

SANDVIK DS412iE



INTELLIGENT BATTERY-POWERED ROCK BOLTER (07-21)



BACKGROUND

REASONS FOR PRODUCT DEVELOPMENT

- Need for more sustainable business
- Need automated and faster bolting cycles
- Improve operator's safety and working conditions
- Develop new features to achieve higher productivity
- Fleet standardization offering (high parts commonality with other 400i drills)
- Customers' feedback



DS412iE IS MEETING THOSE NEEDS



WHY CHOOSE SANDVIK DS412iE ?



Lower total cost of ownership

- ✓ High parts commonality with other 400i applications
- ✓ Excellent serviceability
- ✓ High performance level

Improved

- ✓ Health conditions underground
- ✓ Bolting process control through assistive and automatic technologies
- ✓ Connectivity

WHY SANDVIK DS412iE?

ROCK REINFORCEMENT BATTERY POWERED DRILL

IMPROVED WORKING CONDITIONS

0%

diesel emissions while
tramming



IMPROVED PRODUCTIVITY

Up to **35*** %

higher penetration rate



AUTOMATION

Up to **90*** %

automatic bolt installation



*Test results and calculations are to be considered as results reached under certain and controlled conditions. These test results and calculations should not be treated as specifications and Sandvik does not guarantee, warrant or represent the outcome of test results or calculations in any or all circumstances.



PRODUCT OFFERING

UNDERGROUND MINING OFFERING

Drill Class								
	Face Drills 1B DD	Face Drills 2B DD	Rock Bolters DS	Cable Bolters DS	Longhole TH Drills DL	Longhole ITH Drills DU	Secondary Breaking DB	
LP	DD211L DD211L-V	DD220L	DS211L-V DS211L-M	DS221L	DL230L			Height ~ 2 m
200	DD210 DD212				DL210	DU211-T		Width ~ 2.0 m
2700	DD2710 DD2711		DS2710 DS2711		DL2710 / DL2711 DL2720 / DL2721			Width ~ 2.7 m
300	DD311	DD321 DD320S	DS311 DS312		DL311 / DL321 DL331	DU311 DU311-TK DU311-TVK	DB311 DB331	3 x 3 m
400	DD411	DD421 DD422i-iE	DS411 DS412iE*	DS421 DS422i	DL411 / DL421 DL431 / DL432i DL422iE	DU411 DU431 DU412i (V30)		4 x 4 m
500			DS511 DS512i					5 x 5 m

INTRODUCTION



TECHNICAL SPECIFICATIONS

TECHNICAL SPECIFICATIONS

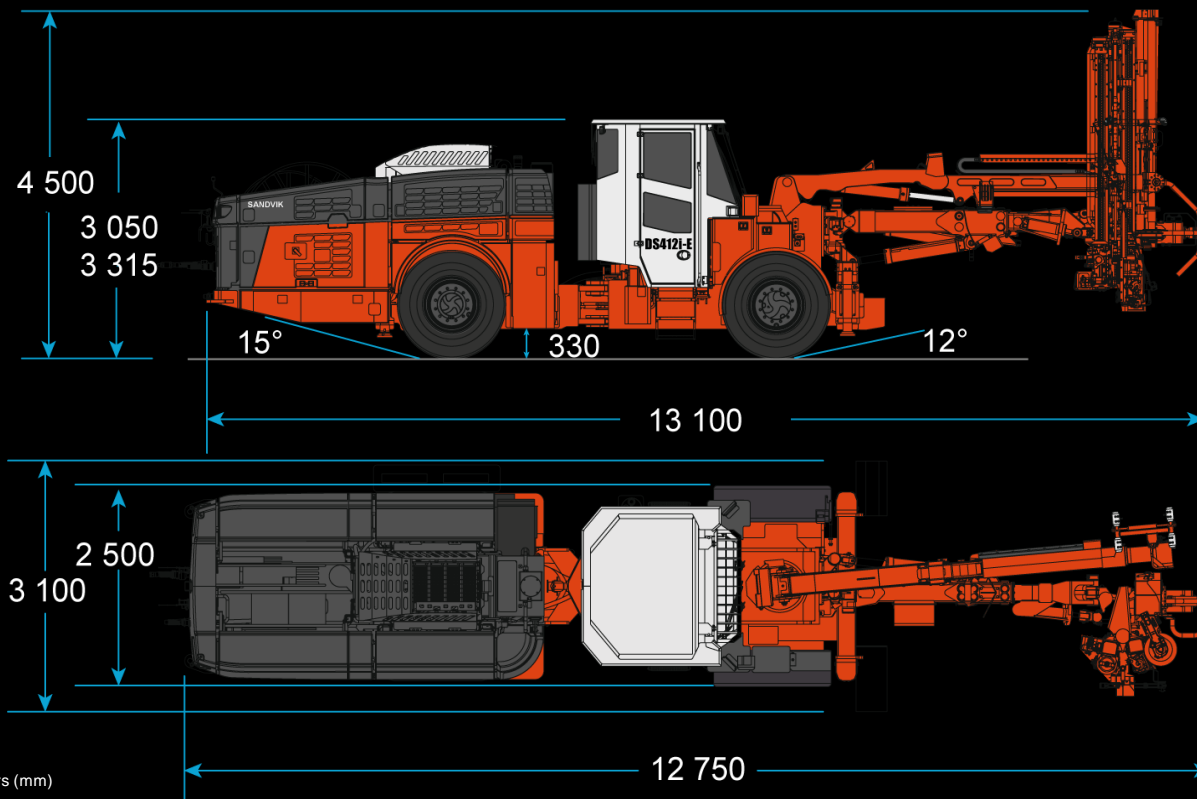
KEY PARAMETERS

Optimum Minimum bolting coverage	4,5 m x 4,5 m
Bolt length	1.5 m to 3 m (5' to 10')
Hole size (bolting)	33 – 43 mm
Bolt carousel capacity	8 rock bolts (200 x 200mm max plate size)
Control system	SICA: Intelligent torque control/feed percussion
Safety cabin	FOPS/ROPS (ISO 3449/3471)
Monitoring & Fleet management	Readiness for AutoMine®, Optimine® and MySandvik



TECHNICAL SPECIFICATIONS

DRILLING DIMENSIONS

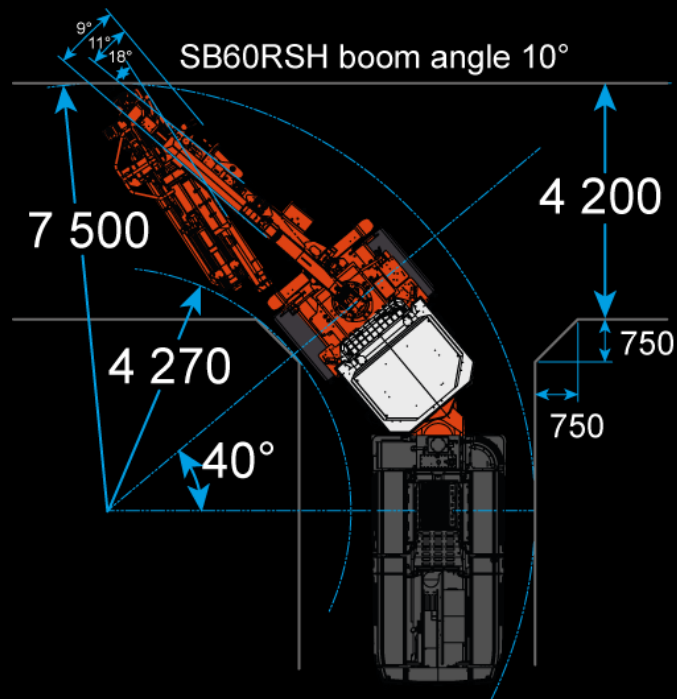
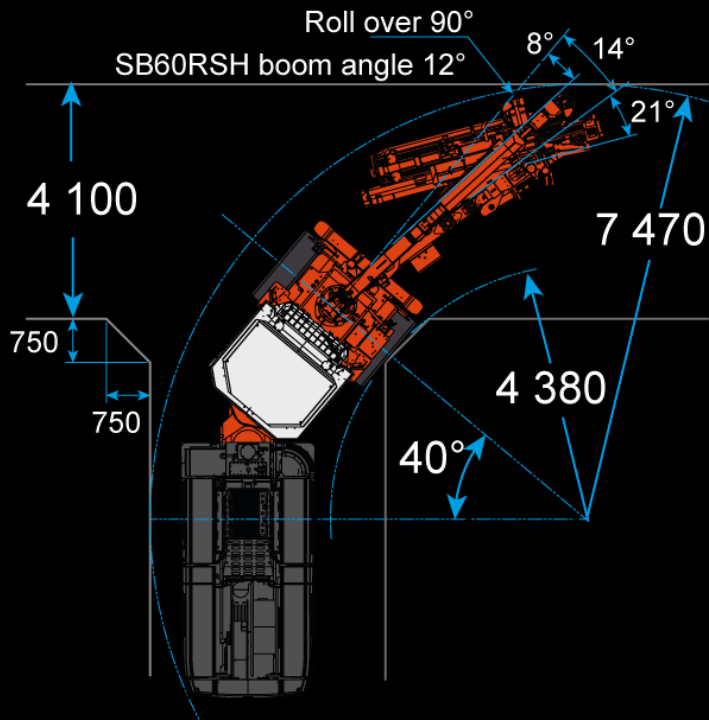


10 *Dimensions in millimeters (mm)



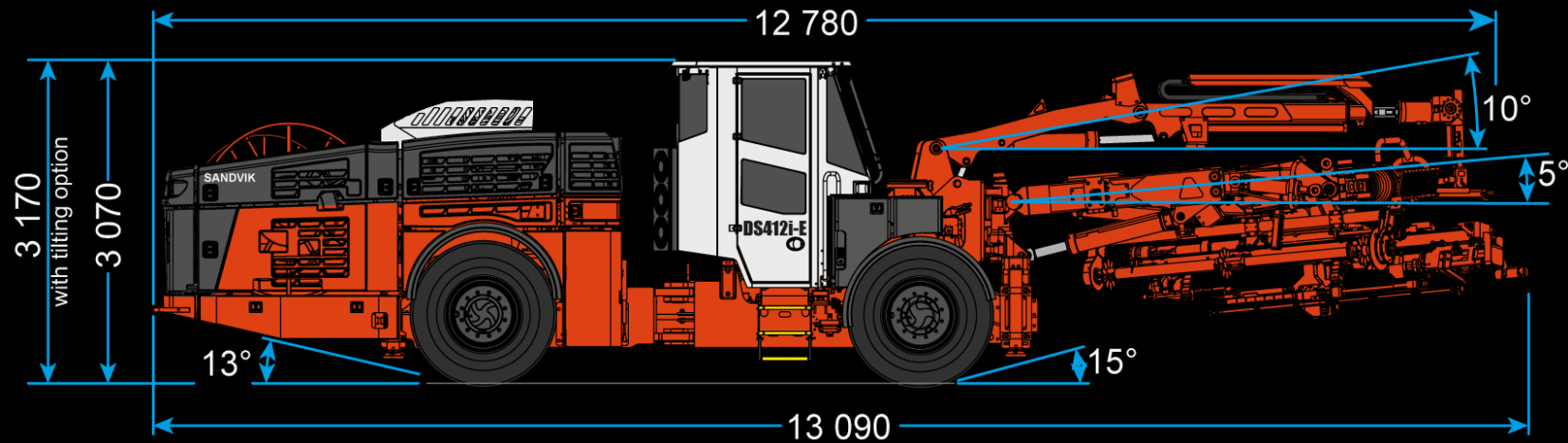
TRAMMING

CORNERING



TECHNICAL SPECIFICATIONS

TRAMMING DIMENSIONS



EQUIPMENT AUTOMATION

AUTOMATION LEVELS

Silver

- ✓ One bolt automation
- ✓ Hole angle measurement
- ✓ Advanced boom manipulator mode
- ✓ Basic remote monitoring

Gold (2022)

- ✓ Full instrumentation
- ✓ Full fan bolt locations
- ✓ iSURE®
- ✓ Total station navigation
- ✓ Full remote monitoring with reporting tools
- ✓ MWD capability
- ✓ New automated features

DS412iE CONTROL SYSTEM

AUTOMATION LEVELS

	Manual	Assistive	Auto
Tramming	X	-	-
Navigation	X	-	-
Boom positioning	X	X	-
Drilling	X	X	X
Grouting	X	X	X
Bolt handling	X	X	X
Bolt tightening	X	X	X

EQUIPMENT AUTOMATION

SILVER AUTOMATION LEVEL

- One bolt automation
 - ✓ Collaring → Drilling → Grouting → Bolt handling → Tensioning → All automatic
- Hole angle measurement
 - ✓ Indicates one hole angles Tilt and Rotation. Boom is fully instrumented at Silver level
- Advanced boom manipulator mode
 - ✓ Operator can “lock” one of XYZ-axis
- Automatic cement mixer
 - ✓ Mixing one batch automatically – operator just set W/C-ratio and size of the batch (kg)
- Basic remote monitoring
 - ✓ Cumulative values of different functions (e.g. drilled meters, pumped cement, installed bolts etc...)

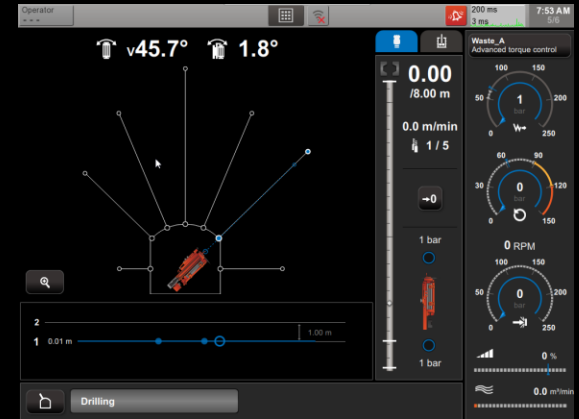
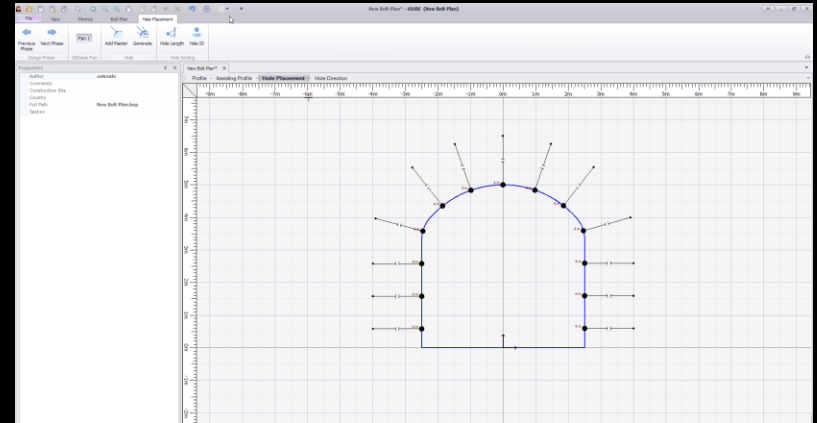
EQUIPMENT AUTOMATION

GOLD AUTOMATION LEVEL (2021)

- Full instrumentation
- Full fan bolt locations
 - ✓ Shows one or more bolt fans in mine or tunnel coordinates
- iSURE®
 - ✓ Planned bolt plans can be transferred to the control system. Planned vs. Actual (one fan)
- Total Station navigation
 - ✓ Linked to mine or tunnel coordinates for accuracy carrier/bolt location
- Full remote monitoring – Individual hole information – e.g. pumped cement, installed bolts, shot resin etc..
- MWD – Individual hole information
- New automated features

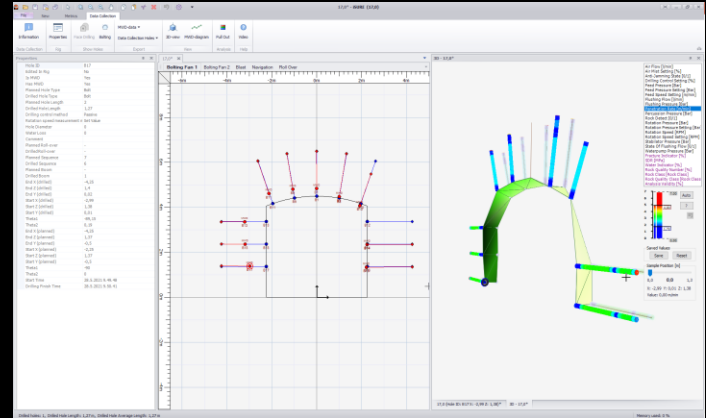
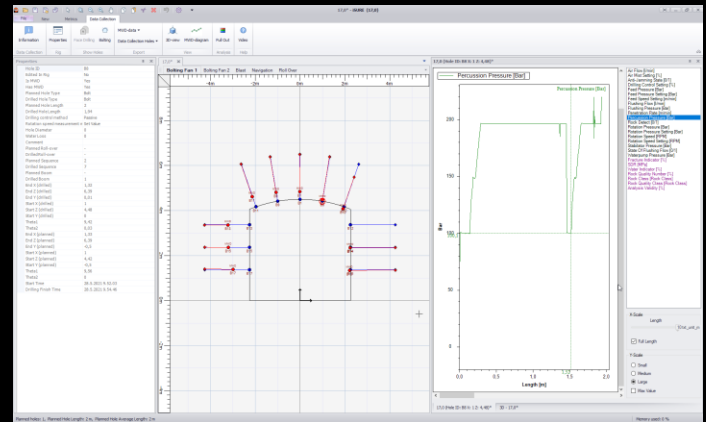
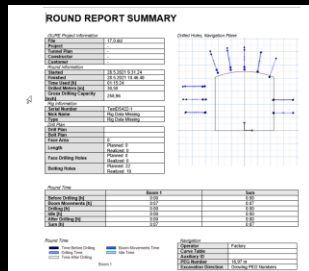
iSURE FOR BOLTING

1. Bolting plans for rock and cable bolting are done in iSure
2. Bolt plans can be transferred to the bolter via multiple ways (USB, Wi-Fi and DrillConnect)
3. Operator drills and bolts according to the plans
4. Plans can be transferred back to office (iSure) and analyzed



iSURE FOR BOLTING

- Comprehensive information is collected through drilling and bolting process, like MWD (Measurement While Drilling)
- Information can be analyzed in iSure in several different ways
- If needed, reports (.pdf) can be created and saved from information



KEY FEATURES

BATTERY TRAMMING

ELECTRIC DRIVELINE AND BATTERY PACK

- Electric motor mechanically connected onto axles via dropbox (high torque and efficiency)
 - ✓ High precision tramming control via inverter
- During drilling the electric motor is connected onto hydraulic pumps via same drop box
- SoNick battery pack for tramming – regarded as safe technology in underground drilling:
 - ✓ Total 252 cells in each battery block connected together in a vacuum steel box (210 kg)
 - ✓ Total energy onboard: 4 x 24,7 kWh (38 Ah)
 - ✓ Operating temperature >250°C, air cooled
- Maintains operating temperature for 7 days



BATTERY TRAMMING

FEATURES & BENEFITS

- Energy for tramming from onboard batteries
- Battery charging via mine electrical supply during drilling (patented feature)
- Drilling power from mine electrical system
- Active power compensation (patented feature)
- Tramming speed with 100 kWh (4 batteries):
 - ✓ 10 km/h on flat ground
 - ✓ 5 km/h (from 0 to 1.5)
 - ✓ 3 km/h (from 0 to 1.5) in a 1:7 incline
- Tramming distance:
 - ✓ 18 km on flat ground
 - ✓ 3 km (1:7 incline upwards)
- Battery weekly compensation charge (6 hours)
- Battery life expectancy 5 to 10 years



BATTERY BOLTING

ADDITIONAL FEATURES

- No electric network needed for drilling / bolting
 - ✓ Batteries can be used for drilling
 - ✓ In case on power down or rehab work for old areas where network already removed
- Test results of Split-Set bolting:

1. 100% → 20%	24 bolts installed
2. 100% → 0%	31 bolts installed



CABIN

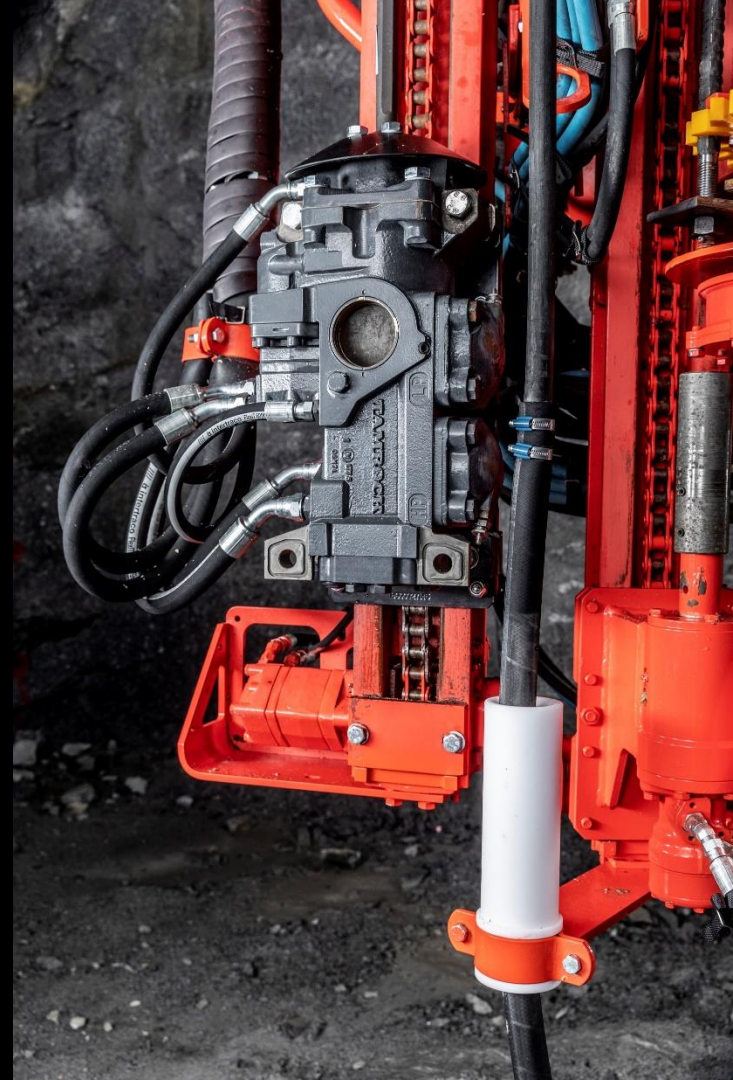
MODERN AND ERGONOMIC

- Increased visibility 55%
- Reduced noise and dust level
- More open and spacious operator environment
- Maximized safety and operator ergonomics



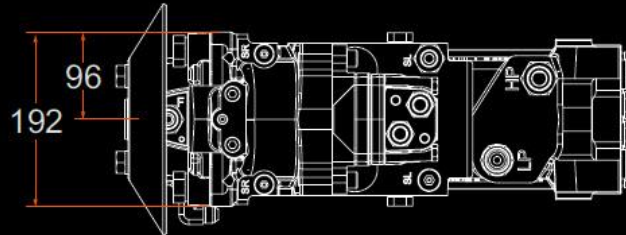
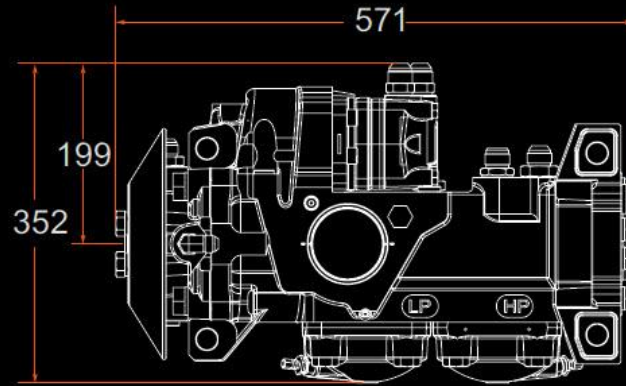
SANDVIK RD314 ROCK DRILL

- Designed for rock bolting
- Compact and robust
- Powerful rock drill for various rock conditions
- A large variety of rock drill options and tool combinations
 - ✓ High frequency rock drill-Percussion rate 110Hz
 - ✓ Rotation motor: OMS 100
 - ✓ Drill steels: R32-HEX25-R25 (Hole diameter from 33mm to 43mm)
 - ✓ Shanks: R32 (female)

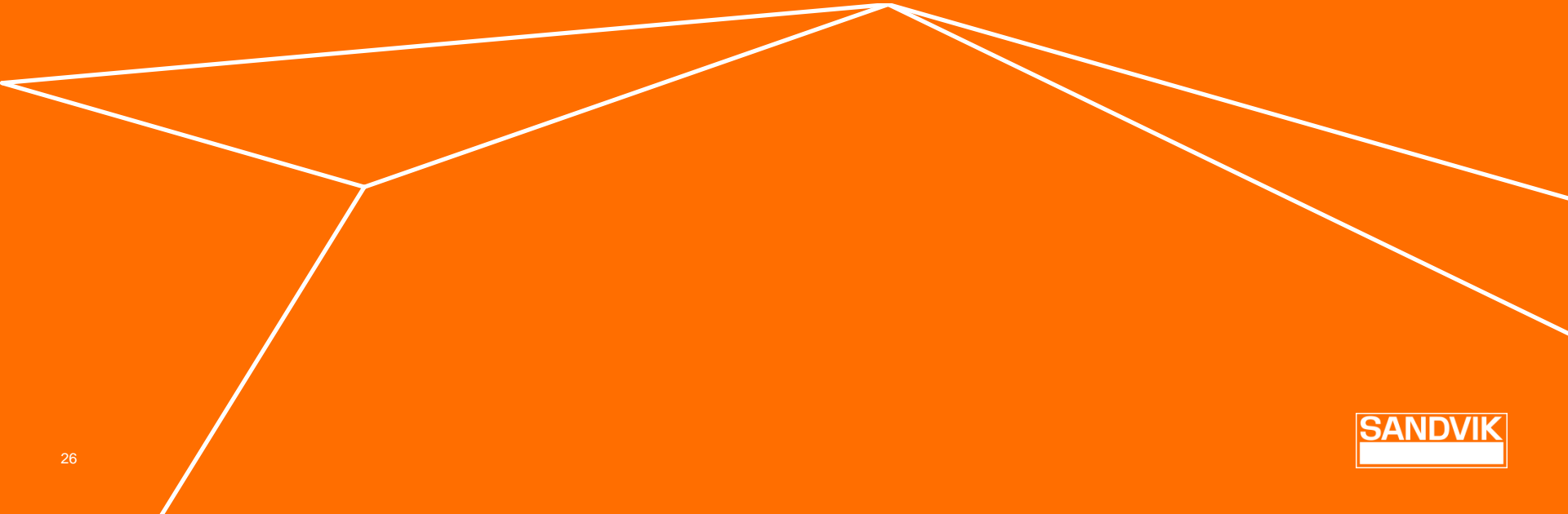




RD314 TECHNICAL DETAILS



BENEFITS-VALUE PROPOSITIONS



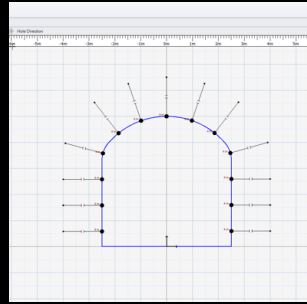
SANDVIK DS412iE



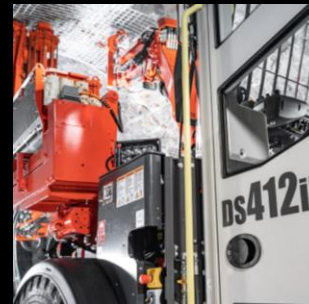
NO EMISSION
DURING
TRAMMING



HIGHER
PENETRATION
RATE



MORE
ACCURATE BOLT
LOCATION



HIGHER ROCK
SUPPORT
QUALITY



BETTER
PROCESS
CONTROL

NO EMISSION DURING TRAMMING

CUSTOMER VALUES

- **Zero emissions and reduced heat generation**

- ✓ **Feature:** No diesel engine. Electric driveline

- **Noiseless tramming**

- ✓ **Feature:** Low noise level in electric driveline

- **Savings in fuel and in ventilation cost**

- ✓ **Feature:** No fuel needed. No emission



0%

Zero emissions



INCREASED PRODUCTIVITY

CUSTOMER VALUES

- **Higher penetration rate**

- ✓ **Feature:** New intelligent drilling control system (SICA*) & high frequency rock drill Sandvik RD314

- **Accurate and faster boom positioning**

- ✓ **Feature:** Advanced boom manipulator mode



35%

Extra penetration rate

*SICA = Sandvik Intelligent control architecture



ACCURATE BOLTING PROCESS

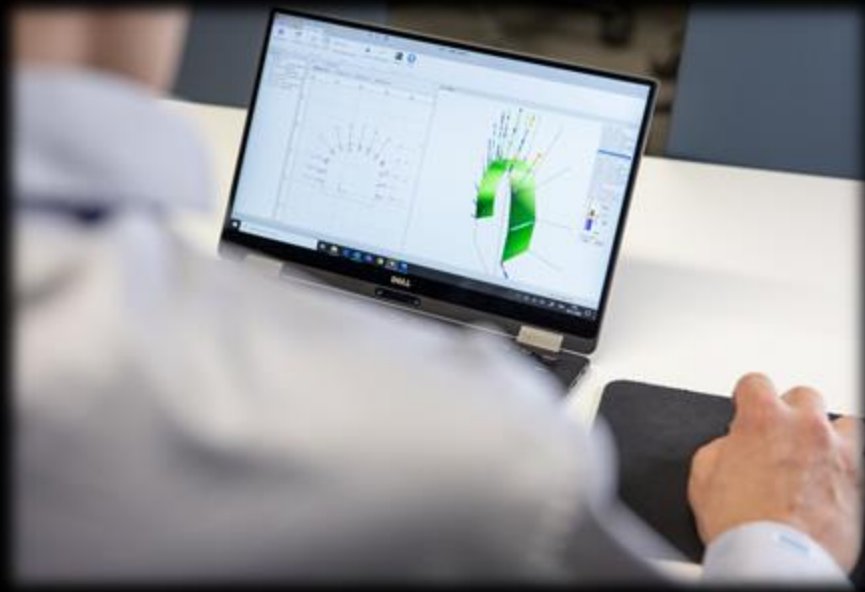
CUSTOMER VALUES

- **Accurate bolt locations**

- ✓ **Feature:** iSURE® for bolting plan design

- **Boom positioning for correct location**

- ✓ **Feature:** Fully instrumented boom



HIGH ROCK SUPPORT QUALITY

CUSTOMER VALUES

- **Autonomous bolting**
 - ✓ **Feature:** One bolt automation with multiple automation levels
- **Improved grouting process**
 - ✓ **Feature:** Automatic Resin Injection system



BETTER PROCESS CONTROL

CUSTOMER VALUES

- **Predetermined bolt locations**

✓ **Feature:** Sandvik iSURE®

- **Comprehensive data collection features**

✓ **Feature:** Compatibility to Sandvik digital offering



SANDVIK DS412iE

ROCK REINFORCEMENT BATTERY POWERED DRILL

IMPROVED WORKING CONDITIONS

0%

diesel emissions while
tramming



IMPROVED PRODUCTIVITY

Up to 35* %

higher penetration rate



AUTOMATION

Up to 90* %

automatic bolt installation



*Test results and calculations are to be considered as results reached under certain and controlled conditions. These test results and calculations should not be treated as specifications and Sandvik does not guarantee, warrant or represent the outcome of test results or calculations in any or all circumstances.



ROCKTECHNOLOGY.SANDVIK