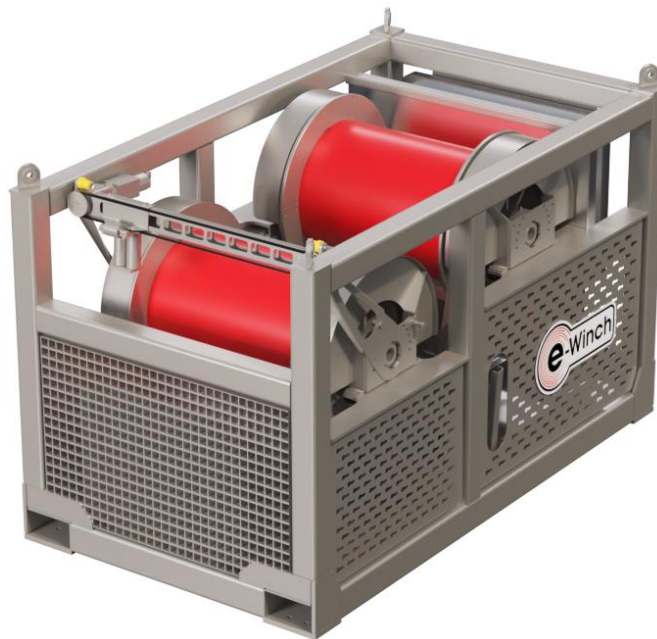


Paradigm's all electric e-Winch® technology is built upon the extensive smart conveyance product range and delivers the much-needed breakthrough in operational safety, winch performance and environmental impact reduction demanded in today's low-carbon operations.

The e-Winch® system uses the latest design in compact high-power inverters and permanent magnet motors. Sophisticated drive control software allows for precise and smooth control of the liquid cooled high torque electric motors. The direct electric drive system delivers the best winch control and automation available in the market today, providing rapid responses for fast stopping capability, instant torque delivery for fast acceleration and jarring, and ultra-slow stable logging speeds.

The software affords a high degree of safety functionality by operator defined parameters, to prevent overpulls, pull-offs at surface or other unsafe situations.



Applications

- Efficient wireline operations
- Slickline mechanical services
- Digital Slickline operations
- Heavy duty fishing operations
- Cased hole logging services

Benefits

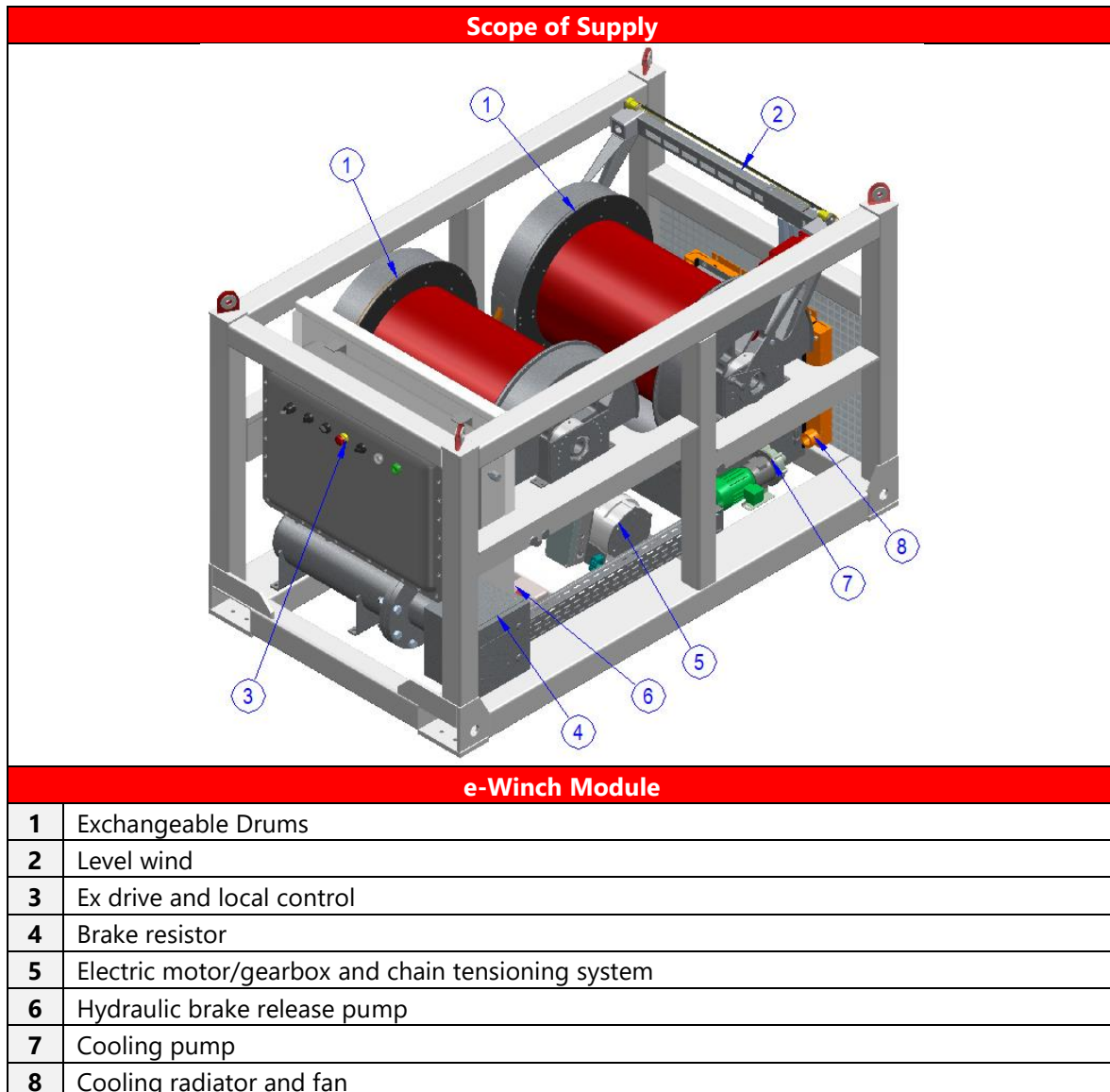
- Minimized crew requirements
- Ultra-slow logging speeds
- Unmatched jarring performance
- Energy efficient, no hydraulic system losses
- No emissions
- Reduced environmental risks
- Low cost of operation
- Maintenance free and high availability
- Low noise

Features

- Standard joystick control
- Electronic depth, tension and speed visualization
- Rig safe certified drive system
- Advanced safety functionality
- Continuous operation
- Automatic brake function test

Directives & Certifications

- Machinery directive 2006/42/EC
- ATEX directive 2014/34/EU
- Low voltage directive 2006/95/EC
- Electromagnetic compatibility 2004/108/EC
- DNVGL Offshore lifting
- Lower & Power regulations



The **E20 Double Drum e-Winch®** design is based on the latest standard in electric drive technology. Electric power from grid supply or generator is directly converted into winch motion by servo motor and inverter technology. The unit is a single lift winch unit and has a double drum winch arrangement with easy exchangeable drums. NOV Elmar ASEP style winch drums also fit in the winch unit.

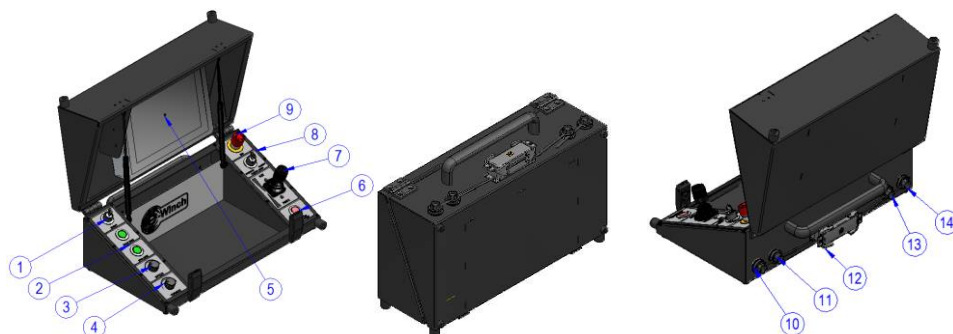
A liquid cooled electric motor drives the winch drums through a planetary gearbox, with a roller chain. The electric motor provides a precise control of speed, torque, and acceleration, either software controlled or by the operator. On the drum a band brake system is used as a parking brake. This band brake is fail-safe spring activated and electro-hydraulic released.

The Level Wind system is a software assisted feature which provides a controlled manner of wire spooling. The level wind is driven by a servomotor, lateral movement is provided by a maintenance free high strength timing belt. The cooling system pump circulates the cooling liquid through the drive electronics cold plate, servomotor, brake resistor and fan cooled radiator to provide cooling in the harshest environments.

Depth and tension are measured with a stuffing box mounted, fully electronic ParaSheave as a standard. Optional PM20, a 20" 3-wheel wrap around measuring head, can be integrated in the winch unit.

The winch is controlled with a removable winch control panel. This allows the winch to be controlled at the winch location or from another location near the winch.

Operator Control Panel Layout



Control Panel

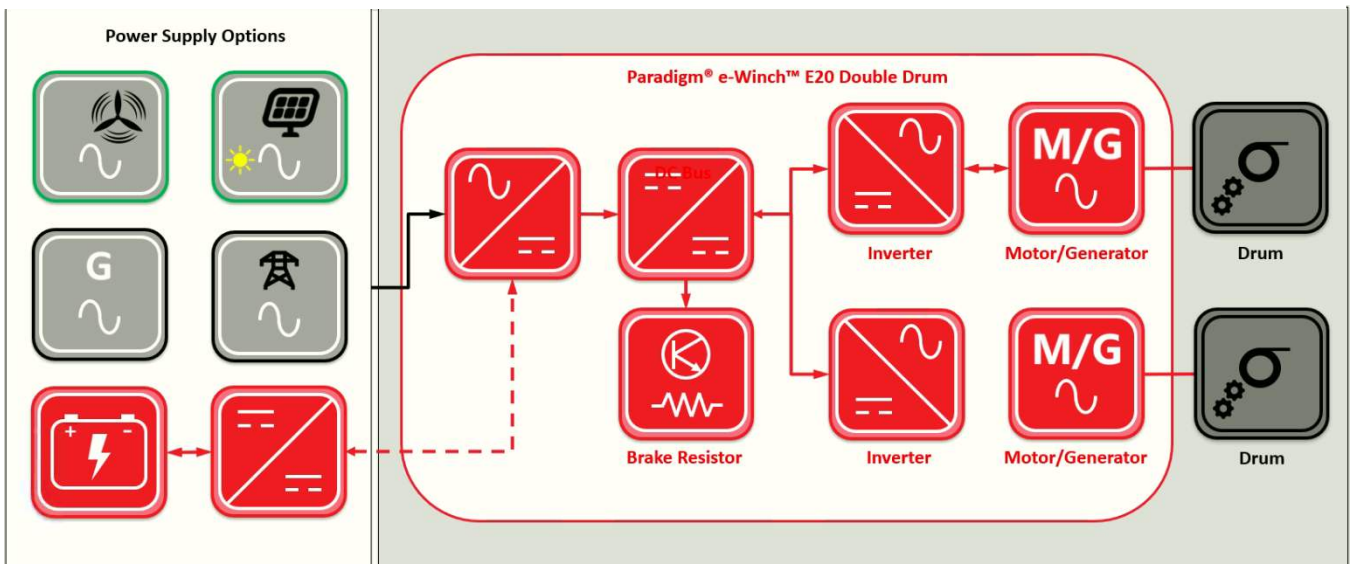
1	Enable / Release brake key switch
2	Winch rear / front drum selection (winch specific)
3	Winch speed range settings slow / normal / jarring
4	Winch torque control
5	12" Winch control HMI panel
6	Winch stop / Backup start
7	Joystick for winch speed and direction control
8	Winch control mode settings manual / automatic / rig-up remote (optional)
9	Emergency stop
10	Cat-5 Coupler local connection
11	Cat-5 Coupler external connection
12	Remote control multi connector
13	USB-A Plug
14	USB-A Plug external connection



Optional Hardware

- Rig-up remote radio winch control
- Alternative planetary gear ratio
- Slick-E-Line® integration and hardware
- Slick-O-Line® integration and hardware
- Integrated PM20 20" 3-wheel measuring head
- Standalone foldable roof
- Rig connection cable ordered to length
- Client specific paint system and colour
- Light weight tarpaulin
- Lifting Sling set
- Ambient temperature options, desert, arctic
- Offshore rated fully enclosed lifting frame
- ATEX/IECEX Zone 1 certified drive system
- ATEX/IECEX Zone 2 certified drive system
- Alternative supply voltages
- Well control functions
- Well control pressure sensors
- ParaSheave top-sheave SB Depth & Tension
- Bottom-Sheave
- Spare drum and chain
- Battery pack non-zone and zone 2
- Solar panel
- Portable diesel genset

e-Winch® Direct Electric Drive System Layout for Double Drum.



The e-Winch® system power supply can either be connected to the grid or a generator set. The power supply converts the AC supply to a DC voltage on the DC bus. The motor inverter connected to the common DC-bus converts the DC voltage to a controlled AC voltage and current to control the speed and torque of the motor driving the drum.

When the winch is running in hole, decelerating or stopping the motor acts as a brake generating power and feeding this brake power back to the drive system. This power is destroyed in a brake resistor or recovered. Energy recovery systems will be available on future versions of the direct electric winch drive system. This will maximize the energy efficiency of direct electric winch drive system.

Nominal Specifications – e-Winch®		
	Metric	Imperial
Electrical characteristics		
Rated Power	75 kW	
Electrical connection	380 – 480 V, 50 – 60 Hz, 125 A, 3 phases, 4 wires	
Mechanical characteristics		
Structural design acc.	DNVGL-ST-E271 / ISO 10855	
Noise level	< 75 dB(A) @ 1 m	< 75 dB(A) @ 3 ft
Corrosion protection	Hempel paint system, ISO 12944 C5-M	
Topcoat colour	Grey RAL 7030	
Dimensions & weights		
Dimensions (W x L X H)	1,290 x 2,250 x 1,388 mm	4.2 x 7.4 x 4.6 ft
Forklift pocket size	194 x 102 mm	7.6 x 4.0 inch
Weight (with empty drums)	2,500 kg	5,500 lbs
Environmental limitations		
Operating temperature range Standard	-20 to +50° C	-4 to +122° F
Operating temperature range Arctic	-40 to +40° C	-40 to +104° F
Humidity	100% at +50° C	100% at +122° F
Winch performance		
Rear drum position		
Planetary gearbox ratio	1:6	
Drum type	PD02	
Drum outer diameter	700 mm	27.56 inch
Drum core diameter	504 mm	19.84 inch
Drum width	690 mm	27.17 inch
Maximum line speed at OD	513 m/min	1,683 ft/min
Maximum line speed at core	369 m/min	1,212 ft/min
Maximum line tension at OD	1,468 kg (2,543 kg)*	3,238 lbs (5,608 lbs)*
Maximum line tension at core	2,040 kg (3,532 kg)*	4,497 lbs (7,788 lbs)*
Minimum stable speed at OD	0.011 m/min	0.035 ft/min
Wire capacity 0.160 Slick-E-Line®	8,600 m	28,215 ft
Wire capacity 0.125" Slickline	10,500 m	34,450 ft
Front drum position		
Planetary gearbox ratio	1:8	
Drum type	PD05	
Drum outer diameter	700 mm	27.56 inch
Drum core diameter	260 mm	10.24 inch
Drum width	700 mm	27.56 inch
Maximum line speed at OD	385 m/min	1,263 ft/min
Maximum line speed at core	143 m/min	469 ft/min
Maximum line tension at OD	1,985 kg (2,543 kg)*	4,317 lbs (5,608 lbs)*
Maximum line tension at core	5,271 kg (6,847 kg)*	11,623 lbs (15,097 lbs)*
Minimum stable speed at OD	0.008m/min	0.026 ft/min
Wire capacity 7/32" Wireline	7,620 m	25,000 ft
* Maximum line tension performance in optional boost mode (drive system limits).		
All products, product specifications and data are subject to change without notice, to improve design, reliability, functionality or otherwise.		

The e-Winch® system can run at a reduced power supply. With a reduced power supply the e-Winch® winch system is still capable to reach maximum line tension at a reduced line speed or the maximum line speed at a reduced line tension. Depending on the power supply available the current/power limitation can be set in the e-Winch® machine control software. The e-Winch® system can work with variable grid voltage from 380VAC up to 480VAC at 50 or 60hz. Depending on the available capacity it can be set between 16A and 125A.

Reduced power supply				
Input current at 400 V / 50 Hz	125 A	63 A	32 A	16 A
Power at the drum	70 kW	37 kW	19 kW	9 kW
Winch performance				
Drum type	PD02			
Planetary gearbox ratio	1:6			
Maximum line speed at OD	513 m/min (1683 ft/min)			
Line tension OD at max. line speed	733 kg 1616 lbs	385 kg 849 lbs	196 kg 431 lbs	98 kg 216 lbs
Maximum line speed at core	369 m/min (1212 ft/min)			
Line tension core at max. line speed	1018 kg 2245 lbs	535 kg 1189 lbs	272 kg 599 lbs	136 kg 300 lbs
Maximum line tension at OD	1468 kg (3238 lbs)			
Line speed at max. line tension OD	312 m/min 1023 ft/min	164 m/min 538 ft/min	83 m/min 273 ft/min	42 m/min 137 ft/min
Maximum line tension at core	2040 kg (4497 lbs)			
Line speed at max. line tension core	224 m/min 737 ft/min	118 m/min 387 ft/min	60 m/min 197 ft/min	30 m/min 98 ft/min
Drum type	PD05			
Planetary gearbox ratio	1:8			
Maximum line speed at OD	385 m/min (1263 ft/min)			
Line tension OD at max. line speed	977 kg 2155 lbs	514 kg 1132 lbs	261 kg 575 lbs	130 kg 288 lbs
Maximum line speed at core	143 m/min (469 ft/min)			
Line tension core at max. line speed	2631 kg 5802 lbs	1383 kg 3049 lbs	702 kg 1549 lbs	351 kg 774 lbs
Maximum line tension at OD	1958 kg (4317 lbs)			
Line speed at max. line tension OD	234 m/min 767 ft/min	123 m/min 403 ft/min	62 m/min 205 ft/min	31 m/min 102 ft/min
Maximum line tension at core	5271 kg (11623 lbs)			
Line speed at max. line tension core	87 m/min 285 ft/min	46 m/min 150 ft/min	23 m/min 76 ft/min	12 m/min 38 ft/min

Paradigm e-Winch® software is part of paradigm well intervention software suite for Smart Conveyance™. The basic e-Winch® software functionality can be extended with optional features and functions. These extra features and functions can be enabled with specific software licences and additional software products.

Basic control, visualization, safety and data recording functions.

- Depth, Tension and Speed Visualisation
- Job & Run data recording
- e-Winch® system data recording
- Configurable system alarms
- Brake test
- Level wind control
- Sound alarm
- Shutdown alarm
- Backup Mode
- Drums & Cables Database
- Manual Control
- Power supply settings

Optional safety functions.

- Tension and speed limits
- Differential tension safety
- Well section speed limits
- Dynamic braking

Optional control functions.

- Rig up radio remote
- Constant speed and cruise control
- Constant tension
- Automated Jarring
- Boost Power
- Stuffing Box Pressure Monitoring & Control
- Well Pressure Monitoring & PCE Control

Optional data recording, visualization, connection and integration functions.

- Third party logging system
- ParaView™ live data trending
- Fieldbus connectivity (customer system)
- Remote machine access
- Satellite Communication

Optional software products.

- ParaLife™ Line management
- ParaRun™
- Ai-Winch™ Autonomous Software
- Winch Simulator
- Slick-E-Line® integration
- ParaChart™
- ParaView™

Drive System - Technology Comparison		
	Hydraulic driven Diesel	e-Winch® Electric
Performance		
Installed power	54 kW	75 kW
Machine efficiency	65 %	85 %
Power at the drum	35 kW	70 kW
Energy supply efficiency	30 % (diesel engine)	60 % (grid supply)
Acceleration	1 m/s ²	3 m/s ²
Speed control	+/- 1 m/min	+/- 0.01 m/min
Noise (at the operator position)	<82 dB (A)	<75 dB (A)
Automatic jarring and logging	✗	✓
Constant Speed with Cruise Control	✗	✓
Indoor Unventilated Operation (shop spooling)	✗	✓
Advanced Tamperproof Safety & Data Recording	✗	✓
Energy Recovery System (RIH & Deceleration)	✗	✓
Energy consumption on demand	✗	✓
Full Remote Control	✗	✓
Reduced CO ₂ emissions	✗	✓
Reduced Daily Running Costs	✗	✓
Reduced Yearly Maintenance Costs	✗	✓
Guaranteed Zero Line Breakage	✗	✓
Increased Power at Drum	✗	✓
Improved Overall Efficiency	✗	✓
Lower Noise Pollution	✗	✓
Cost of Ownership (Maintenance)		
Fluid level checks	Daily	Daily
Exhaust gas cooler cleaning	Every 300 hours	Never
Exhaust flame arrester cleaning	Every 300 hours	Never
Exhaust spark arrester cleaning	Every 300 hours	Never
Air, fuel, oil filters change	Every 300 hours	Never
V-belt change	Yearly	Never
Air inlet safety valve service and calibration	Yearly	Never
Pneumatic air system service	Every 600 hours	Never
Diesel engine service (valves, fuel pump)	Every 600 hours	Never
System sensor calibration	Yearly	Yearly
Coolant pump service	Yearly	Yearly
Electrical System Check (CompEx or equivalent)	Yearly	Yearly
Yearly maintenance cost (Diesel engine, Zone 2 exhaust kit, hydraulic system)	\$ 15.000,00	\$ 0,00
Environmental Emissions & Impact[#]		
Direct machine exhaust CO ₂ emissions (nominal)	20 kg/hr	0 kg/hr
Direct machine exhaust CO ₂ emissions (per 8 year/5000 hour asset operating life)	100000 kg	0 kg
[#] Exhaust gas emissions		