

Cleco® D&D

DC Electric Assembly Tools



The Total Solution For Safety & Quality Critical Fastening Operations

Cleco's fastening technology is used globally and across all industries. This technology is used in Aerospace, Motor Vehicle, Offroad, Wind Energy, Agriculture, and a great multitude of applications within general industry where "quality critical" requirements are the rule. In motor vehicle environments across the globe, Cleco and DGD's complete line of transducerized electric tools are used in "safety critical" applications where spot-on precision and traceability are required. And finally, in one of the most demanding environments, our line of DC electric tools are used in aircraft assembly where "good enough" will never be acceptable.

Because of our drive for perfection, you can excel in your job. Indeed, due to our uncommon focus on

total fastening solutions instead of just products, our customers look upon us not merely as vendors, but as strategic allies. And at Apex, we welcome the challenge of leadership this imposes.

The Systems

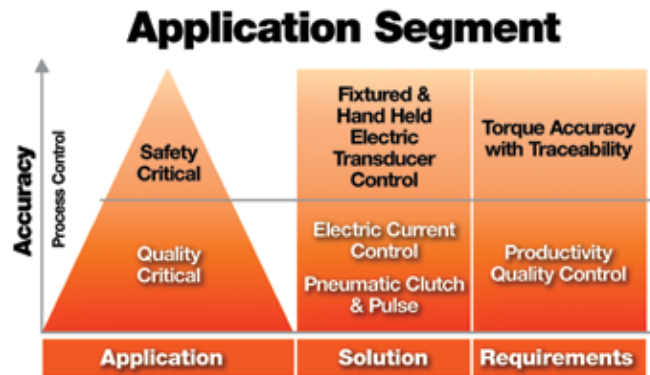
Cleco's state of the art Tightening System delivers unprecedented performance, productivity and accountability in both "quality critical" and "safety critical" assembly applications.

Durability, speed, and ergonomics are achieved using the corded Cleco DC electric tools with a complete line of tool configurations and an assortment of controller options to choose from.



The Cleco LiveWire™ system provides the most cost-effective safety critical fastening solution available in the world today. By marrying cordless tools and WiFi communications, the operators gain the mobility and flexibility they need to increase productivity and reduce in-system damage costs. One line controller managing up to 16 cordless tools while utilizing the most up-to-date wireless encryption technology provides a cost savings unparalleled in industry today.

When considering the cumulative impact of all these components – the tools, the controllers, the software, the flexibility, the accessories and the support – it is easy to see why the Cleco Tightening System is the benchmark for all DC electric tool systems.



Cleco®



The Most Flexible, Cost-Effective

Introducing the Cleco **mPro400GC** Global Controller, the first controller for safety-critical applications that offers unsurpassed levels of flexibility, connectivity, and serviceability while providing superb torque accuracy and process control. This new controller incorporates the advanced technical features of the proven DGD mPro system with the user-friendly software of the trusted Cleco TME controller, resulting in a powerful control solution that offers impressive cost savings through unequalled flexibility.

Corded, Cordless, Or Fixtured ... All From One Controller

The Cleco **mPro400GC** Global Controller is compatible with all Cleco 18-48 Series DC electric corded tools, LiveWire cordless tools, and all DGD and EMT fixtured spindles. That means fewer controllers and cables are needed for your line. And that means savings...up to 50% over traditional systems.

Reduce System Costs Up To 50%

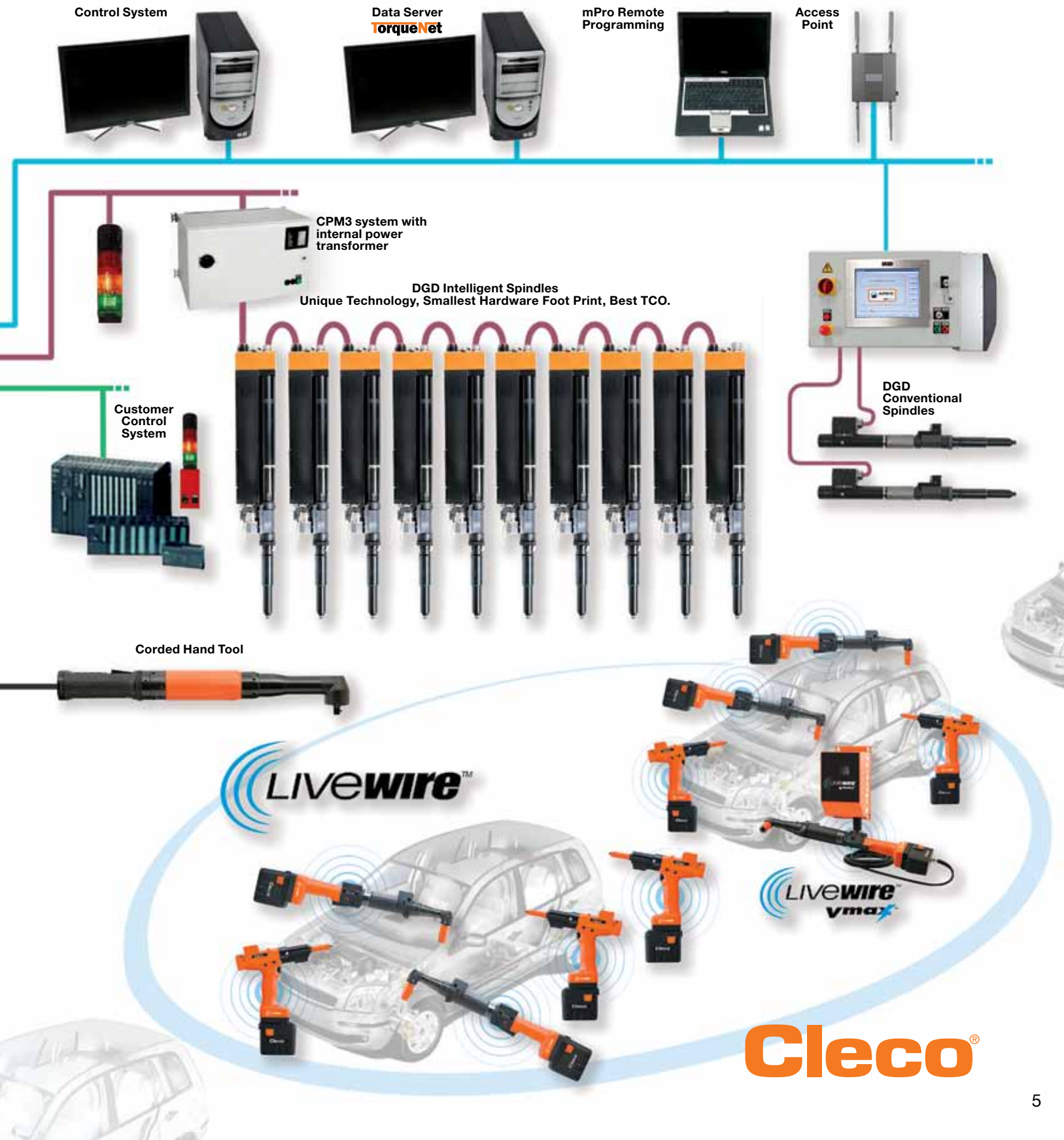
- Configure up to 32 DC spindles in varying configurations. Consult your Apex representative for details.

■ Facility Cost Savings

- Installation Expenses: Save on Ethernet and power drops, controller stands, cable management, labor to install and support
- Production Expenses: One controller means fewer backups, fewer repairs, fewer headaches and one-time training



Intelligent Systems Controller... Ever



Universal Connectivity

Universal connectivity begins with global auto-sensing input voltage, 16 configurable inputs and outputs, plus DeviceNet, Ethernet-IP, Profibus and Profinet fieldbus standards. User-friendly software mapping of discrete and fieldbus selections provides ultimate error-proofing control. Dual fieldbus ports allow redundant I/O mapping or expansion. Utilize two different fieldbus standards simultaneously for maximum flexibility.

The Cleco **mPro400GC** Global Controller comes standard with a system bus to manage internal data flow and avoid burdening outside networks. It can be utilized for rapid “grab and go” connectivity to accessories, such as adding error-proofing

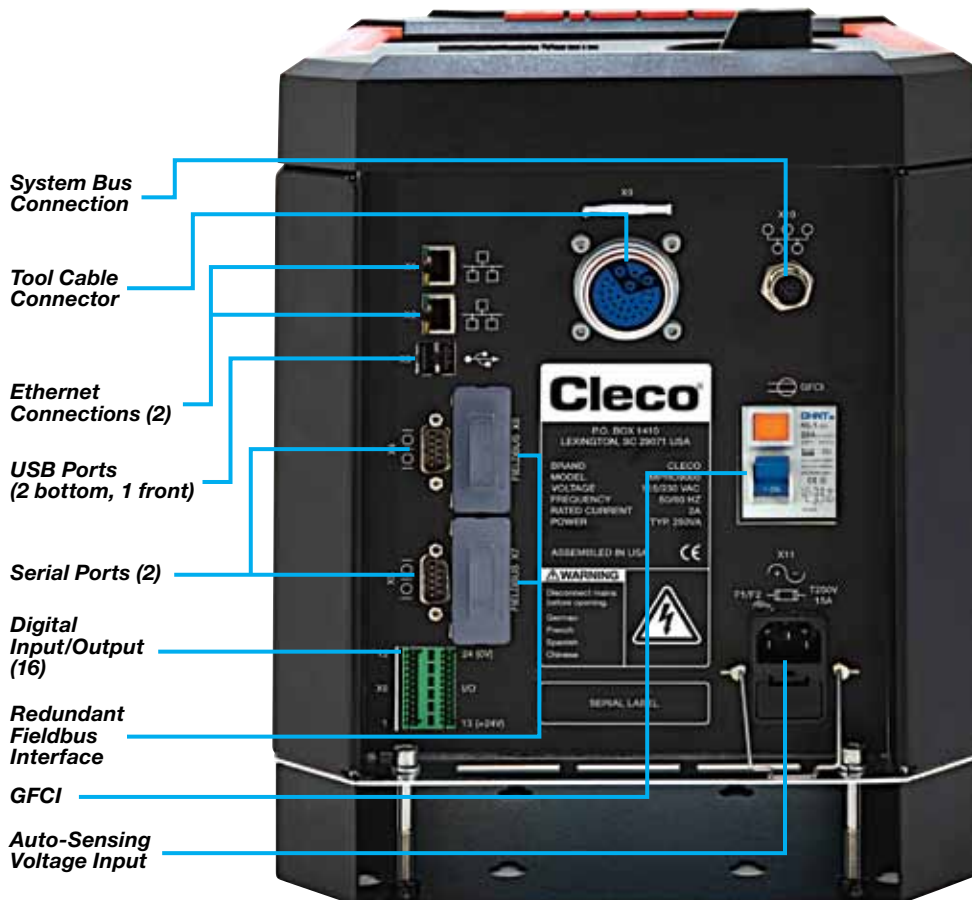
from socket trays, stack lights, or operator boxes. Configurable software menus allow quick integration into any process. With up to 32 configurable nodes on the system bus, endless error-proofing combinations are possible.

The system bus can manage multiple secondary controllers in combination with single and multi-spindle stations. Spindle sequencing, data management, and diagnostics are just a few of the many functions performed. In addition, DGD®

Fixtured Intelligent Spindles can utilize the system bus to drive up to 30% of cost out of a traditional system through cable reduction, maximizing acquisition and facility cost savings.

Universal Connectivity

- Auto-Sensing Voltage
- 16 Configurable I/O's
- Redundant Fieldbus
- Redundant Serial and Ethernet Ports
- Isolated System Bus



For Ultimate Flexibility

Rundown Data Storage

The **mPro400GC** supports TorqueNet, our data collection and archiving software, as well as other industry standard software packages. Protocols are available for many of the standard products.

The Cleco **mPro400GC** Global Controller works seamlessly with current protocols and offers significant performance advantages over traditional systems. Features include:

- A single software program that covers both standard and fixtured applications
- Standard spindle sequencing and reject management
- 19 advanced fastening control sequences standard at no additional cost
- Remote programming software with no licensing restrictions
- Touch screen display with integrated alpha-numeric keyboard

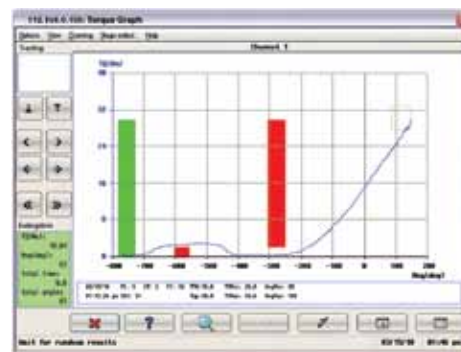
No Software Licensing!



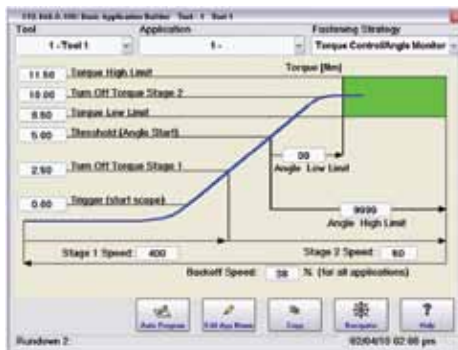
User Friendly GUI



Oscilloscope Process Management



Quick-Start Auto Program Option



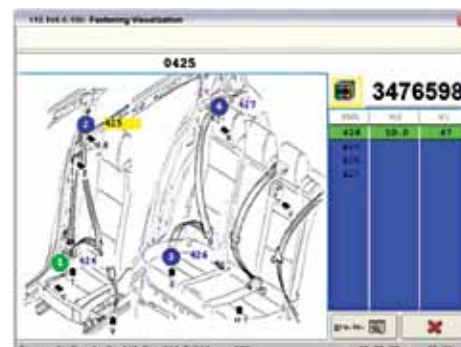
In-Depth Data Management

Seq	No.	PS	SS	Object	Mount	Mount	Error	Splice	Time	Workpiece
1	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20	20	20	20

Easy-To-Read Run Screen



Digital Image Bolt Sequencing



Superior Serviceability For



Installation Flexibility

At only 10" w X 15" h X 15" d (254mm X 381mm X 381mm) and weighing just 30 lbs. (13.6 kg.), the Cleco **mPro400GC** is smaller and lighter than most traditional controllers. It can be lifted easily by a single person and will mount just about anywhere.



Exceptional Ease-Of-Use

Quick Mount Bracket

No more templates and measuring mounting hole patterns...installation of the **mPro400GC** is simple with a separate receiver bracket that makes locating mounting holes easy. The unit then attaches directly to the bracket so the installation is fast and foolproof.

Integrated Cable Management

The **mPro400GC** mounting bracket incorporates an integral cable management channel, so installations stay orderly and easily accessible. Clearly labeled connectors and top-down cable routing means a clean installation with no guesswork. Mounting was designed to be simple and effective to get you up and running fast.

CompactFlash® Memory For Production Uptime

A standard CompactFlash card reliably stores:

- Operating system
- Drivers
- Network settings
- Application parameters
- Torque data

**50
Second
Boot!**

Positioned on the back of the unit for added security and tamper resistance, the card is still easily accessible.

- Rapid controller swap with 50-second boot
- No licensing or proprietary hardware
- Card stores up to 10,000 rundowns

Secondary Controller Functionality

A secondary controller is controlled from a master or primary unit. It has I/O for local error proofing and peripherals, plus a LCD for operator feedback and troubleshooting.



Secondary Unit



Productivity That D

Introduced in 2005, DGD Intelligent Spindles were the first fixtured nutrunners that offered onboard servo and modular construction. Today, these third generation nutrunners are based on over 50 years of proven success of our conventional spindles.

DGD Intelligent Spindles combine high speed, exceptional up time availability, and unprecedented accuracy and durability in a compact design that requires substantially less cabling than traditional nutrunners. The result is productivity gains at a lower cost,

with up to 30% savings on initial purchase price. DGD Intelligent Spindles also offer easy integration with Cleco electric tool products, including the new Cleco Global Controller.



Durability & Accuracy

The BTSE nutrunners are certified to the highest standard of accuracy and durability.

- ISO certified to $\pm 2\%$ accuracy
- 1 million duty cycles maintenance free
- 3 million cycle guarantee @ 80% of capability

Compact On-Board Intelligence

- The on-board servo module is proven technology that has been tested to:
- Shock & Vibration: 3 dimension at 13G
 - Temperature : 45° C
 - MTBF of 7 million cycles

Up To 170% Faster

With sealed, long-life, maintenance-free 380 VDC motors, DGD Intelligent Spindles are faster than a conventional spindle at most every torque level.

DGD Speed Comparison

Torque (Nm)	DGD Conventional Spindle	DGD Intelligent Spindle	DGD RPM Advantage
10	1222	1921	57%
50	329	890	170%
100	329	890	170%
150	219	502	137%
200	220	502	48%



Reduced Field Cables

DGD Intelligent Spindles provide a solution for the number-one cause of shut-down ... cable failure ... by substantially reducing the number of cables needed. Where DGD conventional spindles each need a separate cable, up to 16 Intelligent Spindles can be run from a single field cable by cascading cables between spindles.

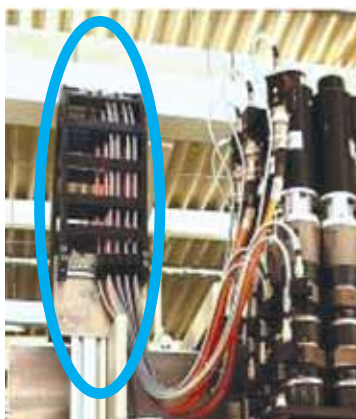


Drives Cost Savings

Acquisition & Installation Costs Plus Floor Space Are All Reduced

DGD Conventional Spindle System Solution	DGD 10 Spindle Requirements			DGD Intelligent Spindle System Solution																				
	Conventional	Intelligent																						
	10	Controllers	1																					
	10	Field Cables	1																					
	10	Power Interface Points	1																					
	5 hrs.	Cable Festooning Time	1 hr.																					
	5 hrs.	Controller Installation Time	1 hr.																					
	5 hrs.	Startup/Debug Time	3 hrs.																					
	6 sq.ft.	Required Floor Space	3.5 sq.ft.																					
No	Ability to add additional tools to existing controller		Yes																					
<table><tr><th colspan="3">Savings</th><th>Time & Material</th></tr><tr><td colspan="3">Tools, Cables & Controller</td><td>\$</td></tr><tr><td colspan="3">Installation</td><td>\$\$\$</td></tr><tr><td colspan="3">Parts (cables & controllers)</td><td>\$</td></tr><tr><td colspan="3">Total System Savings</td><td>\$\$</td></tr></table>					Savings			Time & Material	Tools, Cables & Controller			\$	Installation			\$\$\$	Parts (cables & controllers)			\$	Total System Savings			\$\$
Savings			Time & Material																					
Tools, Cables & Controller			\$																					
Installation			\$\$\$																					
Parts (cables & controllers)			\$																					
Total System Savings			\$\$																					

System Simplicity



Older and more expensive DGD Conventional System

Savings with a DGD 10 Spindle Intelligent Spindle System vs. DGD Conventional System In The Following Areas

Festooning Hardware (including installation)	<input checked="" type="checkbox"/>
Installation Labor	<input checked="" type="checkbox"/>
System Field Cables	<input checked="" type="checkbox"/>
Replacement Spare Parts & Cables	<input checked="" type="checkbox"/>
Trouble Shooting Time	<input checked="" type="checkbox"/>
System Availability	<input checked="" type="checkbox"/>

Incredible Savings!



Cost effective DGD Intelligent System

Your Single Source For Custom Automated Systems

Automated Systems provides custom solutions for the automated fastening of threaded joints.

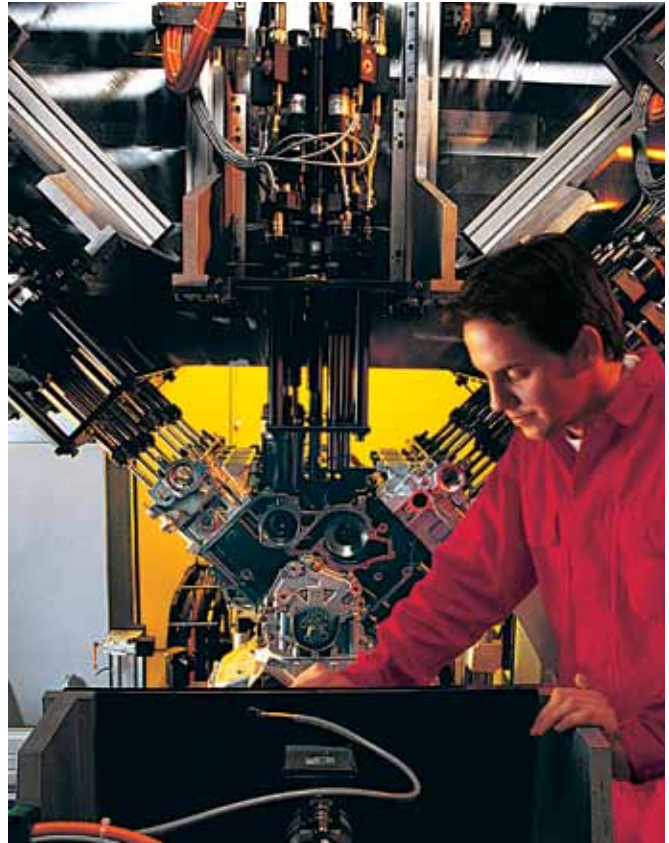
Our global customers span the entire vehicle assembly market, including passenger cars and trucks, power train assembly, off-road vehicles, and agricultural machines. We support machine tool builders in the vehicle and industrial markets with custom fastening system designs based on proven fastening product building modules.

Over many decades, Automated Systems has been providing custom solutions for training, service, and support. From single handheld nutrunners to multiple spindle machines, our custom designed systems are used around the world in an interesting variety of applications.

We have a full support staff of Sales Engineers, Mechanical Engineers, Controls Engineers, Project Managers, Field Service Engineers and In house Service Engineers waiting to serve you.

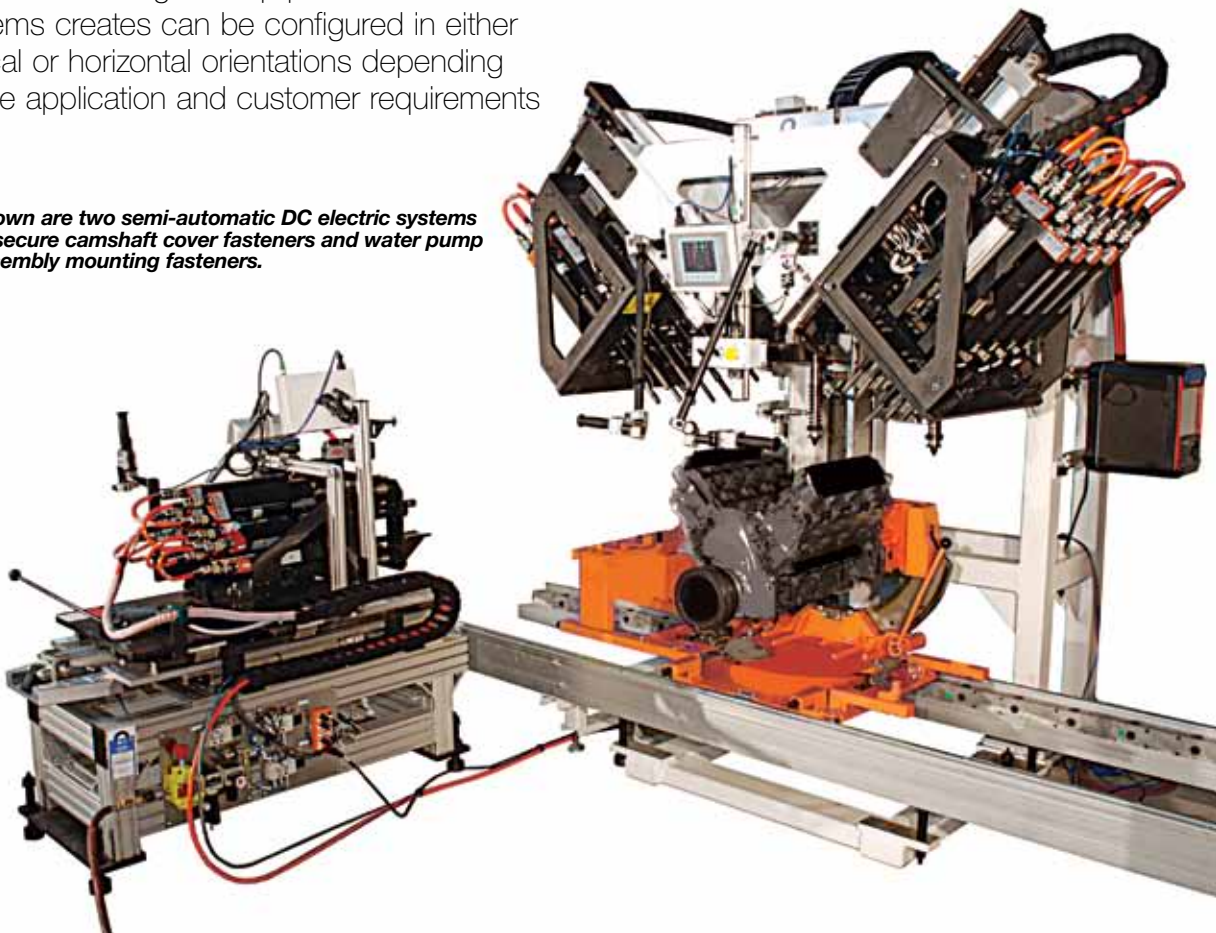
Custom Automated Solutions

The custom designed equipment Automated Systems creates can be configured in either vertical or horizontal orientations depending on the application and customer requirements



An automatic station on an engine assembly line uses two opposing electric power heads, each having 8 spindles, and a center power head of 6 spindles.

Shown are two semi-automatic DC electric systems to secure camshaft cover fasteners and water pump assembly mounting fasteners.

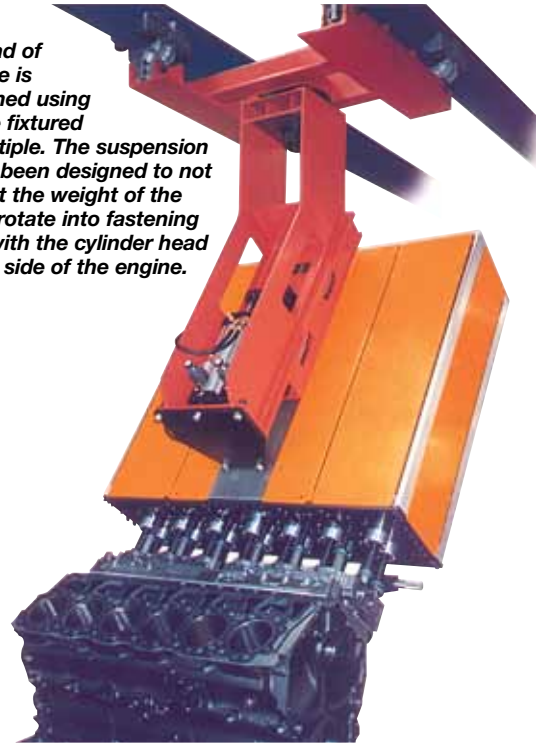


utilizing standard components. Designs may incorporate operator input or be fully automated dependent on the needs of the customer.

Automated Systems' products use high-efficiency electric motors manufactured specifically for this application. Available motor torques range from 2 Nm to 4,000 Nm. Motor spindles can be mounted and arranged to match any pattern using standard in-line, special offset, and 90° angle electric motors.

In order to apply our powerhead designs, we also design custom suspension systems along with cable management systems to provide support and movement. In addition to custom built stations fitted with fixtured nutrunner powerheads, Automated System designs, builds, installs and provides service and support from the complete fastening lines.

The left cylinder head of a V12 engine is being fastened using a 26 spindle fixtured electric multiple. The suspension system has been designed to not only support the weight of the tool, but to rotate into fastening alignment with the cylinder head on the right side of the engine.



The above manually operated railroad wheel bearing multiple has the capability to tighten three (3) fasteners equally spaced on various centers between 3.50" to 5.85" diameters up to 600 NM torque.

Wheelnut Fastening

Automated Systems is the recognized leader in the design and manufacture of multiple spindle wheelnut assembly systems. We are known across the globe for excellence of innovative engineering design, support, and quality award winning service.

Decades of expertise in the design and manufacturing of multiple spindle fixtured and portable assembly systems have identified Automated Systems as an experienced, innovative supplier capable of creating custom solutions matched to unique customer assembly requirements.

Automated Systems makes use of standard system building block components which are used to blend a custom system from a complete line of DC electric spindles, fastening controllers and an extensive listing of twenty-four different fastening strategies which not only include the usual Torque Control, Angle Control and Yield, but also includes the unusual Pulse Torque Recovery makeup torque fastening strategy awarded US Patent number 5,094,301.

Medium Duty Wheelnut Tool For Passenger Vehicles requiring Medium Torque, High Volume

- 100 Nm to 500 Nm

Automated Systems supplies custom Wheelnut multiple designs using standard major components with proven track records for reliability, lifetime performance, millions of cycles capability and ergonomic solutions which support operator safety, comfort and efficiency.

Heavy Duty Wheelnut Tool For Trucks requiring High Torque, Low Volume

- 700 Nm to 1200 Nm

Automated Systems Wheelnut multiples use high-efficiency electric motors manufactured specifically for this application. Available motor torques range from 700 Nm to 1200 Nm. Motor spindles can be mounted and arranged to match any bolt circle pattern, using standard in-line motors with or without offset gearing.



Adjustable Wheel Stud Centers

When several similar wheels need to be assembled and the economics of separate powerheads dictates a single powerhead, Automated Systems has the answer! Adjustable stud centers. The position of the studs can be controlled by an operator manual switch, or auto detection.



Budd Double Wheels

When it comes to fastening inner and outer wheel lug nuts including Budd style stud/nut adapters, a wheelnut powerhead requires long retractable spindles which are designed to prevent side loading. Automated Systems has the know-how, and the products to supply wheelnut multiples for double wheel truck applications. Our wheel equipment is more rugged than the trucks it assembles.

Suspension System

A properly designed suspension system can not only support the tool and return it to a home position, it can also provide a zero gravity lift and hold. The total weight of the tool is controlled by the operator with very little pressure required to move the tool up or down.



Local Operator Display (Operator Interface)

Each powerhead displays a red, green, and yellow LED on a per spindle basis. The LED display indicates the status of the last tightening as NOK, OK and Low Torque or Angle. An optional local operator interface display can be used to display output, and accept touch screen switch inputs.



Some of the uses of a local operator display include:

- Application selection
- Tool home position jog
- Overall fastening status in green or red
- Part graphics
- Fastening values for torque and angle
- Functional push-button inputs & display outputs



Push-off and Return

On moving transfer lines, the overhead suspension system can be mounted to an overhead track, supporting the multiple. At the conclusion of the fastening rundown by all spindles, the suspension pushes the tool away from the wheel and returns the tool to the home position ready for the next wheel. The vehicle on the assembly transfer line continues to move while the lug nuts are being tightened.

Application Detection of Aluminum and Steel Wheels

Wheel lug nut tools are distinguished from standard horizontally aligned systems by their cylindrical shape. Rotation of the tool is required for proper alignment with the wheel lugs, and the ability to provide a clear line of sight for the operator. In addition, a 6 spindle tool can be rotated 30 degrees, rundown a second time and tighten the alternate 6 lug nuts on a 12 lug nut wheel. This alternative design is tightening dual truck wheels, and can automatically determine if the wheel is aluminum or steel and change the fastening parameters automatically.



Shown are two manually operated vertical multiples and one semi-automatic DC electric systems.



How To Build A Fixtured DC Tool System

Building a **Fixtured DC Tool System** is as simple as 1, 2, 3!

1. Choose a common system to the right.
2. Select the correct components below.
3. Order your System!



System Control Package - Intelligent Spindle (Page 89)

Controller, Power Transformer, Power Distribution Box, Arcnet Cable, and Stand



Intelligent Fixtured Spindle (Page 64-87)



Floating Spindle Adapters (Page 122)



Field Cables - Intelligent Spindle (Page 88)



Jumper/Extension Cables - Intelligent Spindle (Page 88)



System Bus Terminator at spindle - Intelligent Spindle (Page 88)



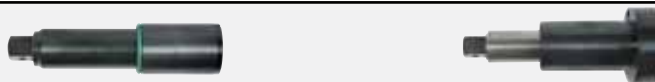
Controller - Conventional Spindle (Page 114-118)



Conventional Fixtured Spindle (Pages 90-111)



Floating Spindle Adapters (Page 113)



Field Cables - Conventional Spindle (Page 122)



Extension Cables - Conventional Spindle (Page 122)



System Bus Cable - (Page 124)



**Add or delete components
as required.**

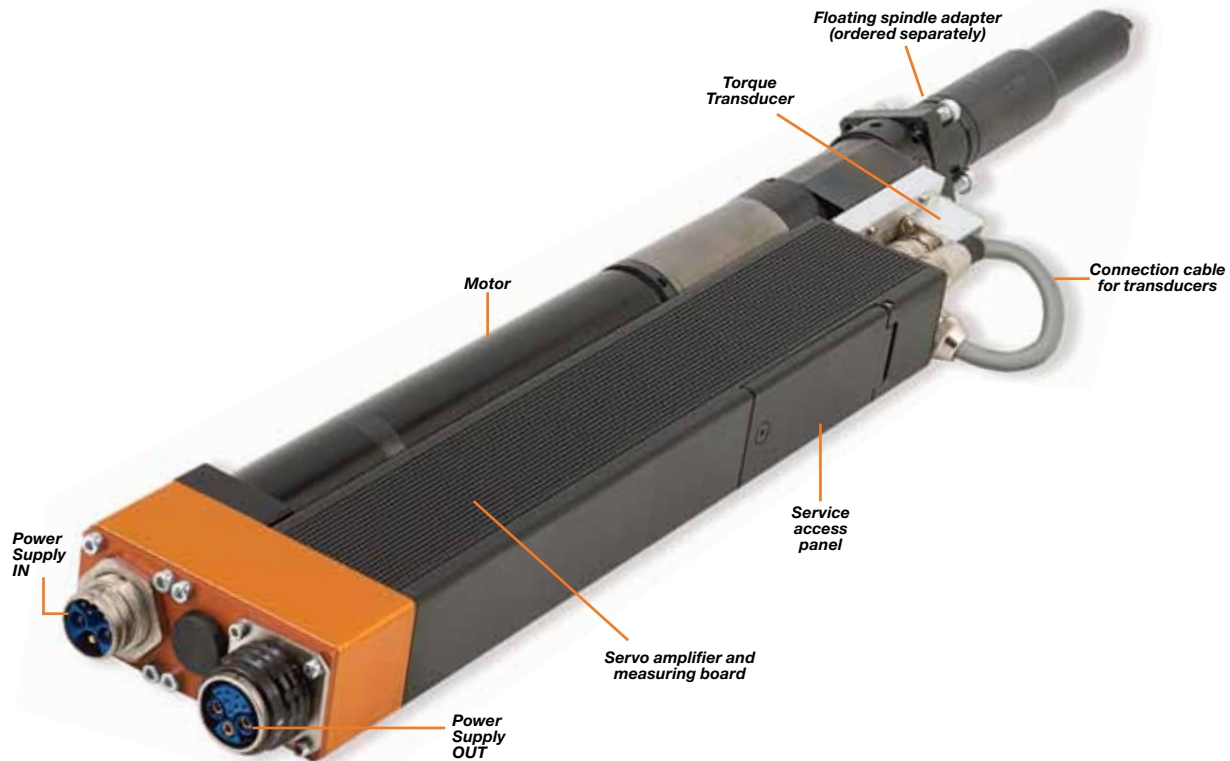
Model/Part Number	<div><div>>2 Convent. Spindles - Consult Application Center</div><div>>2 Intelligent Spindles - Consult Application Center</div><div>Single Application Center</div><div>Two Intelligent Spindle</div><div>Conventional 1-2 Spindle (Size 1, 2)</div><div>Conventional 1-2 Spindle (Size 3, 4)</div><div>Conventional >2 Spindle (Size 1, 2)</div><div>Conventional >2 Spindle (Size 3, 4)</div></div>							
mPro400GCM PDBCPSXX - Select model from catalog.						1	1	
Select from catalog. Floating spindle ordered separately.						1	2	
Select from catalog.						1	2	
Select cable with desired connector from catalog.						1	1	
Select cable with desired connector from catalog.						1	1	
961127						1	1	
mPro400GC-SG-12 Compact Box	1		1					
mPro400GC-SG-34 Compact Box		1		1				
Select from catalog. Floating spindle ordered separately.	1	1	*	*				
Select from catalog.	1	1	*	*				
Select from catalog.	1	1	*	*				
Select from catalog.	1	1	*	*				
Select from catalog. <i>**(Included in the System Control Package)</i>		1		1		**	**	

*As required.

There's A DGD Intelligent S

With straight drive, offset drive, and angle drive configurations, each available with reversible gears, and four different motor sizes to suit different torque requirements, there's a DGD Intelligent Spindle to fit most any situation. Your Apex Tool Group Technical

Sales Representative will work with you to determine the best solution for you. We can also provide you with application assistance in automation integration, joint analysis testing, complex data connection, and more.



Example **1** **BTSE** **1B035A** **2/** **1M1B** **1ZB**

X **XXXX** **XXXXXX** **X** **XXXX** **XXXXX**

Size
1, 2, 3, 4

Motor with servoamplifier & measurement card
B - Brushless Motor
U - Reverse gearing
TS - Tightening System
E - Standard

Gear
1 - Size
B - Brushless motor gear
XXX - Max. torque
A - Generation

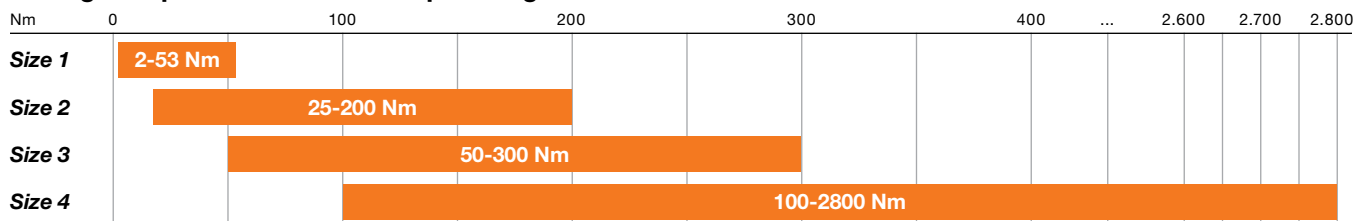
2nd Transducer for cross check
2 - 2x only for Z attachment

Attachment
1 - Size
Z - Straight attachment
VK - Offset drive with transducer
WK - Angle drive with transducer
1 - Capacity level
B - Version

Transducer
1 - Size
K - Combination torque + angle
1 - Capacity level 1 or 2
B - Version
M - Only moment, no angle encoder

Note: Floating spindle adapter must be ordered separately.

Intelligent Spindle Sizes and Torque Ranges



Spindle For Your Application

Intelligent Spindle Configurations

Straight Drive



Straight Drive with reversible gears



Offset Drive



Offset Drive with reversible gears



Angle Drive

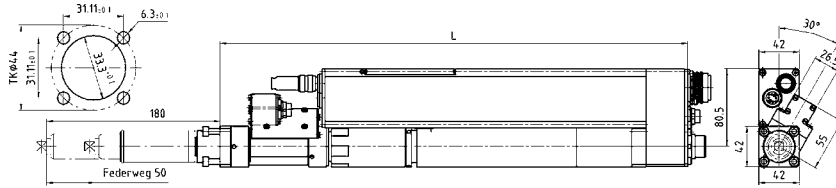


Angle Drive with reversible gears



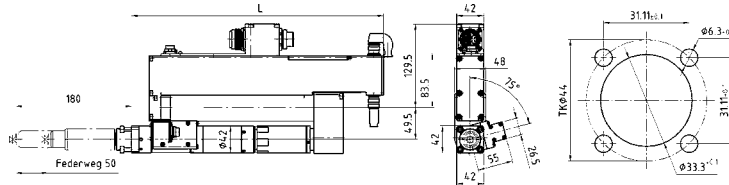
BTS Models

Straight drive, single transducer



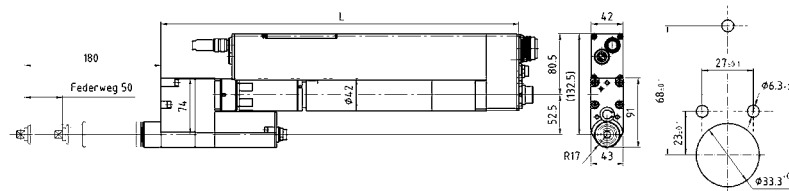
Torque Range	Speed	Float	Square Drive
Nm	RPM	mm	inch
2-12	1921	50	3/8"
5-35	727	50	3/8"
15-53	427	50	3/8"

Straight drive with reversible gears, single transducer



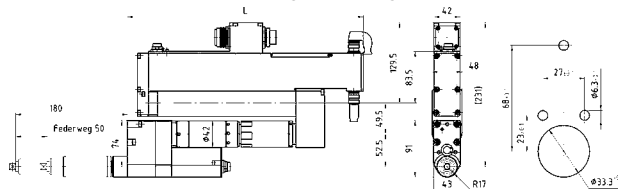
2-12	1921	50	3/8"
5-35	727	50	3/8"
15-53	427	50	3/8"

Offset drive, single transducer



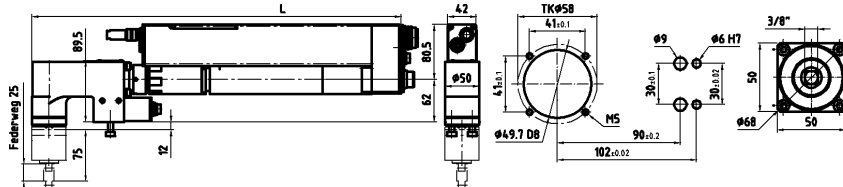
2-12	1825	50	3/8"
5-35	690	50	3/8"
15-53	405	50	3/8"

Offset drive with reversible gears, single transducer



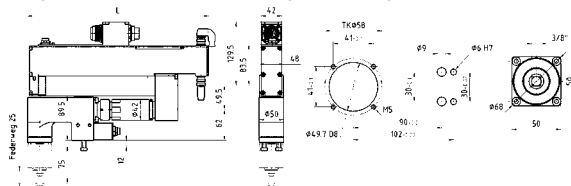
2-12	1825	50	3/8"
5-35	690	50	3/8"
15-53	405	50	3/8"

Angle drive, single transducer



















2-12	1801	25	3/8"
5-35	681	25	3/8"
15-53	400	25	3/8"

Angle drive with reversible gears, single transducer



2-12	1801	25	3/8"
5-35	681	25	3/8"
15-53	400	25	3/8"

Number of spindles	Smallest scribed circle diameter in mm		
	Model 1		
	Attachment		Angle drive
	Straight	Offset	
2	43	35	52
3	54	40	60
4	61	50	74
5	81	58	89
6	99	70	105
7	116	85	120

















	Min. Center- Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	43	486	4.8	1BTS-1B012A-1K3B-1ZB	947541A8	922325PT	180	S308434
	43	486	4.8	1BTS-1B035A-1K1B-1ZB	947553A4	922325PT	180	S308434
	43	486	4.8	1BTS-1B060A-1K2B-1ZB	947565A0	922325PT	180	S308434
								
	43	393	5.3	1BUTS-1B012A-1K3B-1ZB	947547A2	922325PT	180	S308434
	43	393	5.3	1BUTS-1B035A-1K1B-1ZB	947559A8	922325PT	180	S308434
	43	393	5.3	1BUTS-1B060A-1K2B-1ZB	947571A2	922325PT	180	S308434
								
	35	474	5.3	1BTS-1B012A-1VK3B	947543A6	922325PT	180	S308437
	35	474	5.3	1BTS-1B035A-1VK1B	947555A2	922325PT	180	S308437
	35	474	5.3	1BTS-1B060A-1VK2B	947567A8	922325PT	180	S308437
								
	35	382	5.8	1BUTS-1B012A-1VK3B	947549A0	922325PT	180	S308437
	35	382	5.8	1BUTS-1B035A-1VK1B	947561A4	922325PT	180	S308437
	35	382	5.8	1BUTS-1B060A-1VK2B	947573A0	922325PT	180	S308437
								
	52	542	5.7	1BTS-1B012A-1WK3B	947545A4			929041
	52	542	5.7	1BTS-1B035A-1WK1B	947557A0			929041
	52	542	5.7	1BTS-1B060A-1WK2B	947569A6			929041
								
	52	370	6.2	1BUTS-1B012A-1WK3B	947551A6			929041
	52	370	6.2	1BUTS-1B035A-1WK1B	947563A2			929041
	52	370	6.2	1BUTS-1B060A-1WK2B	947575A8			929041

For angle attachment

For angle attachment

The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).
= maximum accessibility. Floating adapter not included with spindle.

2D and 3D are available to download at www.apexpowertools.com in the Customer Support section or on www.apexpowertools.eu in the download area.

	Min. Center- Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	43	566	5.4	1BTS-1B012A-2/1K3B-1ZB	947542A7	922325PT	180	S308434
	43	566	5.4	1BTS-1B035A-2/1K1B-1ZB	947554A3	922325PT	180	S308434
	43	566	5.4	1BTS-1B060A-2/1K2B-1ZB	947566A9	922325PT	180	S308434
								
	43	393	5.9	1BUTS-1B012A-2/1K3B-1ZB	947548A1	922325PT	180	S308434
	43	393	5.9	1BUTS-1B035A-2/1K1B-1ZB	947560A5	922325PT	180	S308434
	43	393	5.9	1BUTS-1B060A-2/1K2B-1ZB	947572A1	922325PT	180	S308434
								
	35	554	5.9	1BTS-1B012A-1K3B-1VK3B	947544A5	922325PT	180	S308437
	35	554	5.9	1BTS-1B035A-1K1B-1VK1B	947556A1	922325PT	180	S308437
	35	554	5.9	1BTS-1B060A-1K2B-1VK2B	947568A7	922325PT	180	S308437
								
	35	382	6.4	1BUTS-1B012A-1K3B-1VK3B	947550A7	922325PT	180	S308437
	35	382	6.4	1BUTS-1B035A-1K1B-1VK1B	947562A3	922325PT	180	S308437
	35	382	6.4	1BUTS-1B060A-1K2B-1VK2B	947574A9	922325PT	180	S308437
								
	52	622	6.3	1BTS-1B012A-1K3B-1WK3B	947546A3			929041
	52	622	6.3	1BTS-1B035A-1K1B-1WK1B	947558A9			929041
	52	622	6.3	1BTS-1B060A-1K2B-1WK2B	947570A3			929041
								
	52	450	6.8	1BUTS-1B012A-1K3B-1WK3B	947552A5			929041
	52	450	6.8	1BUTS-1B035A-1K1B-1WK1B	947564A1			929041
	52	450	6.8	1BUTS-1B060A-1K2B-1WK2B	947576A7			929041

The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).

= maximum accessibility. Floating adapter not included with spindle.

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Intelligent Spindles

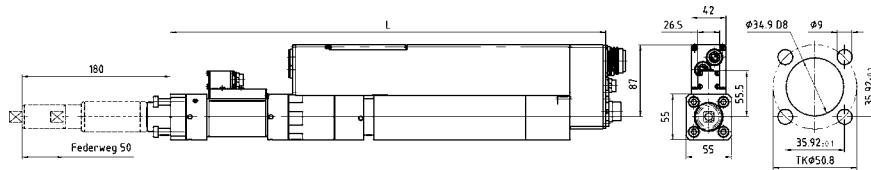
Size 2, Single Transducer

25 - 200 Nm

BTS Models

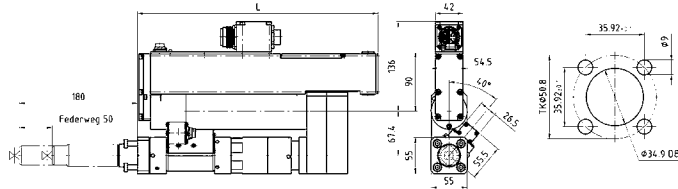
Torque Range	Speed	Float	Square Drive
	RPM		
Nm	max.	mm	inch

Straight drive, single transducer



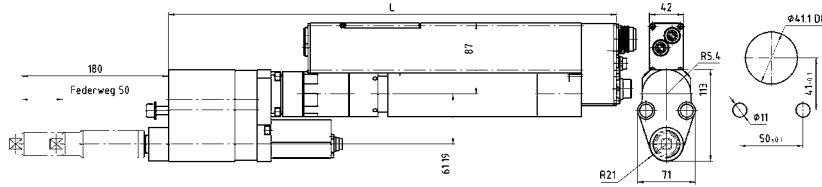
25-110	890	50	1/2"
40-200	502	50	3/4"

Straight drive with reversible gears, single transducer



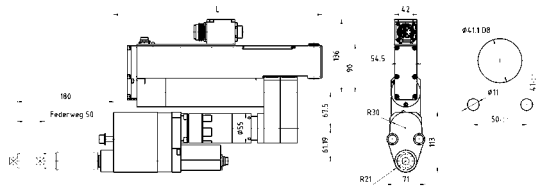
25-110	890	50	1/2"
40-200	502	50	3/4"

Offset drive, single transducer



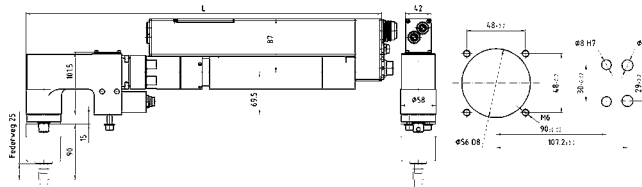
25-110	831	50	1/2"
40-200	468	50	3/4"

Offset drive with reversible gears, single transducer



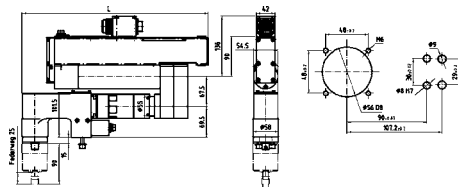
25-110	831	50	1/2"
40-200	468	50	3/4"

Angle drive, single transducer



















25-110	838	25	1/2"
40-200	472	25	3/4"

Angle drive with reversible gears, single transducer



25-110	838	25	1/2"
40-200	472	25	3/4"

Smallest scribed circle diameter in mm			
Number of spindles	Model 2		
	Attachment		Angle drive
	Straight	Offset	
2	56	44	59
3	75	50	68
4	80	62	86
5	106	74	101
6	130	89	118
7	151	102	137

	Min. Center-Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	56	528	7.6	2BTS-2B110A-2K1B-2ZB	947517A8	910609	180	S308435
	56	528	7.6	2BTS-2B200A-2K3B-2ZB	947529A4	935552	180	S308450
								
	56	367	8.6	2BUTS-2B110A-2K1B-2ZB	947519A6	910609	180	S308435
	56	367	8.6	2BUTS-2B200A-2K3B-2ZB	947531A0	935552	180	S308450
								
	44	551	9.2	2BTS-2B110A-2VK1B	947521A2	910609	180	S308438
	44	551	9.2	2BTS-2B200A-2VK3B	947533A8	935552	180	S308475
								
	44	390	10.2	2BUTS-2B110A-2VK1B	947523A0	910609	180	S308438
	44	390	10.2	2BUTS-2B200A-2VK3B	947535A6	935552	180	S308475
								
	59	581	8.7	2BTS-2B110A-2WK1B	947525A8			929053
	59	581	8.7	2BTS-2B200A-2WK3B	947537A4			929061
								
	59	421	9.7	2BUTS-2B110A-2WK1B	947527A6			929053
	59	421	9.7	2BUTS-2B200A-2WK3B	947539A2			929061

The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).

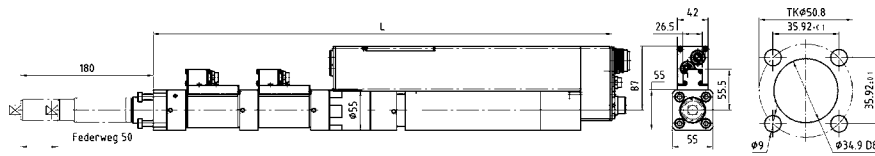
= maximum accessibility. Floating adapter not included with spindle.

2D and 3D are available to download at www.apexpowertools.com in the Customer Support section or on www.apexpowertools.eu in the download area.

BTS Models

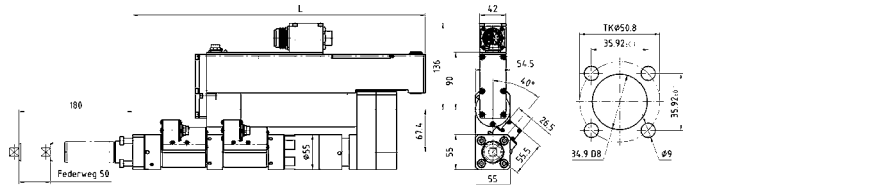
	Torque Range	Speed	Float	Square Drive
		RPM		
	Nm	max.	mm	inch

Straight drive, twin transducer (redundant)



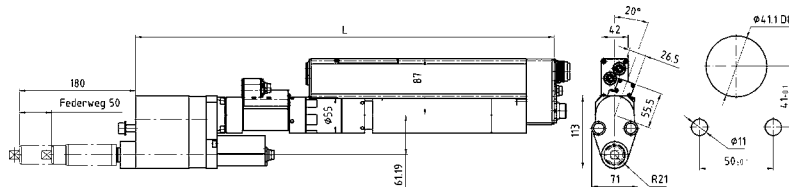
25-110	890	50	1/2"
40-200	502	50	3/4"

Straight drive with reversible gears, twin transducer (redundant)



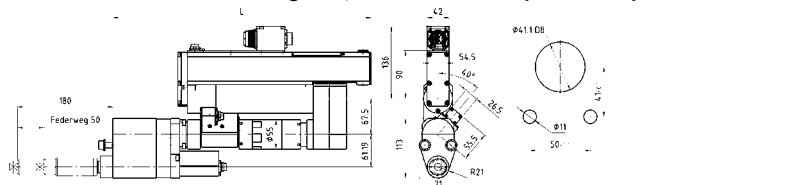
25-110	890	50	1/2"
40-200	502	50	3/4"

Offset drive, twin transducer (redundant)



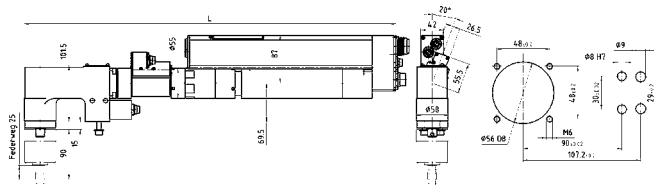
25-110	831	50	1/2"
40-200	468	50	3/4"

Offset drive with reversible gears, twin transducer (redundant)



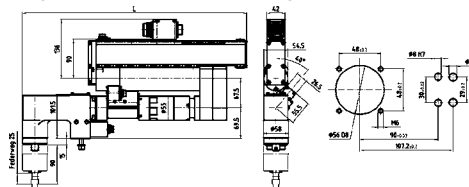
25-110	831	50	1/2"
40-200	468	50	3/4"

Angle drive, twin transducer (redundant)



25-110	838	25	1/2"
40-200	472	25	3/4"

Angle drive with reversible gears, twin transducer (redundant)



25-110	838	25	1/2"
40-200	472	25	3/4"

Smallest scribed circle diameter in mm			
Number of spindles	Model 2		
	Attachment		Angle drive
	Straight	Offset	
2	56	44	59
3	75	50	68
4	80	62	86
5	106	74	101
6	130	89	118
7	151	102	137

	Min. Center- Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	56	625	8.7	2BTS-2B110A-2/2K1B-2ZB	947518A7	910609	180	S308435
	56	625	8.7	2BTS-2B200A-2/2K3B-2ZB	947530A1	935552	180	S308450
								
	56	464	9.7	2BUTS-2B110A-2/2K1B-2ZB	947520A3	910609	180	S308435
	56	464	9.7	2BUTS-2B200A-2/2K3B-2ZB	947532A9	935552	180	S308450
								
	44	648	10.3	2BTS-2B110A-2K1B-2VK1B	947522A1	910609	180	S308438
	44	648	10.3	2BTS-2B200A-2K3B-2VK3B	947534A7	935552	180	S308475
								
	44	487	11.3	2BUTS-2B110A-2K1B-2VK1B	947524A9	910609	180	S308438
	44	487	11.3	2BUTS-2B200A-2K3B-2VK3B	947536A5	935552	180	S308475
								
	59	678	9.8	2BTS-2B110A-2K1B-2WK1B	947526A7			929053
	59	678	9.8	2BTS-2B200A-2K3B-2WK3B	947538A3			929061
								
	59	518	9.7	2BUTS-2B110A-2K1B-2WK1B	947528A5			929053
	59	518	9.7	2BUTS-2B200A-2K3B-2WK3B	947540A9			929061

The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).

= maximum accessibility. Floating adapter not included with spindle.

2D and 3D are available to download at www.apexpowertools.com in the Customer Support section or on www.apexpowertools.eu in the download area.

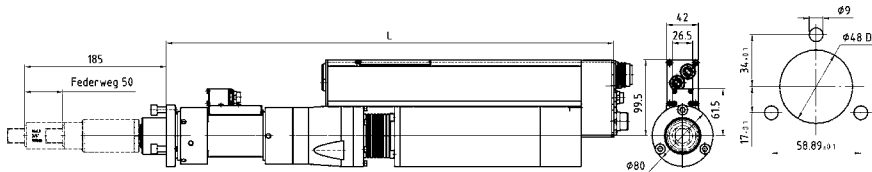
Size 3, Single Transducer

50 - 300 Nm

BTS Models

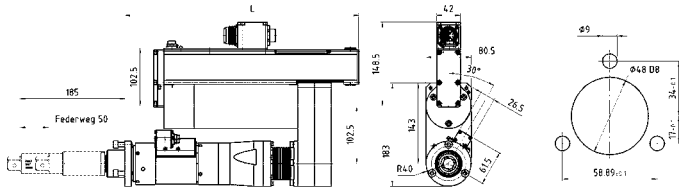
Torque Range	Speed	Float	Square Drive
	RPM		
Nm	max.	mm	inch

Straight drive, single transducer



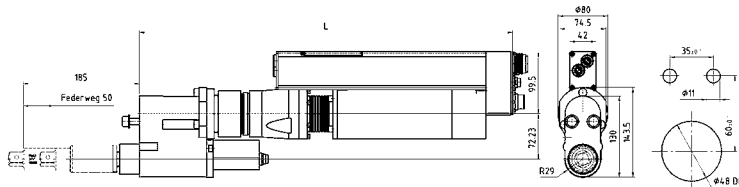
50-300	453	50	3/4"
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Straight drive with reversible gears, single transducer



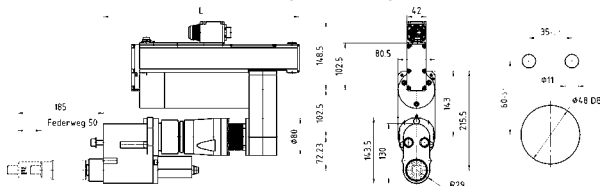
50-300	453	50	3/4"
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versetzter Abtrieb, 1 Messwertaufnehmer / *Offset drive, single transducer*



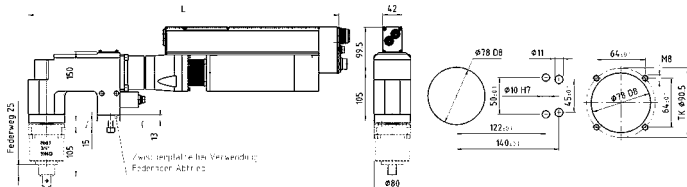
50-300	421	50	3/4"
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Offset drive with reversible gears, single transducer



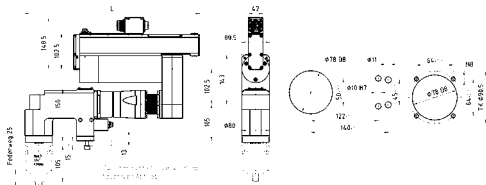
50-300	421	50	3/4"
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Angle drive, single transducer



50-300	437	25	3/4"
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Angle drive with reversible gears, single transducer



50-300	437	25	3/4"
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Smallest scribed circle diameter in mm			
Number of spindles	Model 3		
	Attachment		Angle drive
	Straight	Offset	
2	81	59	81
3	94	69	94
4	116	84	116
5	139	102	139
6	164	122	164
7	189	138	189

	Min. Center-Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	81	589	14.1	3BTS-3B300A-3K2B-3ZB	947577A6	910613	185	S308436
								
	81	417	16.1	3BUTS-3B300A-3K2B-3ZB	947583A8	910613	185	S308436
								
	59	584	15.2	3BTS-3B300A-3VK2B	947579A4	910613	185	S308439
								
	59	412	17.2	3BUTS-3B300A-3VK2B	947585A6	910613	185	S308439
								<i>For angle attachment</i>
	81	678	17.8	3BTS-3B300A-3WK2B	947581A0			929065
								<i>For angle attachment</i>
	81	506	19.8	3BUTS-3B300A-3WK2B	947587A4			929065

The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).

= maximum accessibility. Floating adapter not included with spindle.

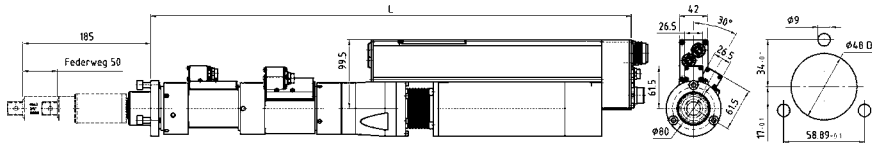
2D and 3D are available to download at www.apexpowertools.com in the Customer Support section or on www.apexpowertools.eu in the download area.

Intelligent Spindles

50 - 300 Nm

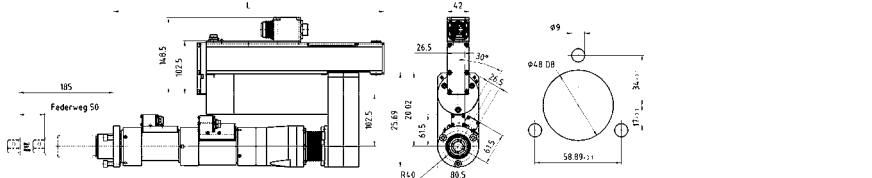
BTS Models	Torque Range	Speed	Float	Square Drive	
		RPM			
	Nm	max.	mm	inch	

Straight drive, twin transducer (redundant)



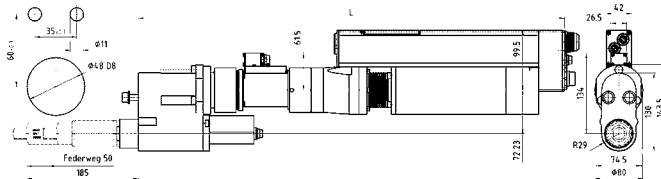
50-300	453	50	3/4"	
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Straight drive with reversible gears, twin transducer (redundant)



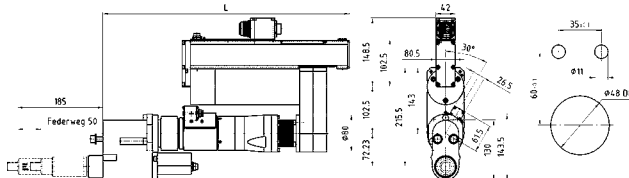
50-300	453	50	3/4"	
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Offset drive, twin transducer (redundant)



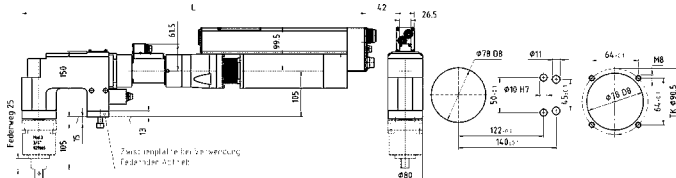
50-300	421	50	3/4"	
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Offset drive with reversible gears, twin transducer (redundant)



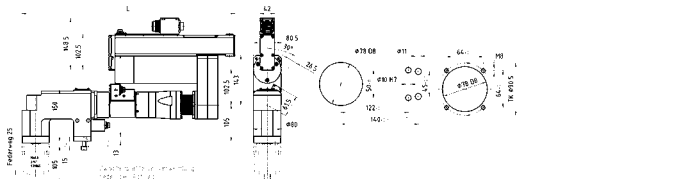
50-300	421	50	3/4"	
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Angle drive, twin transducer (redundant)



50-300	437	25	3/4"	
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Angle drive with reversible gears, twin transducer (redundant)



50-300	437	25	3/4"	
--------	-----	----	------	--

Smallest scribed circle diameter in mm			
Number of spindles	Model 3		
	Attachment		Angle drive
	Straight	Offset	
2	81	59	81
3	94	69	94
4	116	84	116
5	139	102	139
6	164	122	164
7	189	138	189

	Min. Center-Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	81	701	16.2	3BTS-3B300A-2/3K2B-3ZB	947578A5	910613	185	S308436
								
	81	528	18.2	3BUTS-3B300A-2/3K2B-3ZB	947584A7	910613	185	S308436
								
	59	696	17.3	3BTS-3B300A-3K2B-3VK2B	947580A1	910613	185	S308439
								
	59	523	19.3	3BUTS-3B300A-3K2B-3VK2B	947586A5	910613	185	S308439
								
	81	790	19.9	3BTS-3B300A-3K2B-3WK2B	947582A9			929065
								
	81	617	21.9	3BUTS-3B300A-3K2B-3WK2B	947588A3			929065

The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).

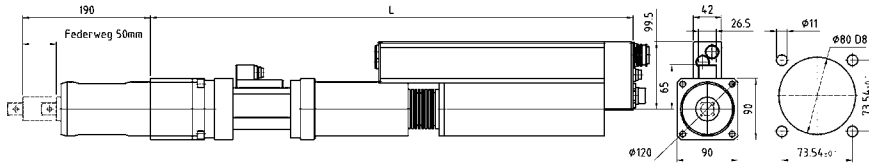
= maximum accessibility. Floating adapter not included with spindle.

2D and 3D are available to download at www.apexpowertools.com in the Customer Support section or on www.apexpowertools.eu in the download area.

BTS Models

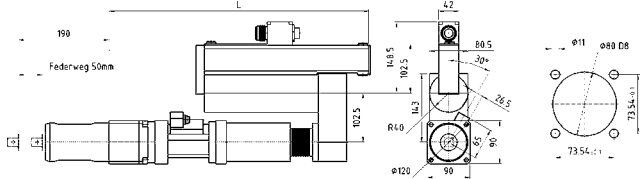
Torque Range	Speed	Float	Square Drive
	RPM		
Nm	max.	mm	inch

Straight drive, single transducer



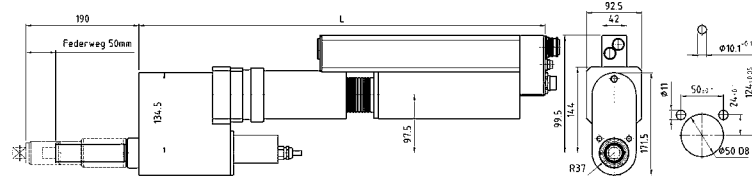
100-500	254	50	3/4"
130-660	174	50	1"
320-1250 ¹	86	50	1"
400-1600 ¹	68	50	1 1/2"

Straight drive with reversible gears, single transducer



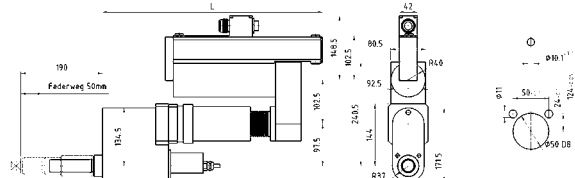
100-500	254	50	3/4"
130-660	174	50	1"
320-1250 ¹	86	50	1"
400-1600 ¹	68	50	1 1/2"

Offset drive, single transducer



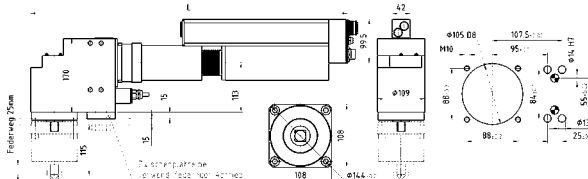
100-500	238	50	3/4"
130-660	163	50	1"
160-750	135	50	1"

Offset drive with reversible gears, single transducer



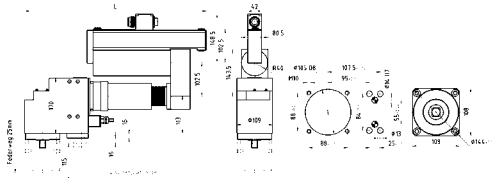
100-500	238	50	3/4"
130-660	163	50	1"
160-750	135	50	1"

Angle drive, single transducer



100-500	245	25	1"
130-660	167	25	1"

Angle drive with reversible gears, single transducer

















100-500	245	25	1"
130-660	167	25	1"

¹ Special version - technical drawings on request.

*2800 Nm spindle available on request.

Smallest scribed circle diameter in mm				
Model 4				
Number of spindles	Attachment			Angle drive
	Straight	**	Offset	
2	91	121	76	112
3	122	152	88	130
4	130	172	108	160
5	174	230	130	192
6	217	281	153	224
7	246	327	180	263

	Min. Center- Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	91	719	21	4BTS-4B500A-4K2B-4ZA	947589A2	916643	190	
	91	719	21	4BTS-4B660A-4K3B-4ZA	947601A5	916642	186	
	121*	771	29	4BTS-4B360A-4K1B-4Z1250A	947617A7 ¹	S976956	140	
	121*	771	29	4BTS-4B500A-4K2B-4Z1600A	947621A1 ¹	S308441	140	
								
	91	546	22.5	4BUTS-4B500A-4K2B-4ZA	947595A4	916643	190	
	91	546	22.5	4BUTS-4B660A-4K3B-4ZA	947609A7	916642	186	
	121**	599	31	4BUTS-4B360A-4K1B-4Z1250A	947619A5 ¹	S976956	140	
	121**	599	31	4BUTS-4B500A-4K2B-4Z1600A	947623A9 ¹	S308441	140	
								
	76	684	22.5	4BTS-4B500A-4VK2B	947591A8	912106	190	S308440
	76	684	22.5	4BTS-4B660A-4VK3B	947603A3	912147	186	S308474
	76	684	23	4BTS-4B660A-4VK4B	947607A9	912147	186	S308474
								
	76	512	24	4BUTS-4B500A-4VK2B	947597A2	912106	190	S308440
	76	512	24	4BUTS-4B660A-4VK3B	947611A3	912147	186	S308474
	76	512	24.5	4BUTS-4B660A-4VK4B	947615A9	912147	186	S308474
								
	112	729	27.1	4BTS-4B500A-4WK2B	947593A6			929089
	112	729	27.1	4BTS-4B660A-4WK3B	947605A1			929089
								
	112	556	28.6	4BUTS-4B500A-4WK2B	947599A0			929089
	112	556	28.7	4BUTS-4B660A-4WK3B	947613A1			929089

¹ Special version - technical drawings on request

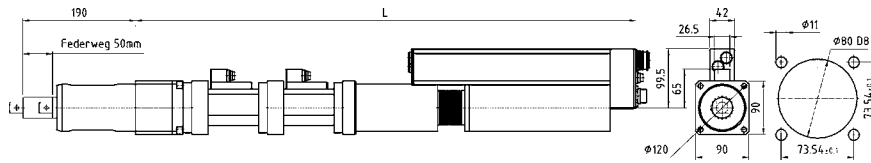
The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).

= maximum accessibility. Floating adapter not included with spindle.

2D and 3D are available to download at www.apexpowertools.com in the Customer Support section or on www.apexpowertools.eu in the download area.

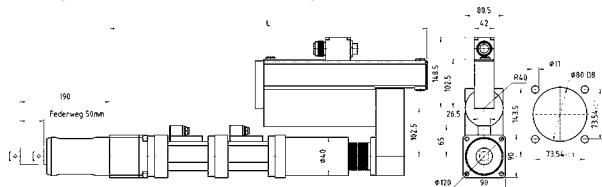
BTS Models	Torque Range	Speed	Float	Square Drive
	Nm	RPM max.	mm	inch

Straight drive, twin transducer (redundant)



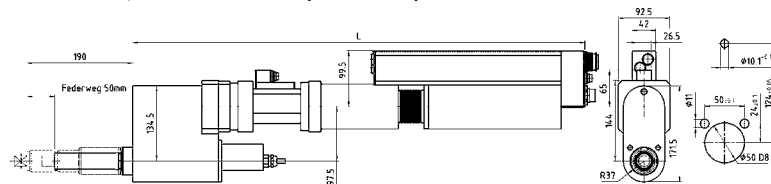
100-500	254	50	3/4"
130-660	174	50	1"
320-1250 ¹	86	50	1"
400-1600 ¹	68	50	1 1/2"

Straight drive with reversible gears, twin transducer (redundant)



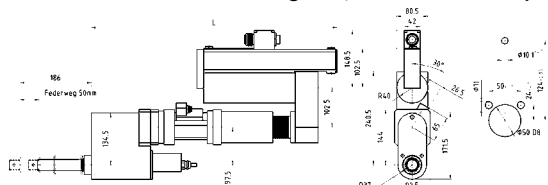
100-500	254	50	3/4"
130-660	174	50	1"
320-1250 ¹	86	50	1"
400-1600 ¹	68	50	1 1/2"

Offset drive, twin transducer (redundant)



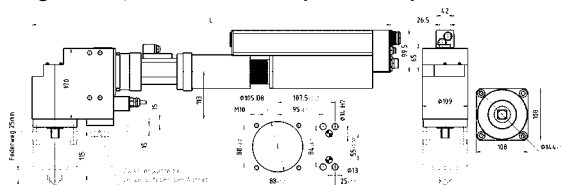
100-500	238	50	3/4"
130-660	163	50	1"
160-750	135	50	1"

Offset drive with reversible gears, twin transducer (redundant)



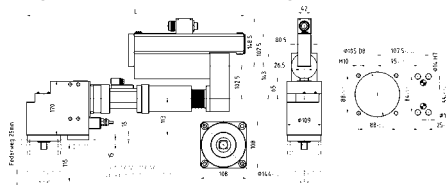
100-500	238	50	3/4"
130-660	163	50	1"
160-750	135	50	1"

Angle drive, twin transducer (redundant)



100-500	245	25	1"
130-660	167	25	1"

Angle drive with reversible gears, twin transducer (redundant)













100-500	245	25	1"
130-660	167	25	1"

¹ Special version - technical drawings on request.

*2800 Nm spindle available on request.

Smallest scribed circle diameter in mm				
Number of spindles	Model 4			
	Attachment			Angle drive
	Straight	**	Offset	
2	91	121	76	112
3	122	152	88	130
4	130	172	108	160
5	174	230	130	192
6	217	281	153	224
7	246	327	180	263

	Min. Center- Center	L	Weight	Design	Order No. DGD Spindle	Floating Adapter		Floating Adapter incl. guide housing
	mm	mm	kg			Order No.	X (mm)	Order No.
								
	91	846	24	4BTS-4B500A-2/4K2B-4ZA	947590A9	916643	190	
	91	846	24	4BTS-4B660A-2/4K3B-4ZA	947602A4	916642	186	
	121**	899	32	4BTS-4B360A-2/4K1B-4Z1250A	947618A6 ¹	S976956	140	
	121**	899	32	4BTS-4B500A-2/4K2B-4Z1600A	947622A0 ¹	S308441	140	
								
	91	674	25.5	4BUTS-4B500A-2/4K2B-4ZA	947596A3	916643	190	
	91	674	25.5	4BUTS-4B660A-2/4K3B-4ZA	947610A4	916642	186	
	121**	726	34	4BUTS-4B360A-2/4K1B-4Z1250A	947620A2 ¹	S976956	140	
	121**	726	34	4BUTS-4B500A-2/4K2B-4Z1600A	947624A8 ¹	S308441	140	
								
	76	812	25.5	4BTS-4B500A-4K2B-4VK2B	947592A7	912106	190	S308440
	76	812	25.5	4BTS-4B660A-4K3B-4VK3B	947604A2	912147	186	S308474
	76	812	26	4BTS-4B660A-4K3M-4VK4B	947608A8	912147	186	S308474
								
	76	639	27	4BUTS-4B500A-4K2B-4VK2B	947598A1	912106	186	S308440
	76	639	27	4BUTS-4B660A-4K3B-4VK3B	947612A2	912147	181	S308474
	76	639	27.5	4BUTS-4B660A-4K3M-4VK4B	947616A8	912147	181	S308474
								
	112	856	30.1	4BTS-4B500A-4K2B-4WK2B	947594A5			929089
	112	856	30.1	4BTS-4B660A-4K3B-4WK3B	947606A0			929089
								
	112	684	31.6	4BUTS-4B500A-4K2B-4WK2B	947600A6			929089
	112	684	31.7	4BUTS-4B660A-4K3B-4WK3B	947614A0			929089

¹ Special version - technical drawings on request

The transducer can be rotated for crowded multiple spindle arrangements (DGD 15° radial toothing).

= maximum accessibility. Floating adapter not included with spindle.

2D and 3D are available to download at www.apexpowertools.com in the Customer Support section or on www.apexpowertools.eu in the download area.

Versatility To Work With Many Tool Configurations

DGD Intelligent Spindles can be used in conjunction with any Cleco DC electric tool combination – cordless LiveWire or corded handheld – and with the mPro400GC Global Controller for even greater efficiencies.

Cleco Global Controllers for Intelligent Spindles

Description	Tool Compatibility	Model
Primary	Cleco 18-48 Series, LiveWire, Intelligent Spindle*	MPRO400GC-P
Master	LiveWire, Intelligent Spindle*	MPRO400GC-M
Panel Mount	LiveWire, Intelligent Spindle	MPRO400GC-SG

* Requires quote to accommodate hardware configurations.



Connection & Extension Cables For Intelligent Spindles

HighFlex Quality

- For fixed or flexible routing with heavy-duty requirements in applications with cable drag chain or standard robot applications

SuperHighFlex Quality

- For robot and all high mobility applications (high durability) with complex motion-sequences
- Available on request

mPro400GC-M



Jumper Cables between nutrunners (straight connector)

Primary Field Cable, direct connection between nutrunner and fastening control (straight connector)



Bus-Terminator 961127

System Bus Cable

CPM3

System Cables for Intelligent Spindle

System Bus Cables

Description	Length* (m)	Order No.
System Bus Cable	0.5	544196-005
System Bus Cable	2.0	544196-020
System Bus Cable	5.0	544196-050
System Bus Cable	20.0	544196-200
System Bus Cable	50.0	544196-500

*The cable lengths are specified in decimeters at the end of the order number

Jumper Cables

Description	Length* (m)	Order No.
-------------	-------------	-----------

Highflex Type D (Jumper) straight connector on both sides moulded connector housing



0.5	961104-005
1.0	961104-010
2.0	961104-020

Highflex Type E (Jumper) 90° connector on both sides rotatable cable glands



0.5	961299-005
1.0	961299-010
2.0	961299-020

*The cable lengths are specified in decimeters at the end of the order number.
Other cable length on request.

Primary Field Cables

Description	Length* (m)	Order No.
Highflex Type A Straight connector on both sides	0,5	961104-005
	1	961104-010
	2	961104-020
	3	961104-030
	4	961104-040
	5	961104-050
	6	961104-060
	7	961104-070
	8	961104-080
	9	961104-090
	10	961104-100
	15	961104-150
	20	961104-200
	30	961104-300
	40	961104-400
	50	961104-500

Highflex Type A Straight connector on both sides



*The cable lengths are specified in decimeters at the end of the order number

Warranty

Apex Tool Group, LLC warrants products and parts sold by it, insofar as they are of its own manufacture, against defects of material and workmanship, under normal use and service in accordance with its written instructions, recommendations, and ratings for installation, operation, maintenance, and service of products, for a period of **ONE YEAR FROM THE DATE OF INITIAL USE, BUT IN NO EVENT SHALL THE WARRANTY EXCEED 24 MONTHS FROM DATE OF DELIVERY TO DISTRIBUTOR.** Proof of Purchase with shipment date must be furnished by the user to validate the warranty. This warranty applies only to products manufactured by Apex Tool Group and specifically excludes products manufactured by others. Products not manufactured by Apex Tool Group are warranted only to the extent and in the manner warranted to Apex Tool Group by the manufacturer

and then only to the extent Apex Tool Group is able to enforce such warranty. Apex Tool Group's warranty with respect to products manufactured by it is limited to the repair or replacement, as Apex Tool Group may elect, of any defective part regarding which the Distributor has given 5 days written notice from the discovery of such defect. Installation and transportation costs are not included. Apex Tool Group shall have the option of requiring the return to it of the defective material, transportation prepaid, for inspection. No allowance will be made for repairs without Apex Tool Group approval. **APEX TOOL GROUP MAKES NO OTHER WARRANTY OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, AND HEREBY DISCLAIMS ALL WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Lubrication Products

Apex Tool Group products are classified as non-hazardous manufactured items, defined in the OSHA 1910.1200 Hazard Communication Standard as "Articles". These products, under conditions of normal use, do not release or cause exposure to a hazardous chemical.

Under normal conditions of use, lubrication products sold separately for or used within these tools should not cause an exposure hazard. Refer to the Material Safety Data Sheet (M.S.D.S.) for Safety and Disposal Information. M.S.D.S. sheets are available upon request from Apex Tool Group.

Apex Tool Group is also aware of, and complies with, the provisions of section 611 amendments

to the Clean Air Act of 1990. No ozone depleting chemicals have been used in the manufacture of our products.

If you resell or distribute these products, you have the responsibility for ensuring that the Material Safety Data Sheets are provided to the purchaser.

Proper lubrication is essential to the economical operation of pneumatic and electric tools. Apex Tool Group perform better and their life is extended by using the recommended lubricants. All lubricants that are listed in the accessory section of this catalog have undergone extensive testing and are recommended for use with Apex Tool Group products.

Fastener Selection

The suggested fasteners listed in this catalog are determined by matching a tool's maximum rated load to Society of Automotive Engineers (SAE) Grade 5 and International Organization of Standardization (ISO) Grade 9.8 fasteners. The torque capabilities for SAE Grade 5 fasteners are from SAE Manual, SAE J429 (Mechanical and Material Requirement for Externally Threaded Fasteners). The torque capabilities for ISO Grade 9.8 fasteners are from ISO 898-1 (Mechanical Properties of Fasteners). All values selected are based on lubricated fasteners.

The suggested fasteners listed in this catalog are advisory only, and Apex Tool Group recommends that you further consult other technical references before final tool selection. Reliance on the accuracy of this catalog data for any purpose by anyone is at the sole risk of that person. Apex Tool Group is not responsible for any loss, claim, or damage arising from improper tool selection.

The torque values listed under the headings "TORQUE" are tested on an ISO 5393 soft joint rate test fixture unless otherwise stated by a special note.

Power Tools Sales & Service Centers

Please note that all locations may not service all products. Please contact the nearest Apex Tool Group Sales & Service Center for the appropriate facility to handle your service requirements.

DETROIT, MICHIGAN

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Parkway North, Suite 200
Houston, TX 77041
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Fax: (713) 849 2047

SEATTLE, WASHINGTON

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Fax: (425) 497 0496

LEXINGTON, SC

Apex Tool Group

670 Industrial Drive
Lexington, SC 29072
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Tel: (803) 951 7544
Fax: (803) 358 7681

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Buena Park, CA 90621
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Fax: (714) 994-9576

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