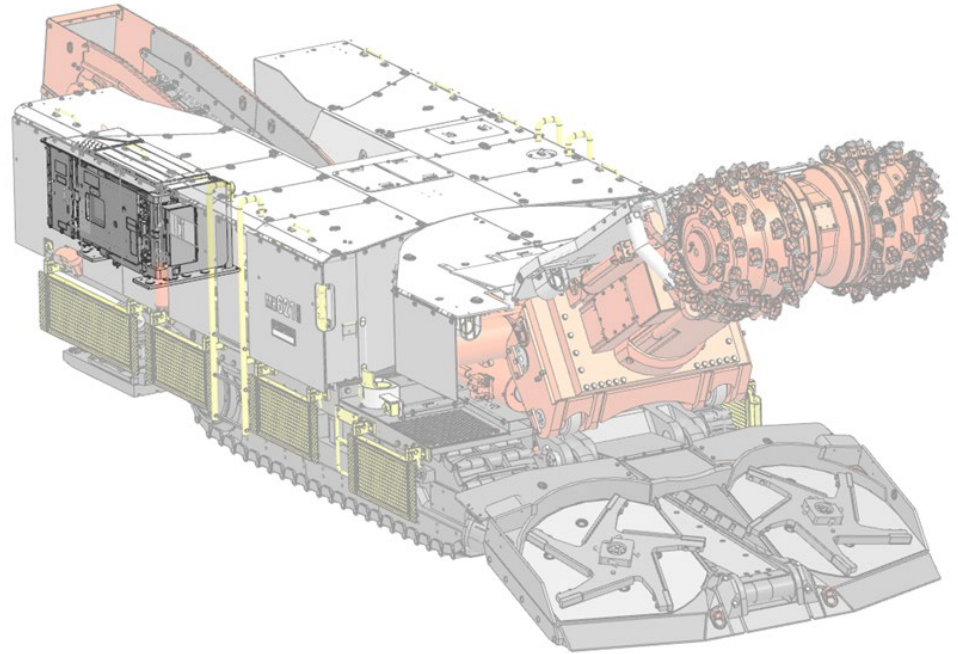
MAIN FRAME WITH CROSS SHIFTING DEVICE

- Rear bottom stabilizers auto function DOWN for quick machine stabilization
- Rear bottom stabilizers auto function UP for quick machine forward and backward tramming
- Optional cross shifting device for easier machine positioning



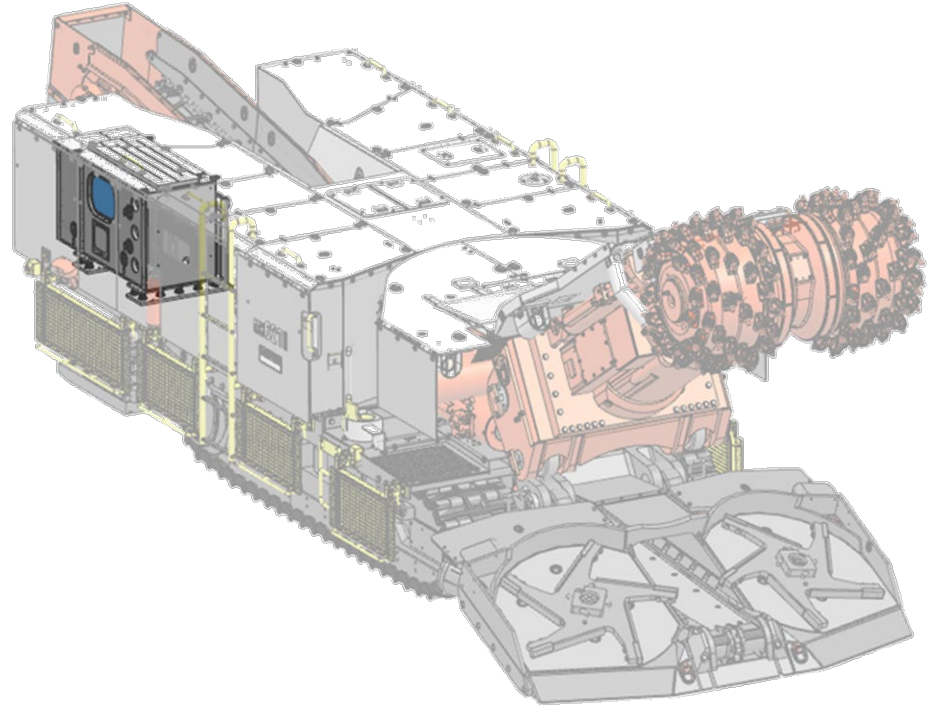
ELECTRIC SYSTEM INCLUDING PLC UNIT

- Main panel SANDVIK SMV Ex-11
- Control system PLC B&R X90
- Monitoring and data logging (SCU, data via OPC available, FDM ready)
- Display integrated in main panel
- Type of solenoid valves 24 V Ex
- SIL 2 emergency stop on main panel & machine
- SMS 3 control system for ITP spraying system



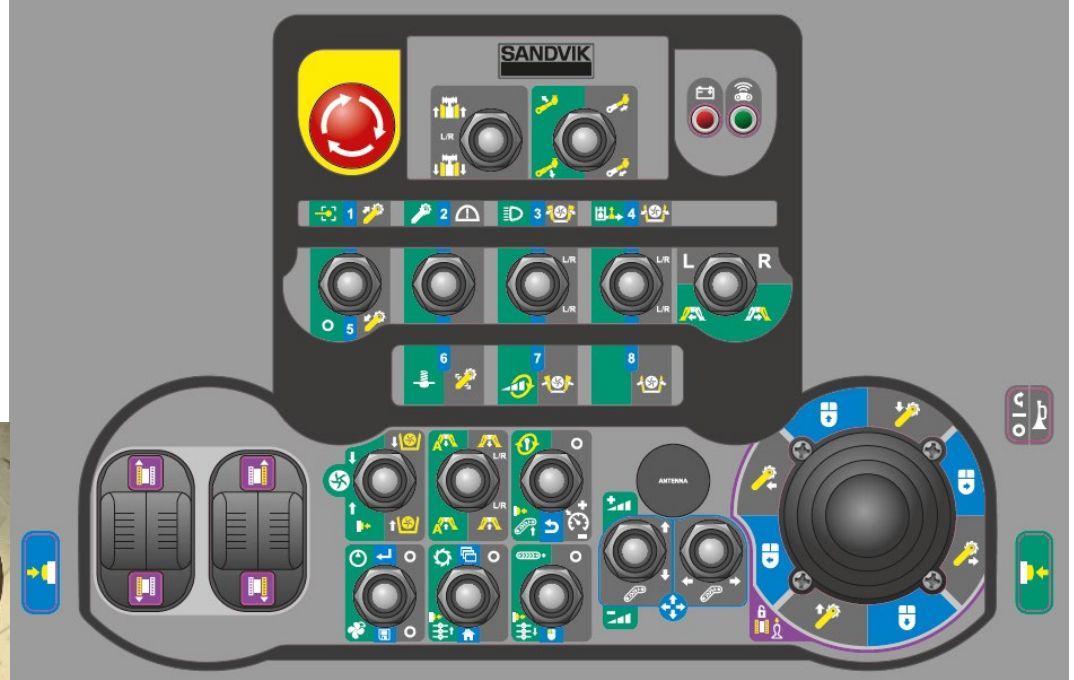
ELECTRIC SYSTEM INCLUDING PLC UNIT

- Main panel SANDVIK SMV nEx-12
- Control system PLC B&R X20
- Monitoring and data logging (SCU, data via OPC available, FDM ready)
- Display integrated in main panel
- Type of solenoid valves 24 V nEx
- SIL 2 emergency stop on main panel & machine



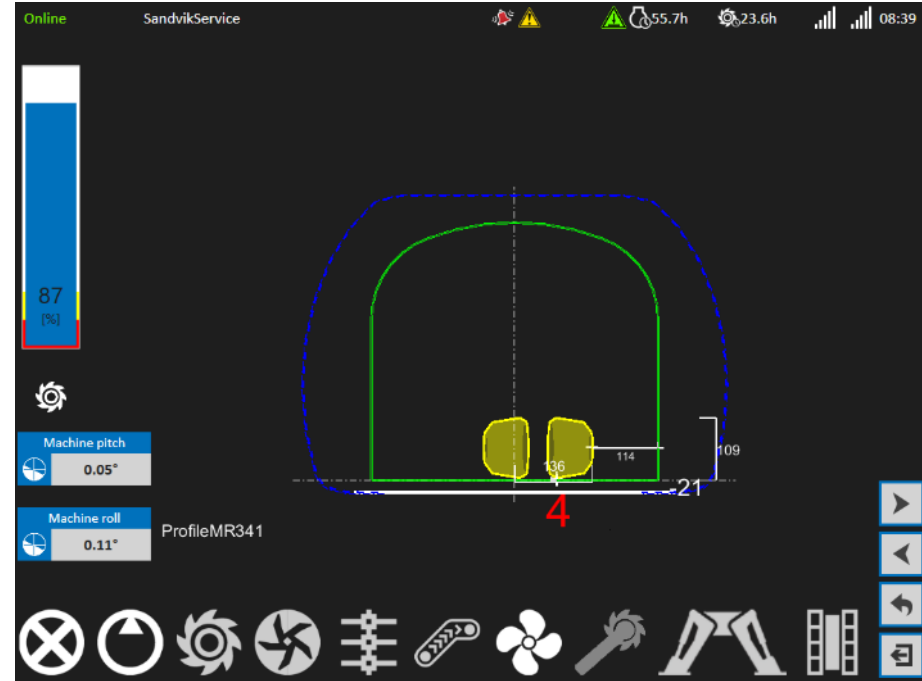
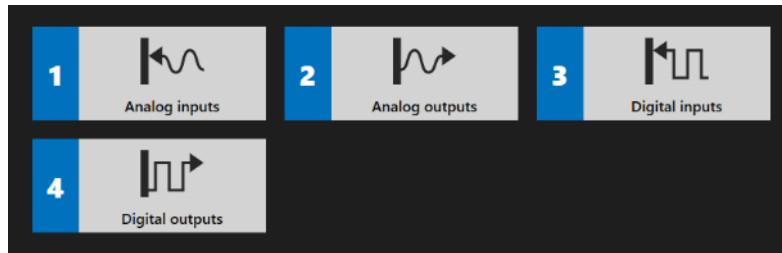
RADIO REMOTE CONTROL

- Easy to operate radio remote control enables machine operation from safe place
- Full control over all operational machine functions
- High functional reliability

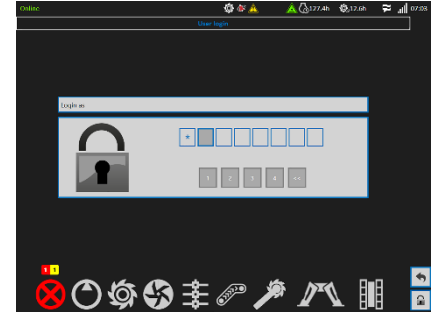
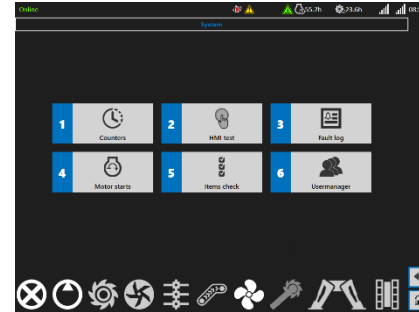
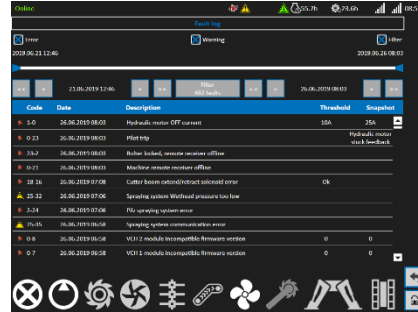
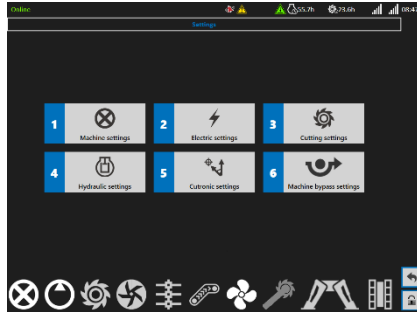
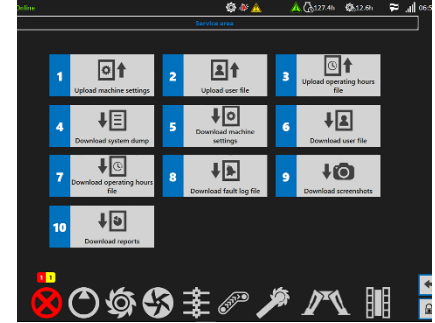
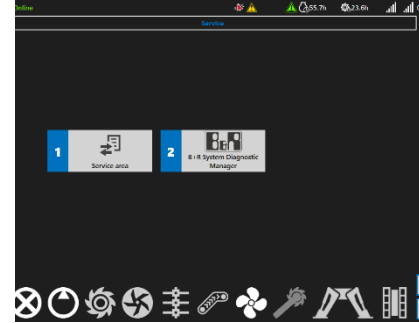
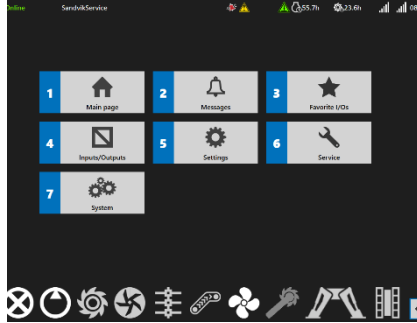


HUMAN MACHINE INTERFACE (HMI)

- Clear and straight information for easy and effective machine control and operation
- Full surveillance of all machine input and output signals (I/Os) for absolute control of machine functions

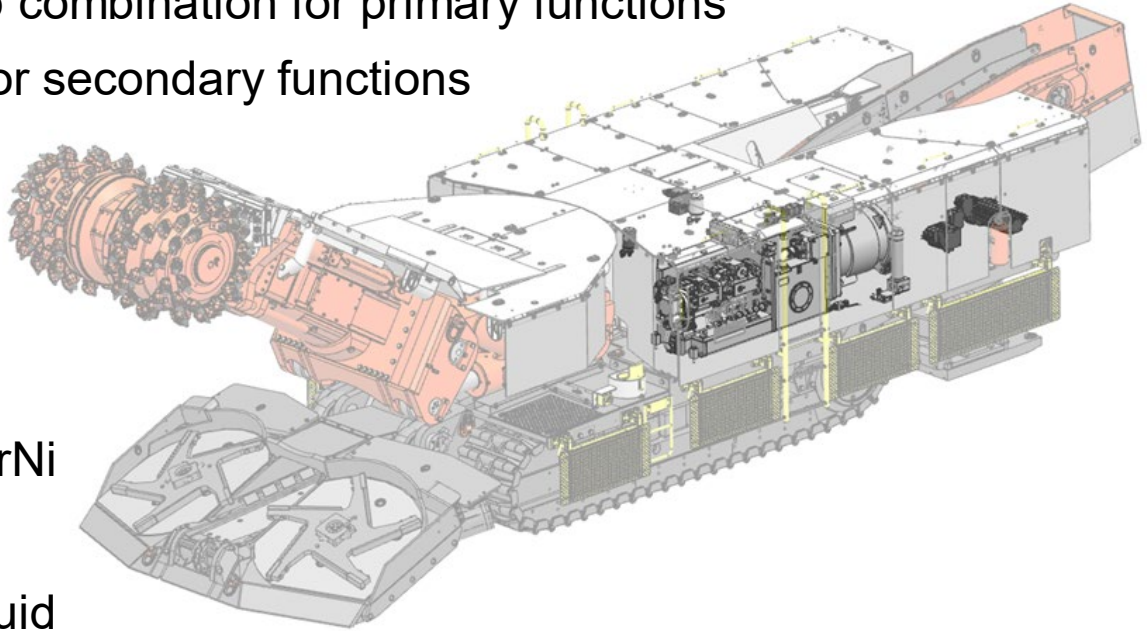


HUMAN MACHINE INTERFACE (HMI)



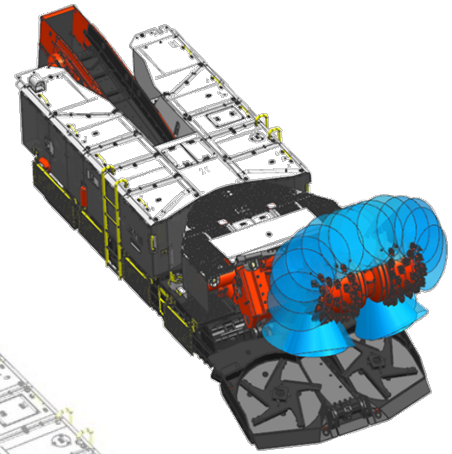
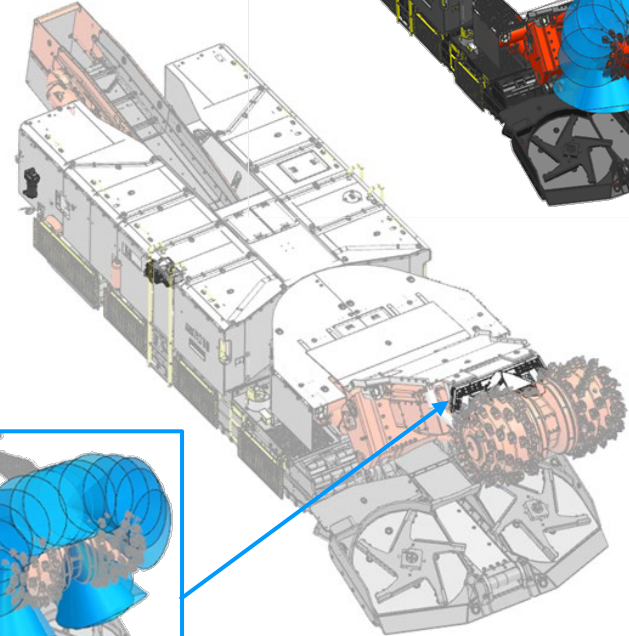
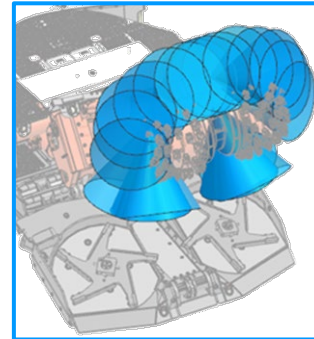
HYDRAULIC SYSTEM

- Variable axial piston pump combination for primary functions
- Vane pump combination for secondary functions
- Maximum hydraulic pump pressure: 330 bar
- Total hydraulic oil volume: ~ 700 l
- Hydraulic cylinders with CrNi standard coating
- Mineral based hydraulic fluid



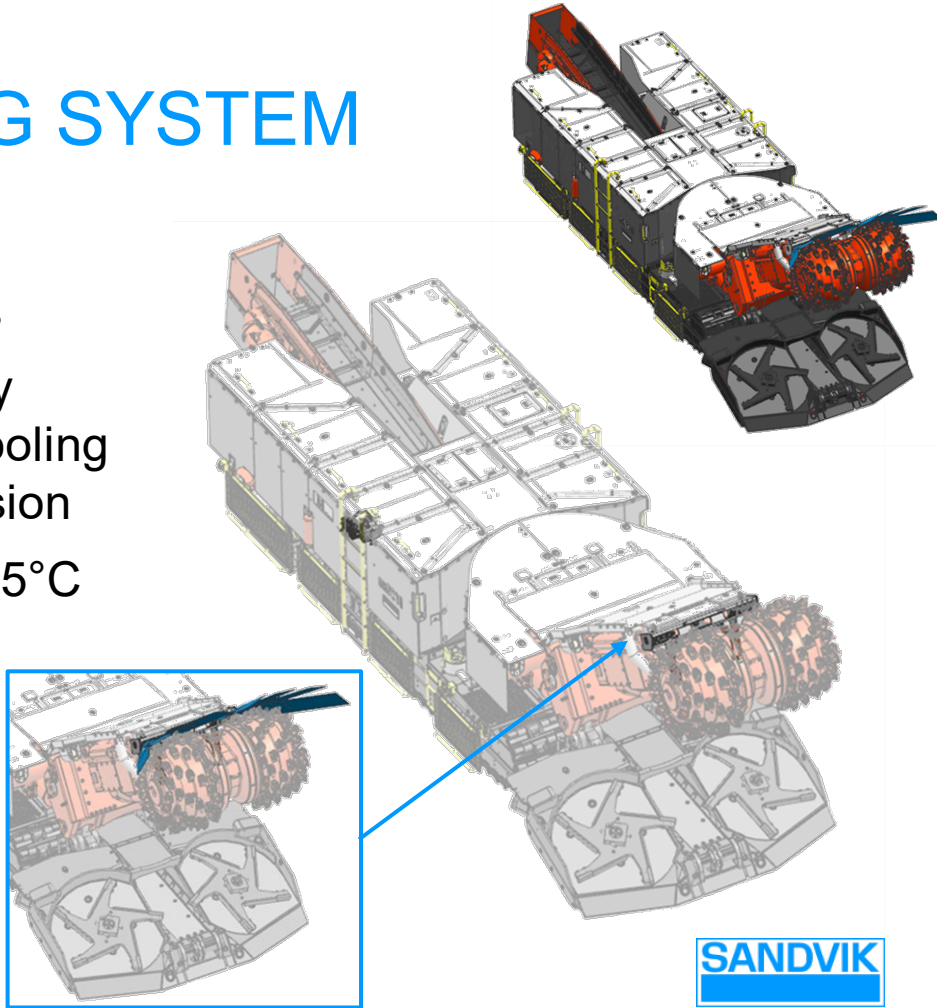
COOLING AND SPRAYING SYSTEM

- Spraying system with ITP nozzles for underground flame proof conditions
- The open cooling system is continuously supplied with fresh water for machine cooling and for water spraying for dust suppression
- Water supply temperature range: $\sim 10\text{-}35^{\circ}\text{C}$
- Water supply volume: $\sim 50\text{ l/min}$
- Water supply pressure range: 10-50 bar
- Water booster pump station for spraying system hydraulically driven
- Back flushing filter



COOLING AND SPRAYING SYSTEM

- Spraying system with flat nozzles for underground non-flame proof conditions
- The open cooling system is continuously supplied with fresh water for machine cooling and for water spraying for dust suppression
- Water supply temperature range: $\sim 10\text{-}35^{\circ}\text{C}$
- Water supply volume: $\sim 50\text{ l/min}$
- Water supply pressure range: 10-50 bar
- Back flushing filter

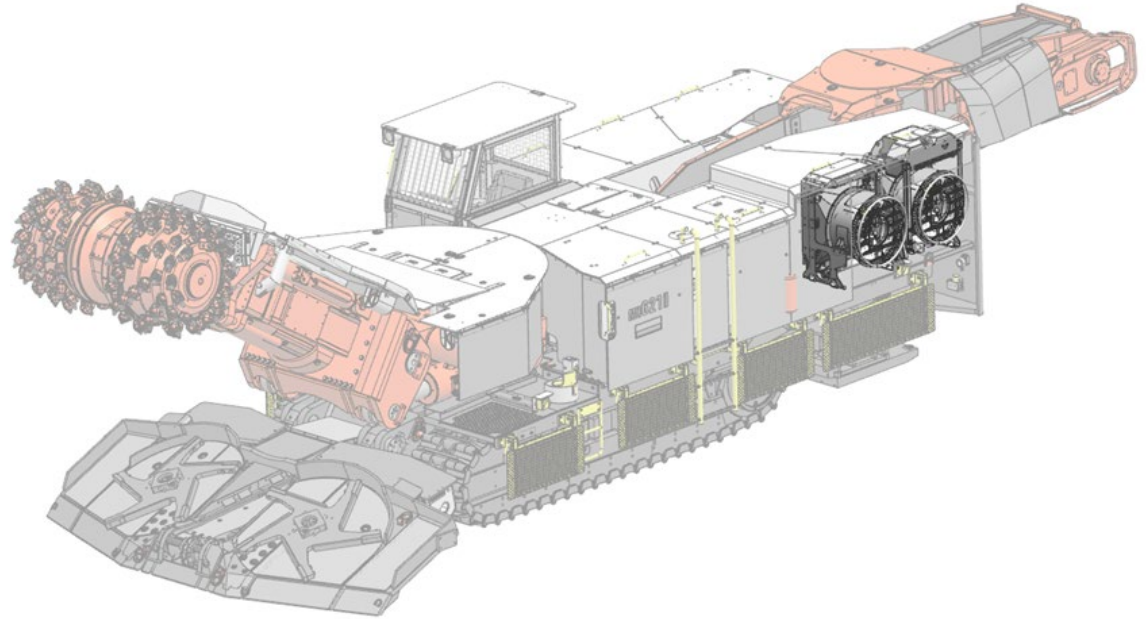




OVERVIEW OF MACHINE OPTIONAL ITEMS

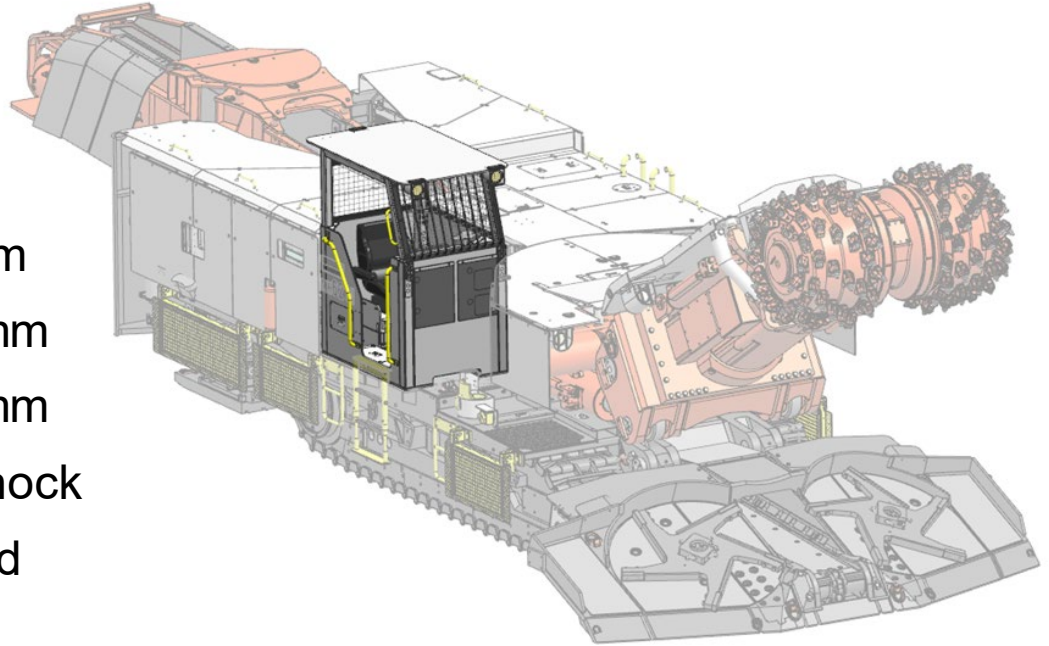
OPTIONAL CLOSED LOOP COOLING SYSTEM

- Closed circuit cooling system for maximum 35°C ambient temperature



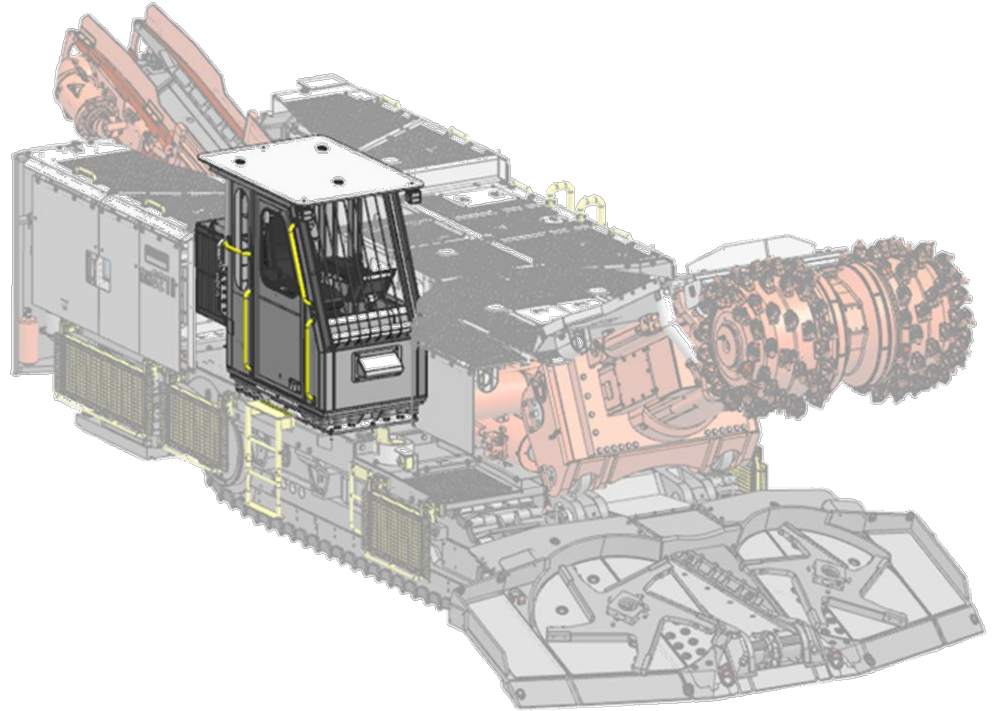
OPTIONAL OPERATOR STAND (FLP)

- Open, FOPS certified operator stand with low roof
- Operator stand width: ~ 1160 mm
- Operator stand length: ~ 1450 mm
- Operator stand height: ~ 1925 mm
- Operator seat adjustable with shock absorbers, ergonomic positioned

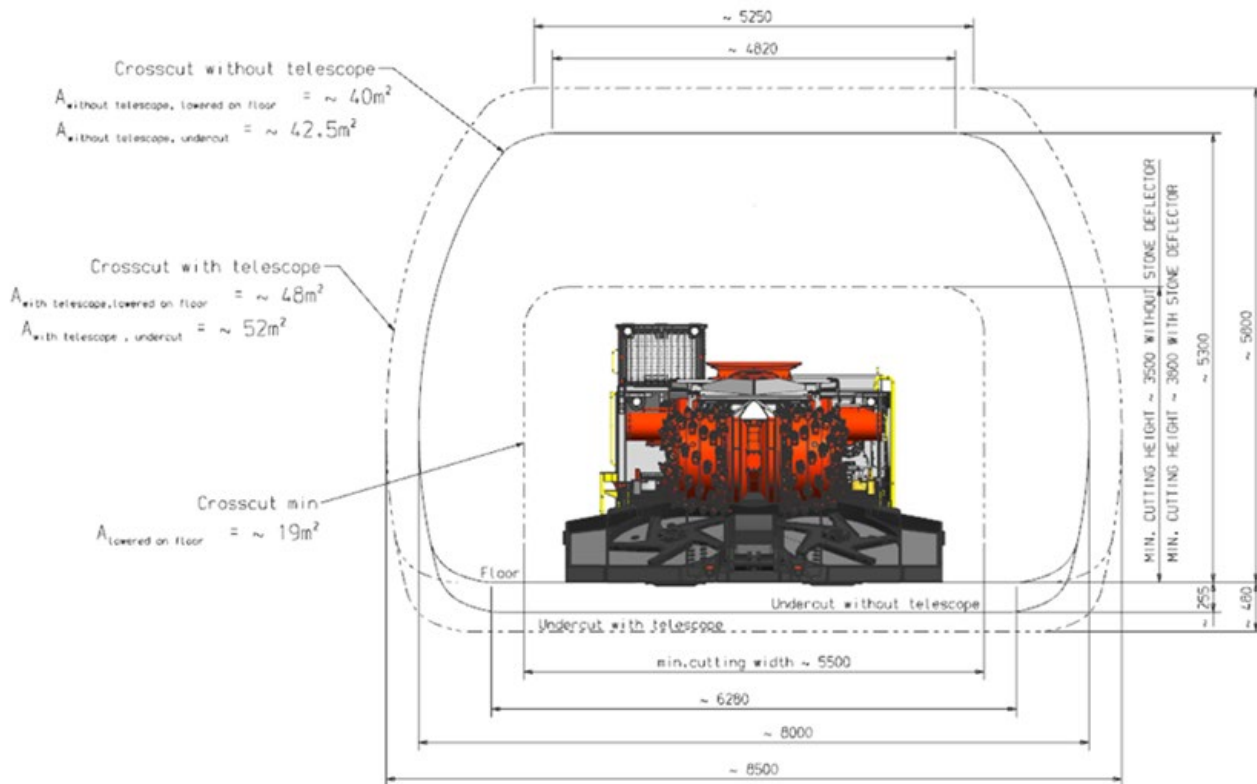


OPTIONAL OPERATOR CABIN (NON-FLP)

- Closed, air pressure-raised, FOPS certified operator cabin with air-condition and heating system
- Operator stand width: ~ 1340 mm
- Operator cabin length: ~ 2360 mm
- Operator stand height: ~ 1780 mm
- Operator seat adjustable with shock absorbers, ergonomic positioned

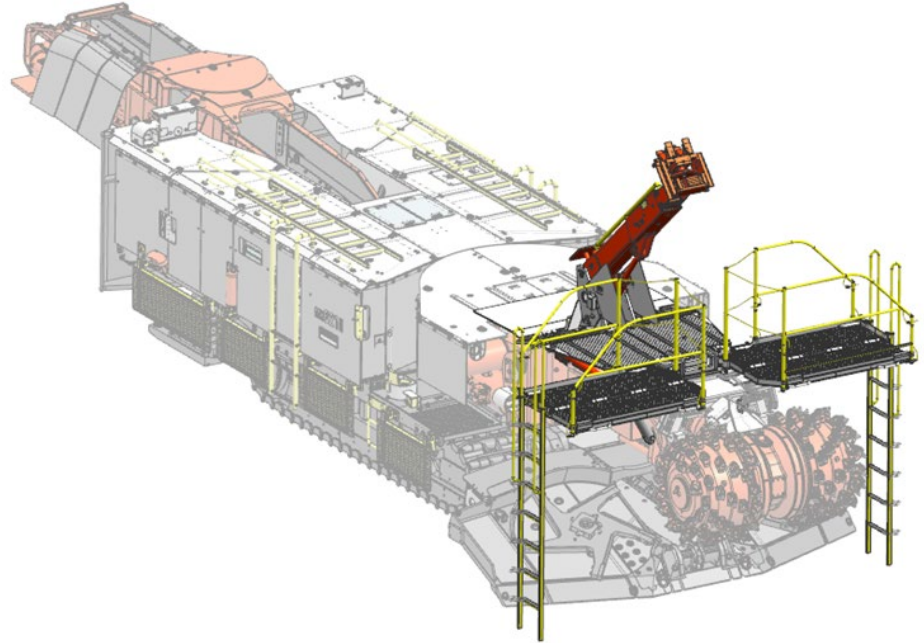


OPTIONAL OPERATOR CABIN – MINIMUM AND MAXIMUM CUTTING DIMENSIONS

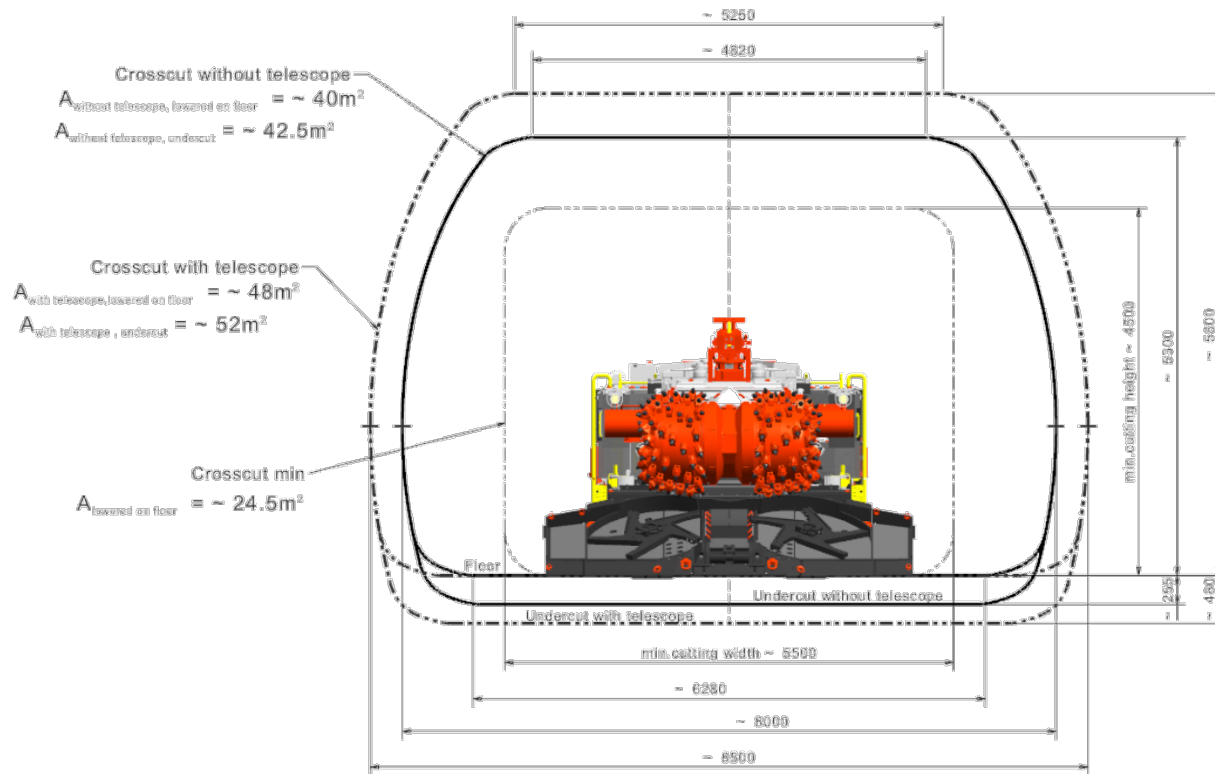


OPTIONAL ARCH LIFTING DEVICE

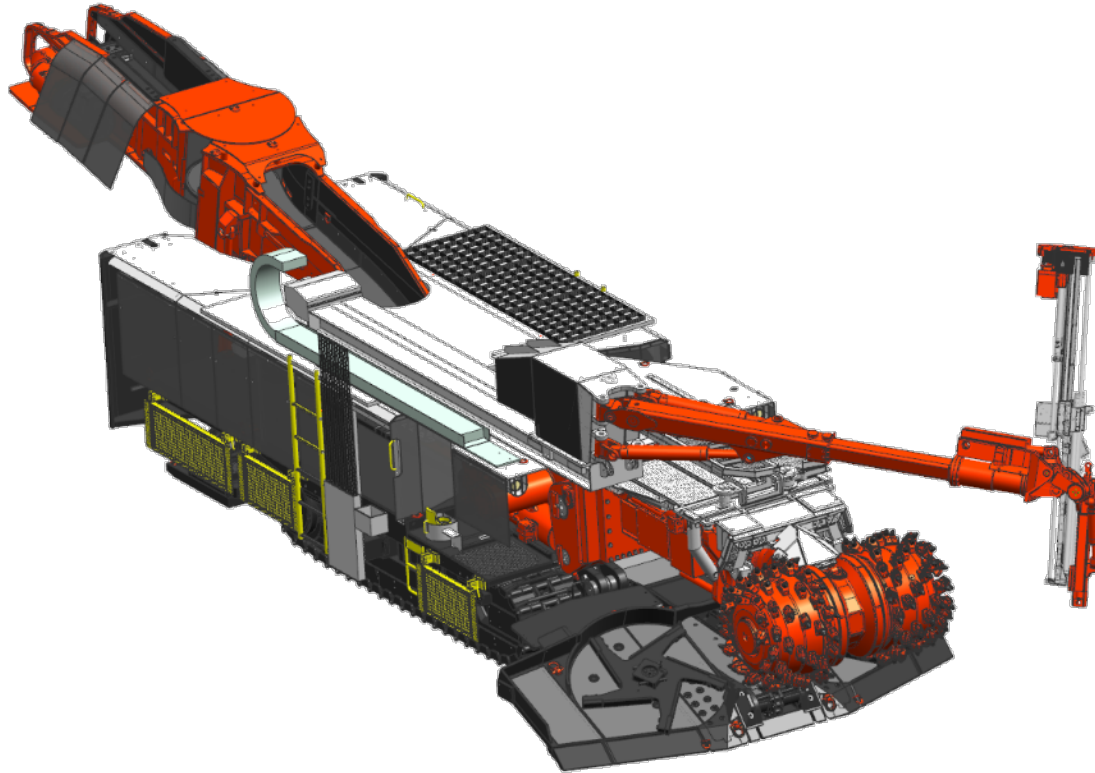
- Liftable and extendable arch lifting device for exact positioning of steel arches for heavy rock support installation
- Extendable and movable working platforms for easy and safe roof access for rock support installation



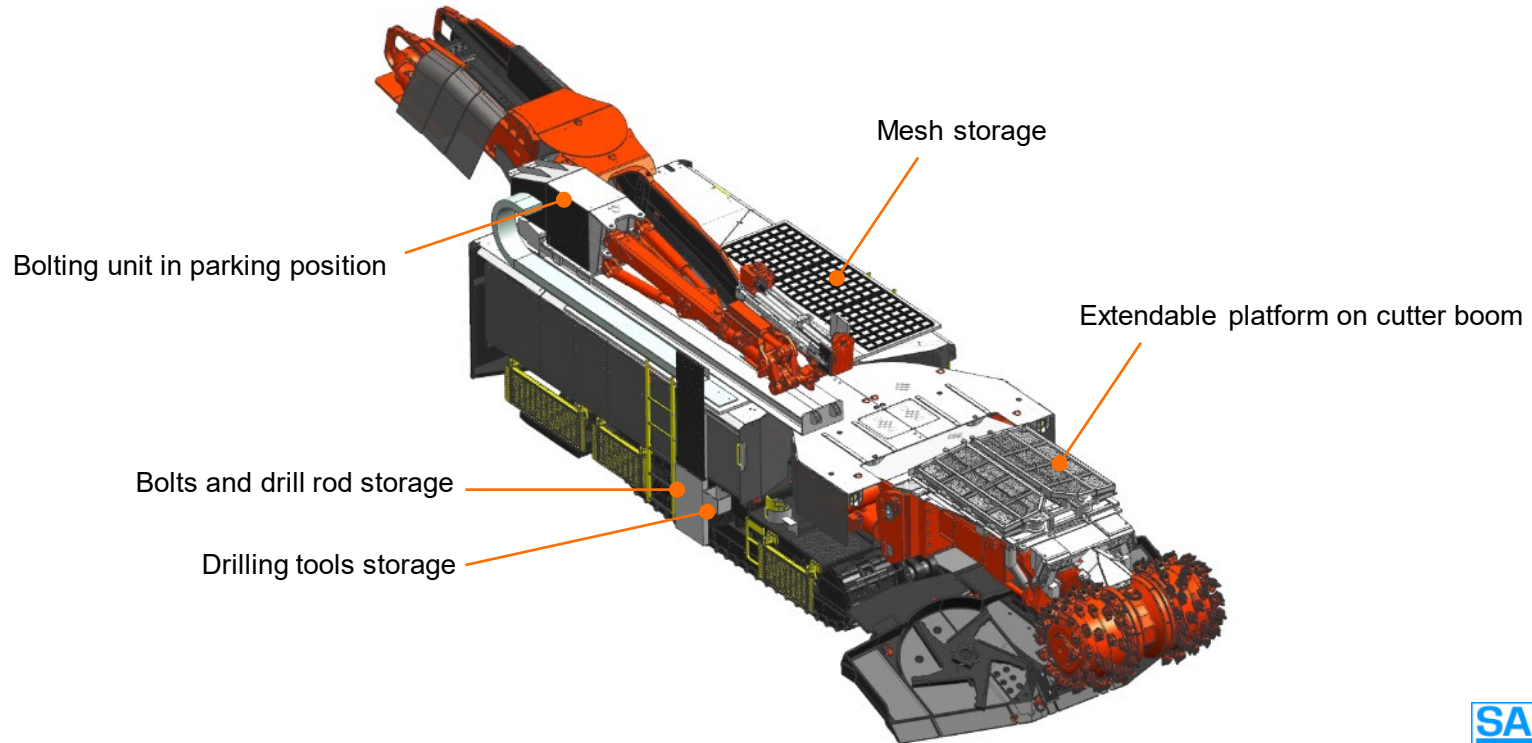
OPTIONAL ARCH LIFTING DEVICE – MINIMUM AND MAXIMUM CUTTING DIMENSIONS



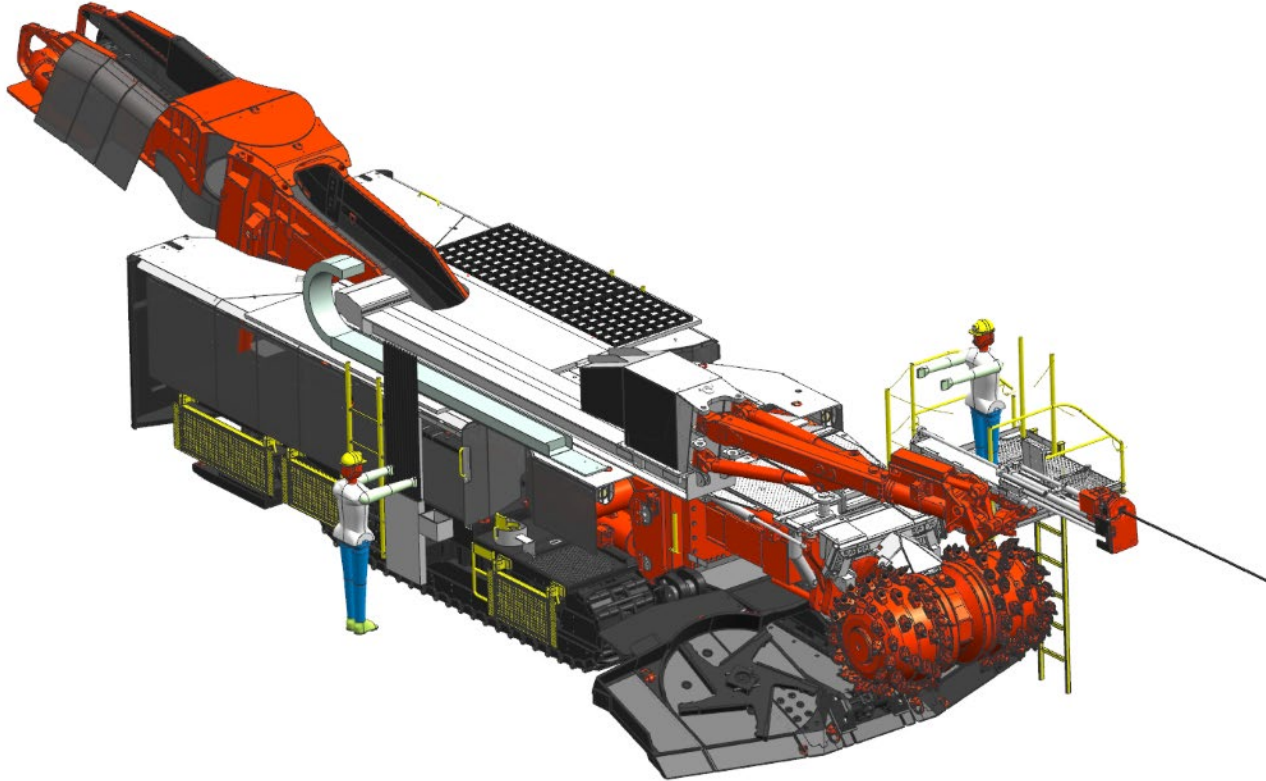
OPTIONAL ROCK BOLTING DEVICE



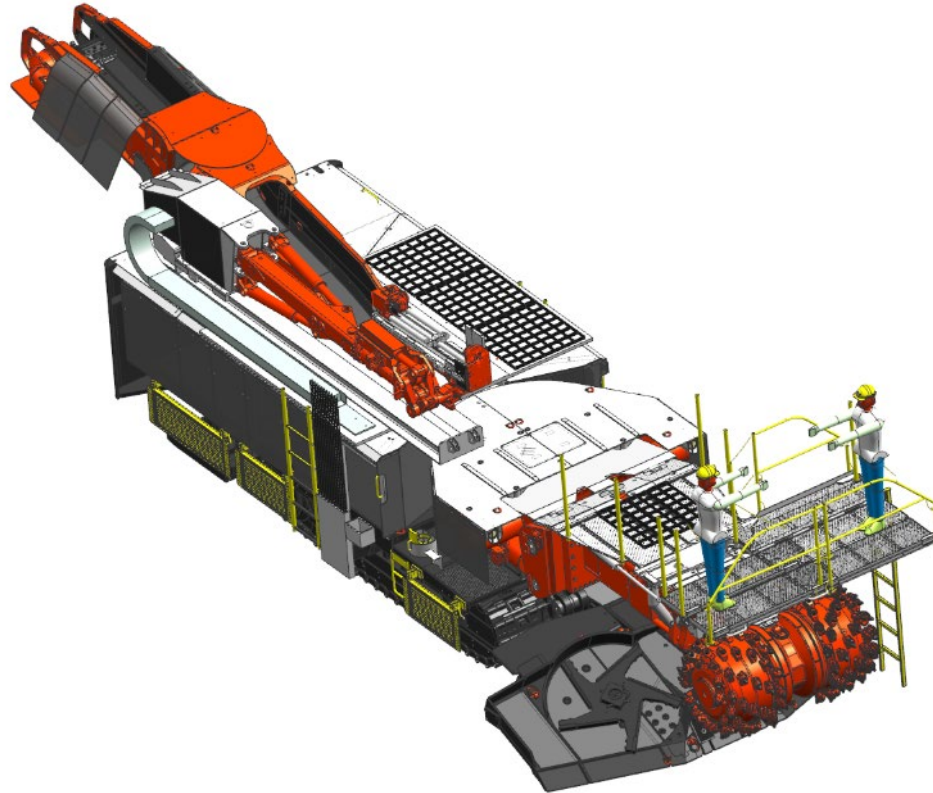
DEVICE IN PARKING POSITION – OVERVIEW



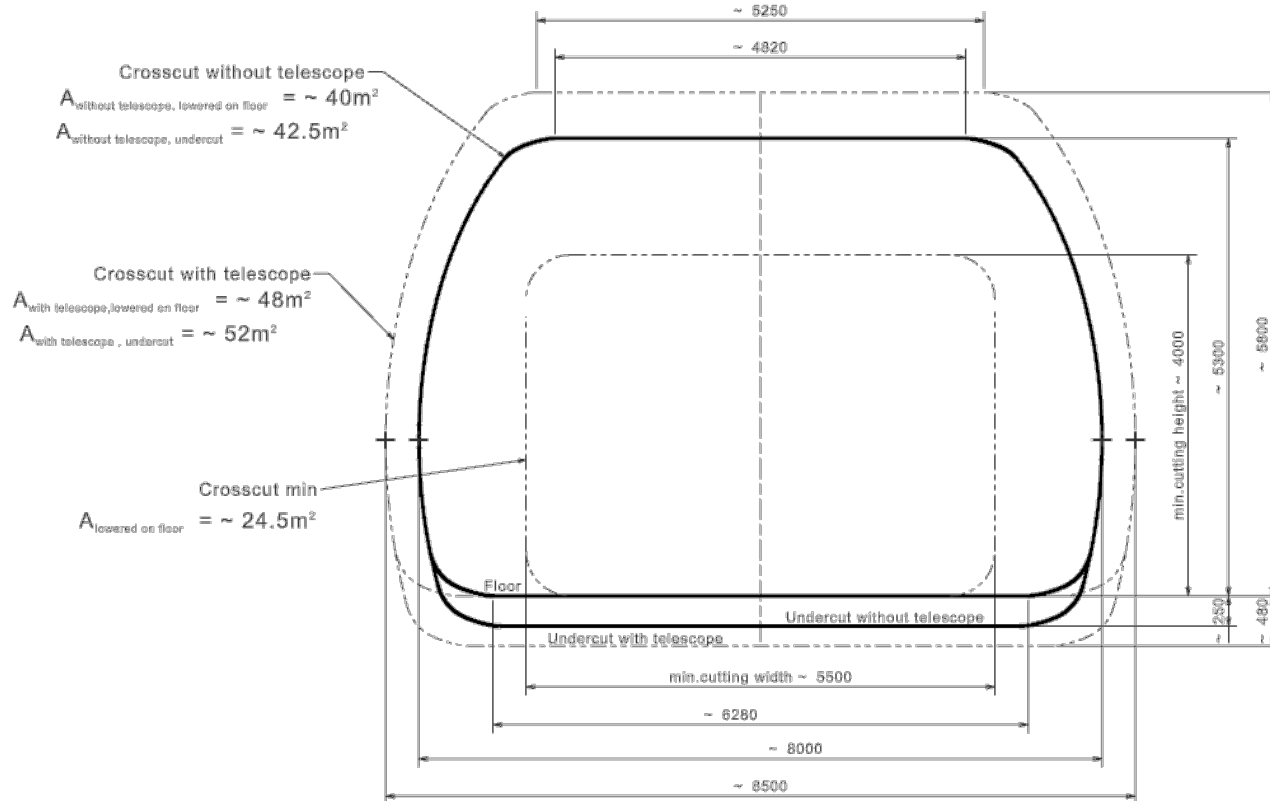
DEVICE IN WORKING POSITION – FACE DRILLING FOR EXPLORATION PURPOSE



DEVICE IN PARKING POSITION WITH EXTENDED PLATFORM ON CUTTER BOOM – MESH INSTALLATION



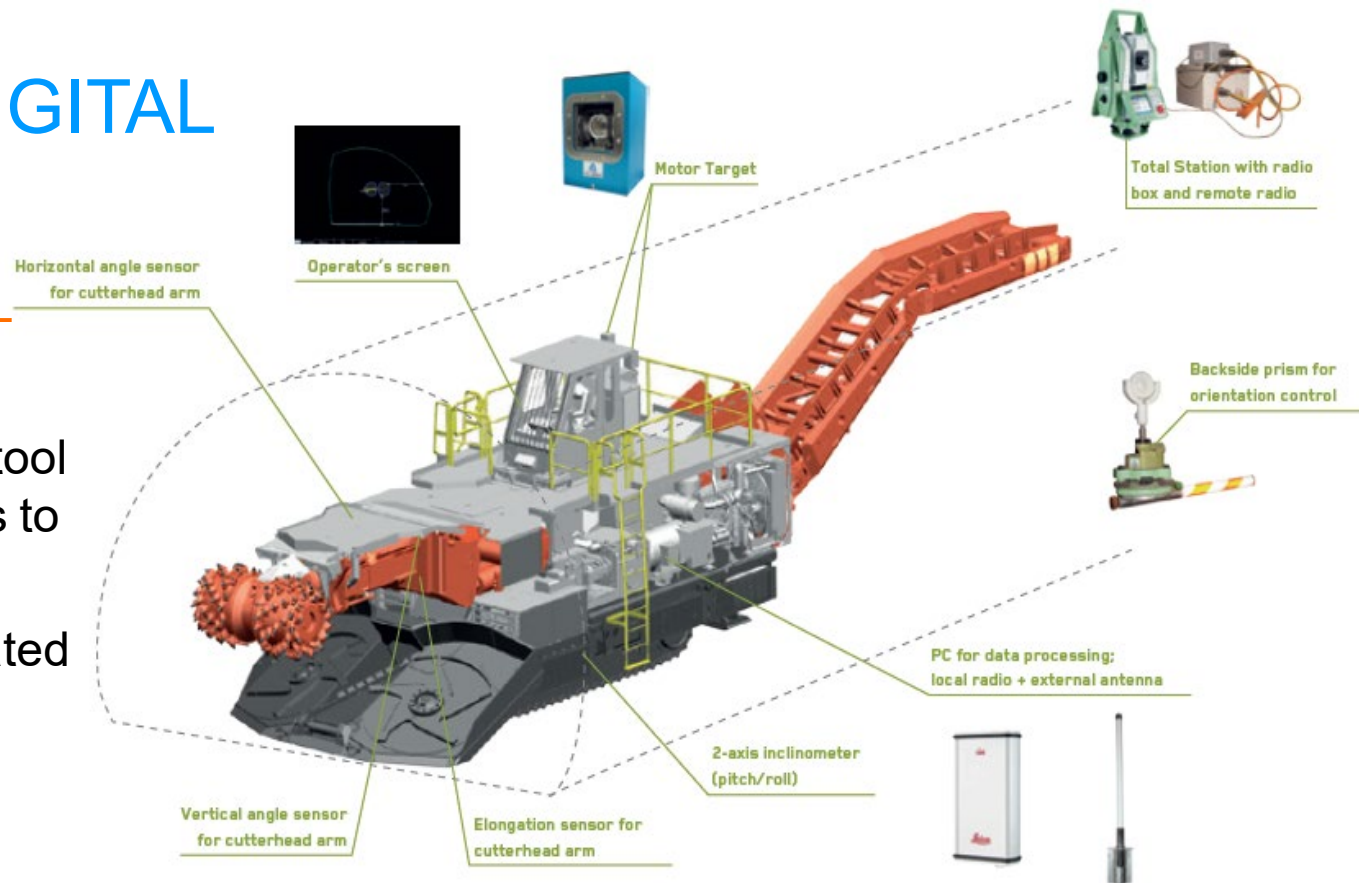
OPTIONAL ROCK BOLTING DEVICE – MINIMUM AND MAXIMUM CUTTING DIMENSIONS



OPTIONAL DIGITAL FEATURES

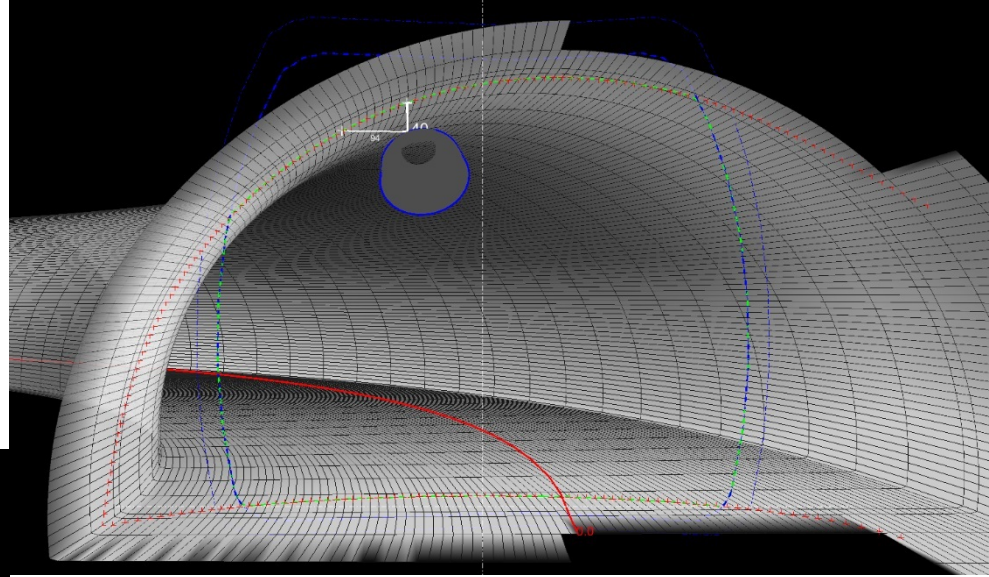
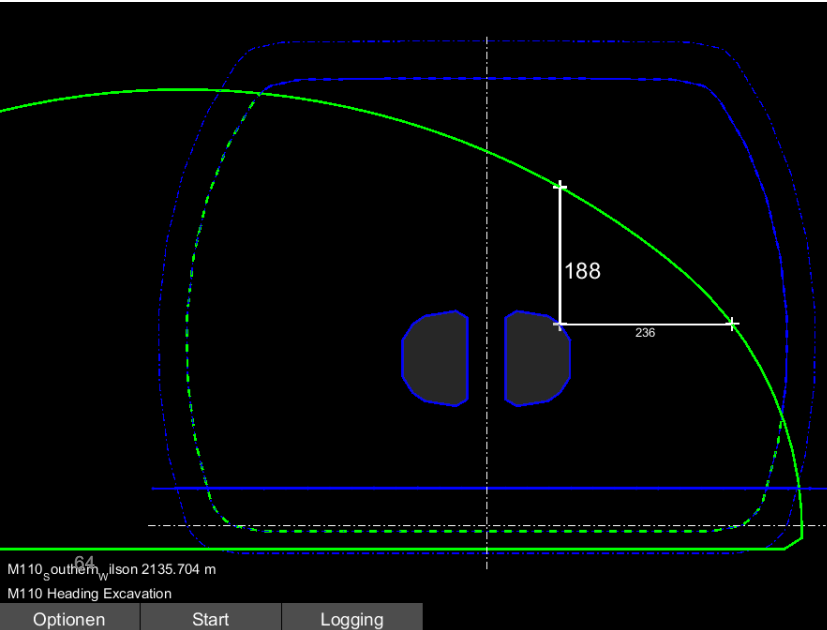
POSITION CONTROL

- Profile and tunnel planning with office tool and transfer of plans to machine
- Solution fully integrated into machine control system
- Profile control



OPTIONAL DIGITAL FEATURES

PROFILE CONTROL

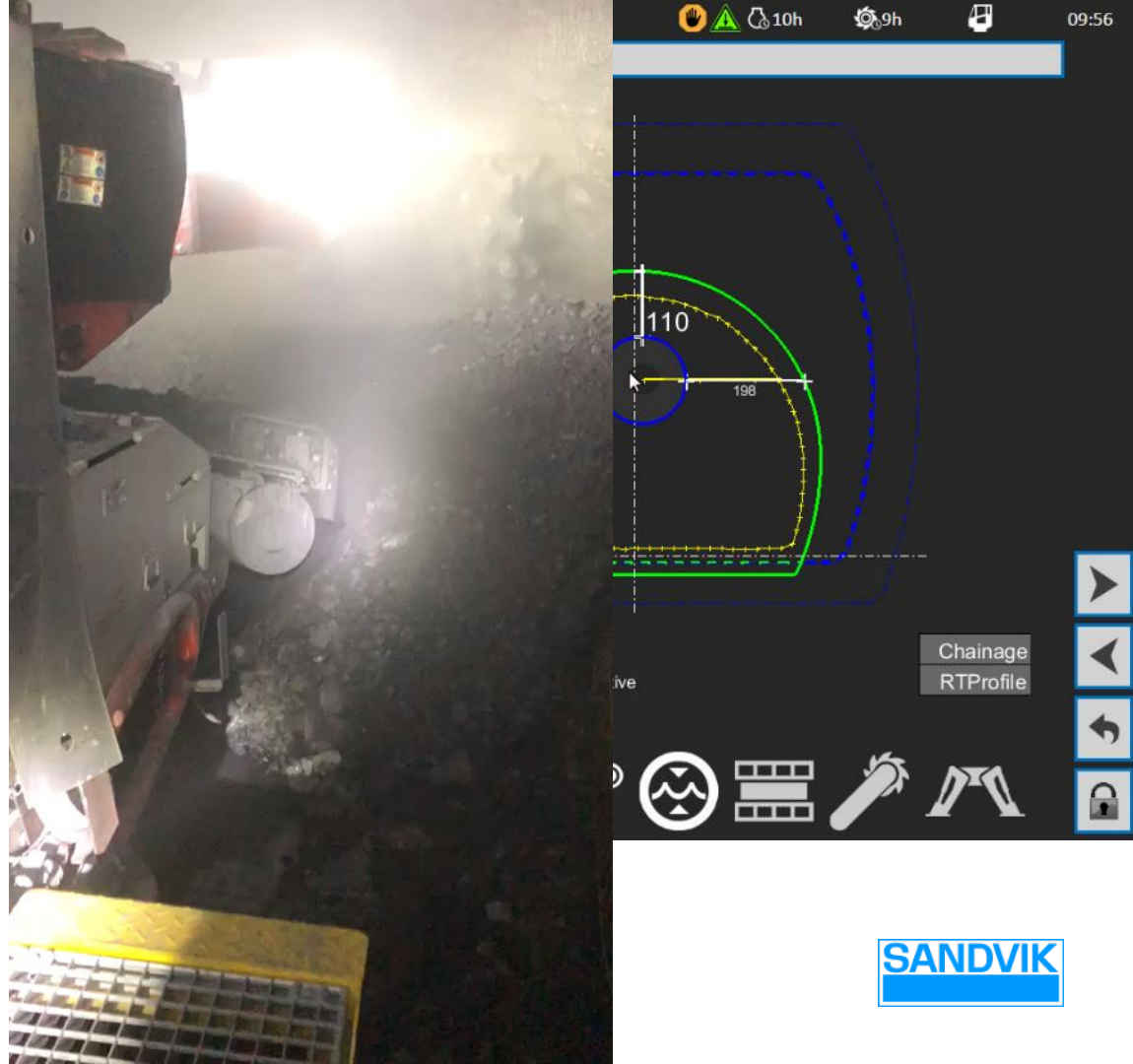


- Cutter head is kept within profile limits
- Visualization of cutting process for machine operator

OPTIONAL DIGITAL FEATURES

CUTRONIC – AUTOMATED CUTTING

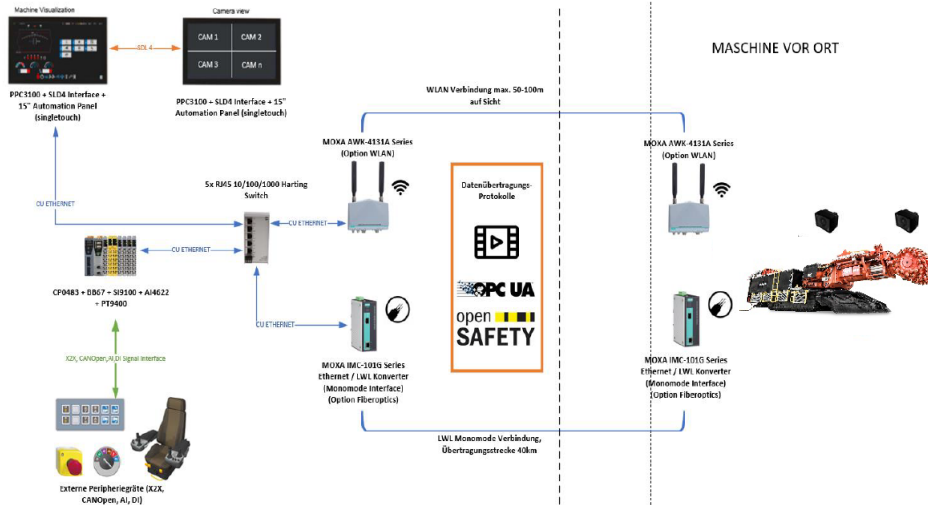
- Planning of cutting path referring to tunnel profile
- Fully automated cutting of one round length / sump distance
- Automated profiling in fast speed



OPTIONAL DIGITAL FEATURES



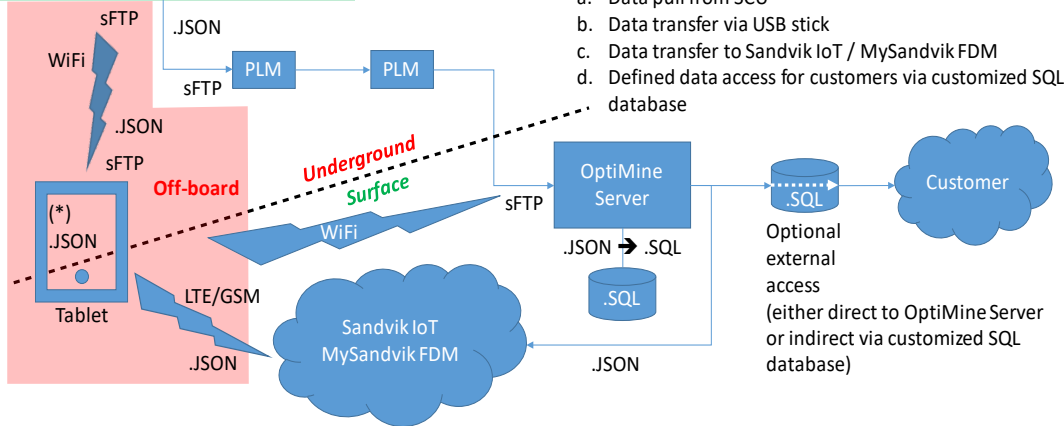
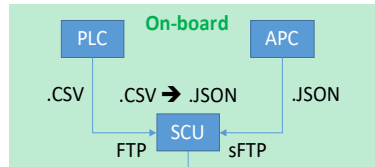
TELE-REMOTE OPERATION OF MACHINE IN SEMI-AUTONOMOUS MODE



OPTIONAL DIGITAL FEATURES

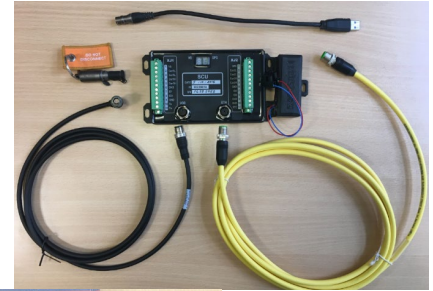


MACHINE OPERATIONAL DATA COLLECTION, TRANSFER AND ANALYSIS



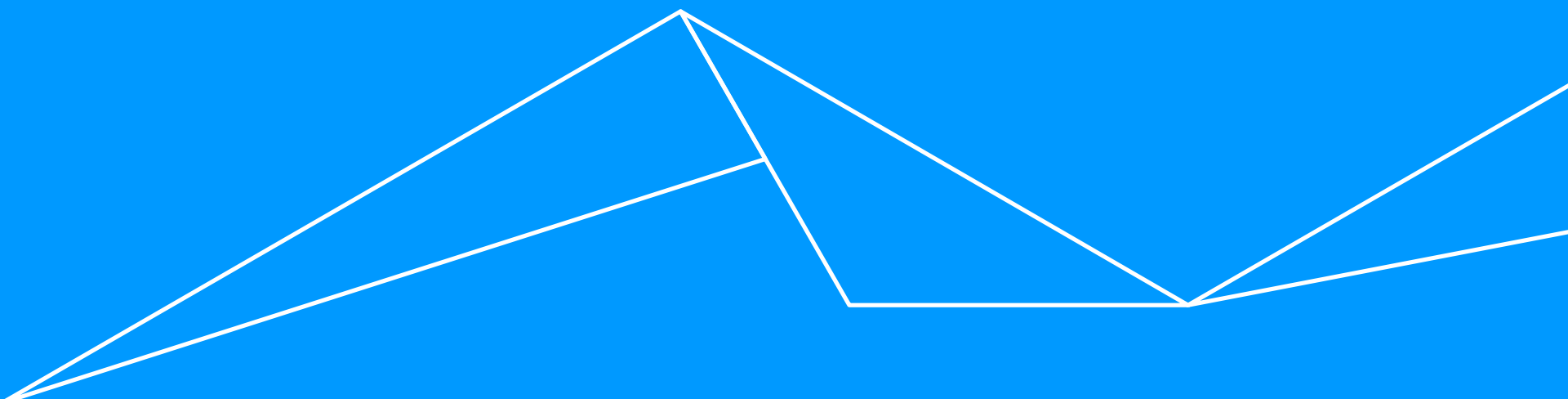
MeCu General FDM – Fleet Data Monitoring Layout

1. Machine internal communication via FTP
2. Machine external communication via sFTP
3. Data transfer directly via mobile device to IoT / FDM
4. Data transfer directly via mobile device to OptiMine
5. OptiMine Server
 - a. Data pull from SCU
 - b. Data transfer via USB stick
 - c. Data transfer to Sandvik IoT / MySandvik FDM
 - d. Defined data access for customers via customized SQL database



(*) Application under flame proof conditions only in combination with BARTEC Tablet PC and only for specified countries / areas!





SANDVIK MH621 ROADHEADER IN ACTION

SANDVIK MH621 ROADHEADER IN ACTION

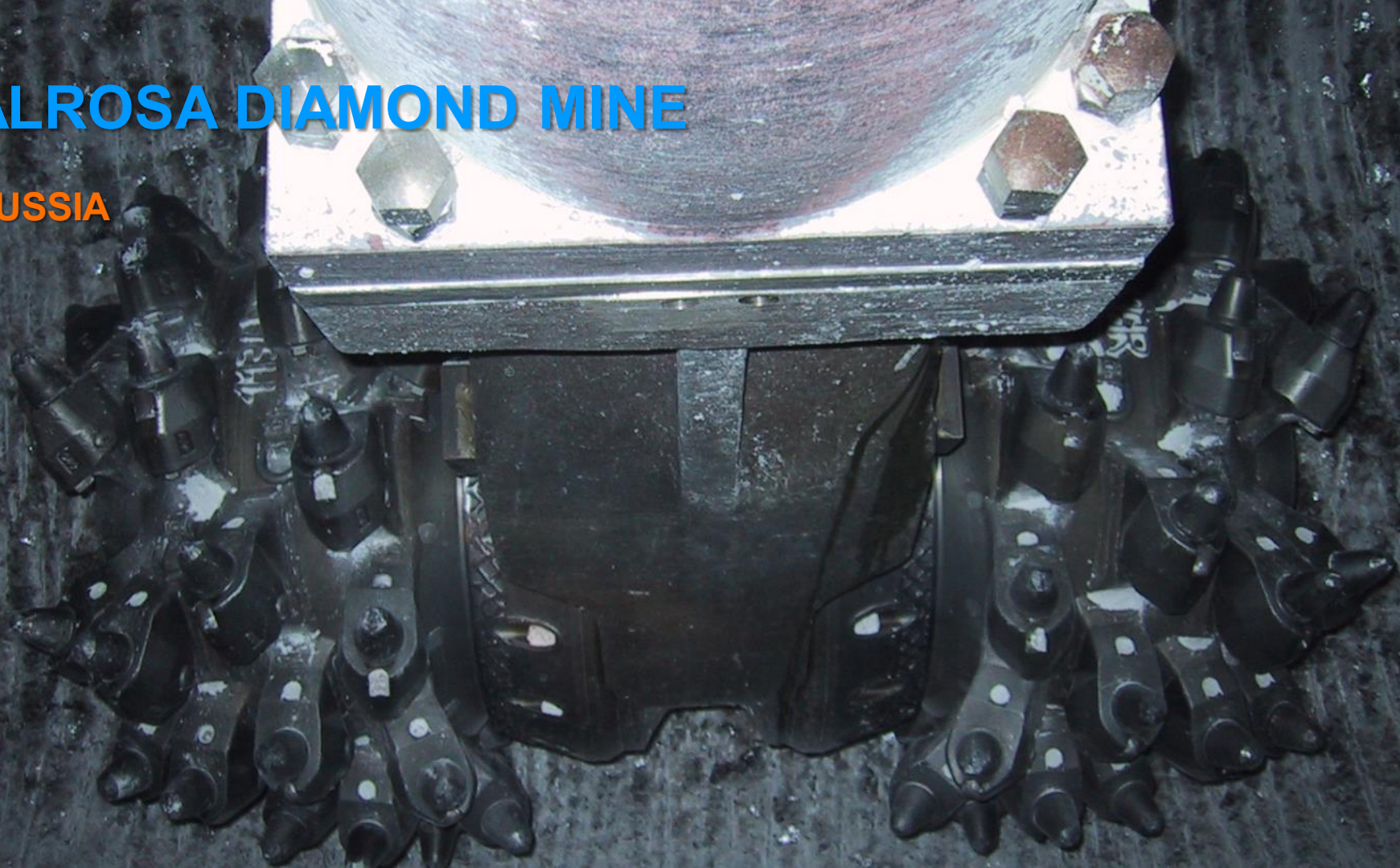
SMART AND STRONG FOR HARD ROCK MINING CONDITIONS

- Heavy-duty roadheader for mining in “hard rock conditions”
- Especially designed for small cross sections
- Weight: ~120 t
- Cutter motor power: 300 kW
- Maximum cutting area: ~48 m²
- Telescopic cutter boom
- ICUTROC cutting technology
- In total 160 units sold until 2020



ALROSA DIAMOND MINE

RUSSIA



KGHM COPPER MINE

POLAND

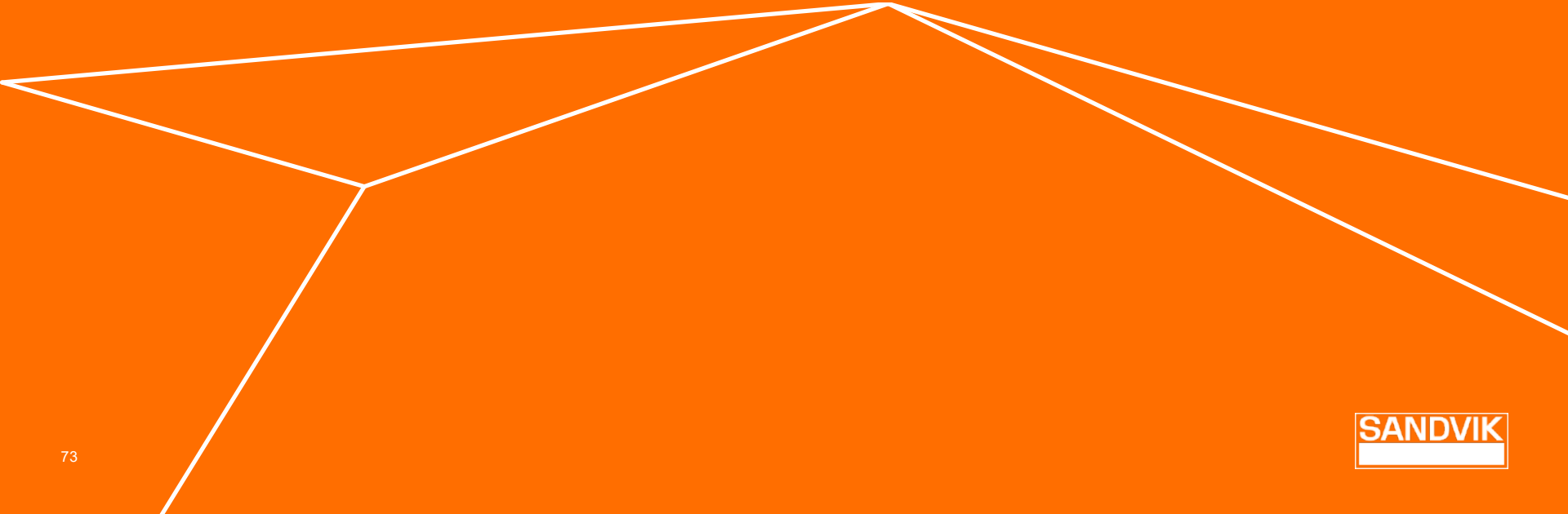


BARRICK GOLD MINE

USA



COMPETENCES AND SERVICES



ENGINEERING EXCELLENCE

YOUR STRONG PARTNER

- Flexibility to design machines according to customer requirements
- Ability to provide globally approved machine electrics
- Safety orientated design incorporating risk and mechanical ignition prevention assessments
- Full documentation from start of design until delivery
(e.g. functional description document, risk assessments, operating & spare parts manuals)

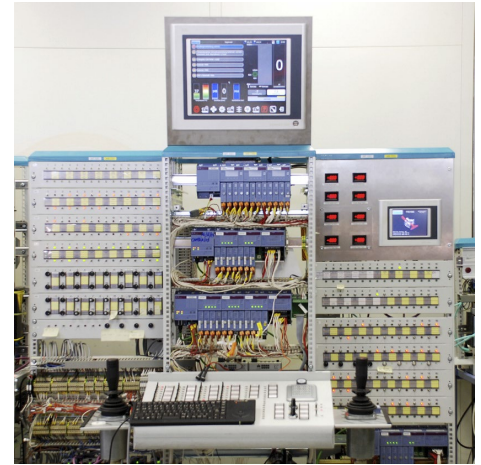
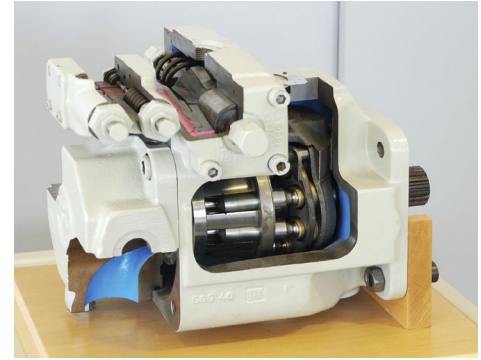


		Severity (S) / Potential Effect or Consequences				
Failure Mode / Hazard Mode		1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
Injury		Nil or Minor	First Aid Treatment	Medium Term Injury	Long Term Injury	Fatal/serious disability
Environment		Odour release immediately contained	Temporary low-level damage	Medium damage that is recoverable	Severe damage that is recoverable only in the long term	Widespread damage where recovery may be doubtful
Damage		Slight damage <10 K	Minor damage 10K - 25K	Moderate Damage 25K - 50K	Major damage 50K - 100K	Extreme damage 250K
Probability (P) / [Occurrence (O)]		Risk Matrix				
5 (A) Almost Certain	Is expected to occur in most circumstances or more than once per month	15 (H)	10 (H)	6 (Ex)	3 (Ex)	1 (Ex)
4 (B) Likely	Will probably occur in most circumstances or less than once month, more than once/year	10 (M)	14 (H)	9 (H)	6 (Ex)	2 (Ex)
3 (C) Possible	Might occur at some time or less than once per year, more than once per 5 years	22 (L)	18 (M)	13 (H)	8 (H)	4 (Ex)
2 (D) Unlikely	Could occur at some time or less than once per 5 years	24 (L)	21 (L)	17 (M)	12 (H)	7 (H)
1 (E) Rare	May occur in exceptional circumstances or unlikely to ever occur	25 (L)	23 (L)	20 (M)	16 (M)	11 (H)

TRAINING EXPERIENCE

FOR SAFE AND PRODUCTIVE OPERATIONS

- Product training usually done in one to two weeks
- Product specific training on demand - classroom training combined with practical sessions in the workshop
- Specialized training related to machine types as:
 - Hydraulic system training
 - Electric system training
 - Control system (PLC) training
 - Mining technology for mechanical cutting machines
 - Components assembly and repair training
 - For gear boxes, cutter heads and drums



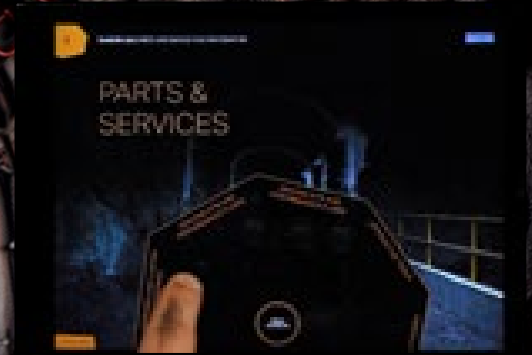
SANDVIK 365

Trust the numbers!

Parts and Service

YOU can count on!

Sandvik 365 App



SANDVIK MINING AND ROCK TECHNOLOGY

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