

WITTENSTEIN
motion control



ternary[®]
All-in-One System



ternary®

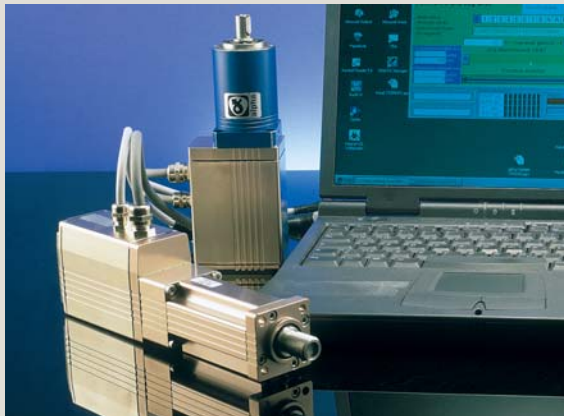
All-in-One System

ternary is an integrated intelligent actuator system, providing intelligent motion control with more flexibility, controllability and precision than a pneumatic actuator ...

... at far less cost and with significantly less engineering than a custom servo system.

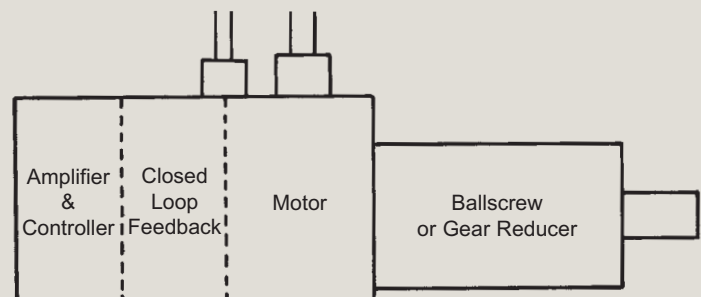
ternary is an integrated closed-loop system, consisting of amplifier & controller, incremental encoder, brushless motor, and mechanics – all in a single package. It provides easy control of position, velocity, acceleration and force/force or force, and allows for mid-move velocity changes. Precise control of multiple points eliminates the need for mechanical stops and limit switches.

- Rotary version offers optional mechanical holding brake and planetary gear reducer.
- Linear version includes an integrated ballscrew with various stroke lengths and forces, plus optional mechanical holding brake.
- Standard-length connectorized cables make installation fast and easy.
- All-in-one design saves cabinet space.
- PC-based set-up software and optional PDA provide quick and easy set up.
- DeviceNet and Profibus versions available



ternary® – The Third Step in Integration.

Electronic control, motor, mechanical actuator integrated into a single package.



ternary® – leverage the talents of your ternary®

Integrated Drive Cuts Costs

ternary is an all-in-one mechatronic actuator system that can be installed and set up in minutes. ternary cuts costs compared to pneumatic/hydraulic or custom servo solutions:

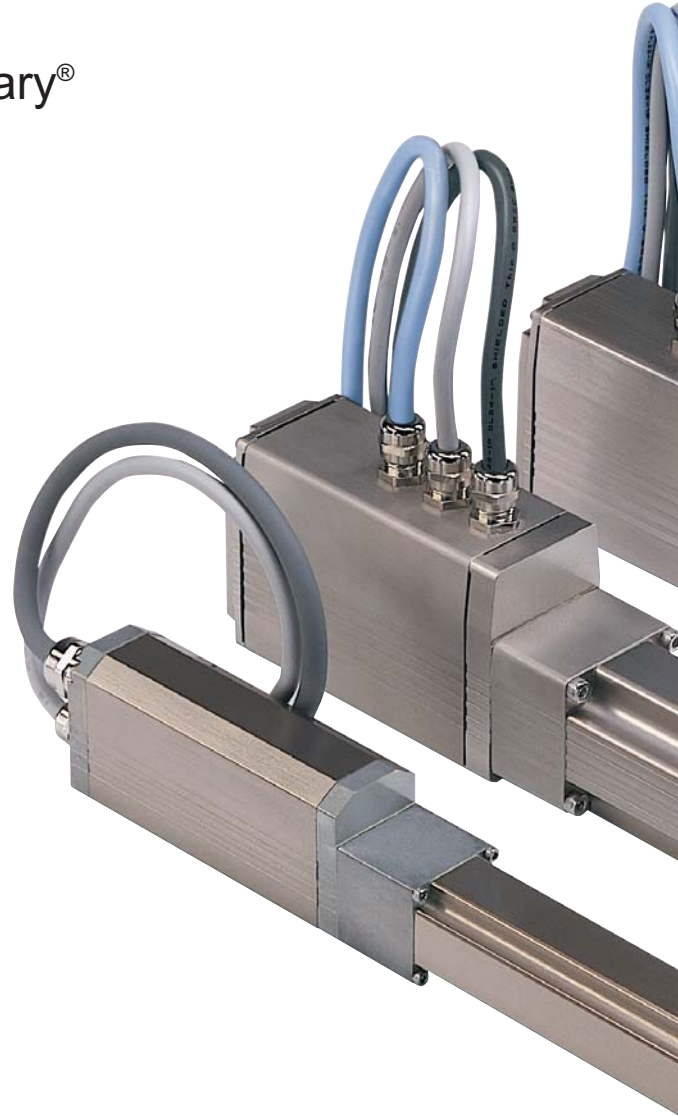
- No piping, valving, air/oil supply necessary
- Connectorized signal and power cables in standard lengths for easy installation - no discrete wiring to run!
- No electronic enclosure required
- No complicated systems integration necessary

Functional Description

The rotary ternary system provides rotary motion on 5 to 12 mm diameter shafts at up to 4500 rpm. Position can be programmed in degrees. Models are available with integrated planetary gear reducer to provide increased force at reduced speed.

The linear ternary system features a ballscrew that drives a rod and provides programmable position, velocity and force functions. In positioning mode, up to 16 points can be stored in the integrated controller via a PC or PLC, down to 0.0075 mm resolution. In the force mode, the actuator can be set to stop motion when it reaches a preset force.

Via the standard serial communications interface, a PC can store a point table and send position changes via the RS485 channel, creating a virtually infinite number of points.



Cutting edge innovations made by WITTENSTEIN

We have been developing, manufacturing and distributing low-backlash planetary gear reducers, servo right-angled gear reducers, complete drive units and planetary elevator machines with an integrated servo motor since 1984.

Profit from our comprehensive service package: from individual components to complete systems, supported by our competent engineering services, several hundred employees worldwide are committed to our cause with operations in the U.S., UK, France, Italy, Belgium and Japan. WITTENSTEIN's headquarters are in Igersheim, Germany.

WITTENSTEIN motion control is a member of **WITTENSTEIN** which has rightly established a name for itself with numerous innovations in industries such as aerospace and simulation, medical technology, elevator drives and Formula One racing.

WITTENSTEIN – being one with the future!

DeviceNet & Profibus Interfaces

- Allow running ternary directly under fieldbus control
- Simplify cabling to the machine
- Eliminate need for additional cabling components
- Use same object motion profile. The same PLC block transfer commands can be used with either version.

proTern™ ternary Digital Assistant Software

- provides project-oriented environment for ternary support
- Used for both on- and off-line ternary software setup
- Intelligent commissioning tool, comprehensive diagnostic tool, OEM application project manager

pockeTern™ Software Toolkit

- Portable PDA version of proTern software
- Download ternary program files to a PDA or pocket PC
- Populate all ternary devices with all required data
- Test, diagnose and adjust ternary systems on the plant floor
- Acts as full-function teach pendant

Leaders of the pack

We are driven by a desire to enhance our customers' success with products and systems from **WITTENSTEIN**. We set benchmarks when it comes to precision, performance and durability. Our trailblazing technology gives our customers an edge in their respective market sectors. Place your trust in premium quality and total reliability from **WITTENSTEIN**. Choose world class engineering – the foundation for strong partnerships and added value that is passed on to your customers.

Benefits at a glance:

Record-breaking lifespan

Extremely long service life resulting from intelligent design, latest synthetic lubrication technology, exclusive sealing technology, and incredibly strong output bearings.

Motor mounting is almost foolproof

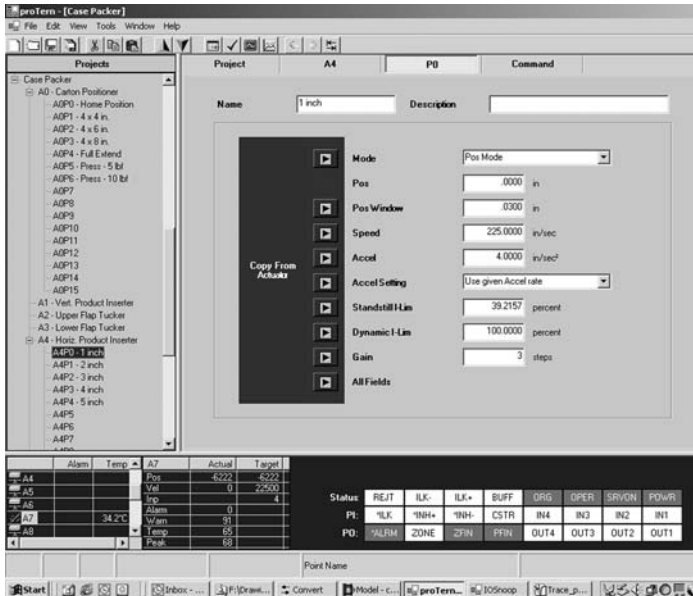
Simple and reliable mounting in a single step.

Top quality from WITTENSTEIN

In-house development and manufacture of all products combined with a pioneering spirit and an insatiable urge to improve.

proTern™ ternary Digital Assistant for Fast, Easy Setup

proTern is a powerful Windows-based software that provides a project-oriented environment for ternary support. It is an intelligent commissioning tool, a comprehensive diagnostic tool, and an OEM application project manager.



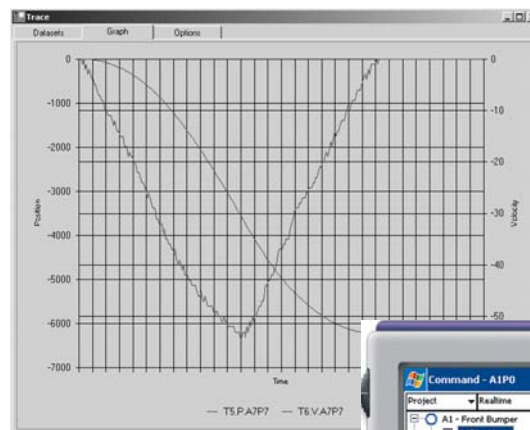
- proTern provides intuitive tools for “Motion in a Minute”
- a project folder is maintained for each machine or application, with any number of projects open simultaneously
- proTern can set up 1-16 ternary axes in a project (system), with up to 16 points for each axis
- proTern can be used for both on-line and off-line development
- proTern reads the ternary preset values for velocity, acceleration and servo gains and presents them to the OEM designer for quick and easy set-up changes
- Select a ternary from a model listing, assign name and description, specify parameter values (travel limits, zone limits, travel direction preferences, etc.) in preferred engineering units
- proTern includes an integrated storage oscilloscope function for quick and easy performance tuning

pockeTern™ Software Toolkit for Portable ternary Set-up

pockeTern™ is a portable version of the powerful proTern™ software that turns a pocket PC or PDA into a portable teach pendant, enabling plant technicians to commission, test, download data, and recalibrate ternary actuators right at the machine on the plant floor. It runs under Pocket PC 2000/2002 or Windows Mobile™ software on a PDA. It requires Microsoft Compact Framework.

The easy-to-use interface graphically displays performance metrics enabling clear, precise readings and calibrations.

pockeTern™ also provides the tools to upload or archive project revisions onto a desktop PC for accurate, organized file management.



Once a ternary Axis is Set Up, the Actuator can be Run via:

- Switches on the machine (parallel I/O)
- A PLC ladder logic program (parallel I/O)
- A C++ program running in a PC (serial I/O)
- Serial Fieldbus I/O

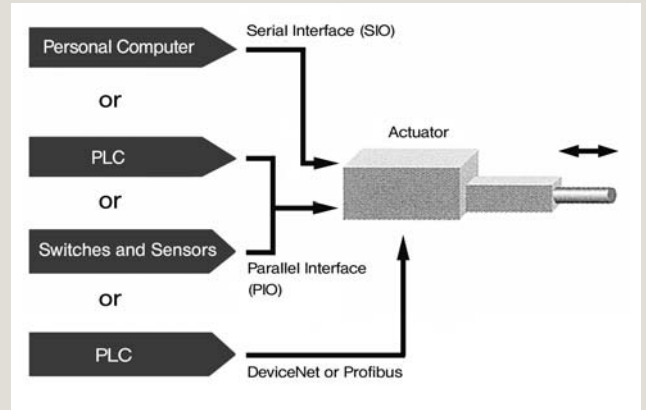
I/O Communications

All ternary actuators are supplied with Parallel I/O and either serial or fieldbus interfaces.

Parallel I/O is used when the machine/ternary is controlled by simple switches or a PLC. The user can easily control the ternary actuator in a conventional ladder logic programming environment, similar to a pneumatic cylinder.

Serial I/O is used to set up the ternary via a PC using proTern™ software and to control the machine/ternary by a PC running a C++ motion control program. Numerous sample programs are available. A combination of up to 16 linear and rotary actuators can be controlled in a system via serial interface.

DeviceNet or Profibus Interfaces are used to run the ternary devices under fieldbus control. The same object motion profile can be used with both DeviceNet and Profibus, allowing the same PLC block transfer commands to be used with either fieldbus version. Up to 63 Devicenet or 125 Profibus actuators can be controlled on a single bus.

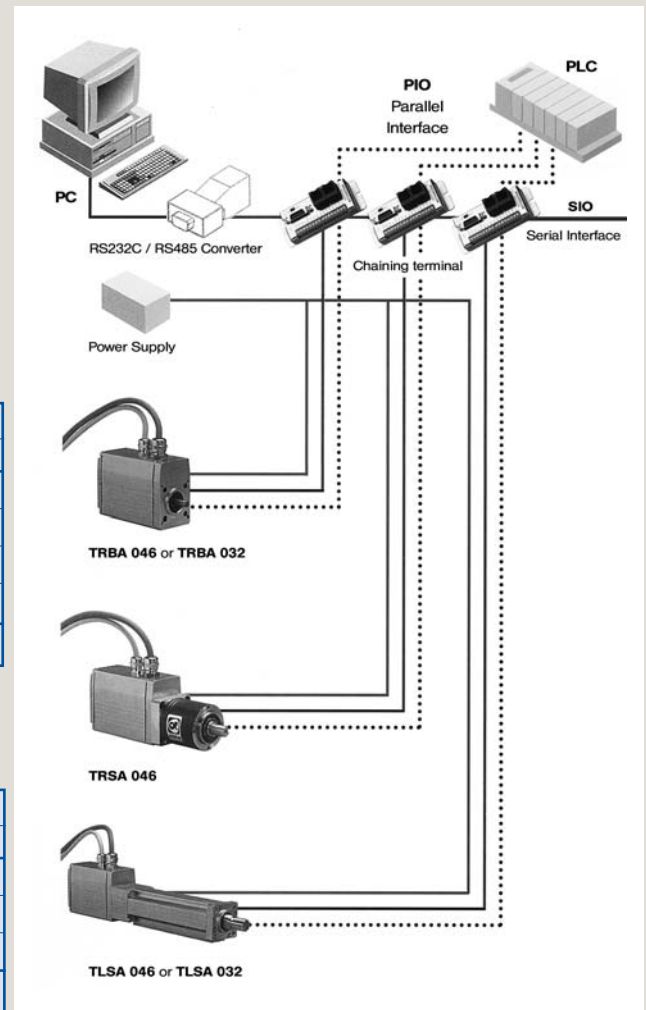


Typical Applications

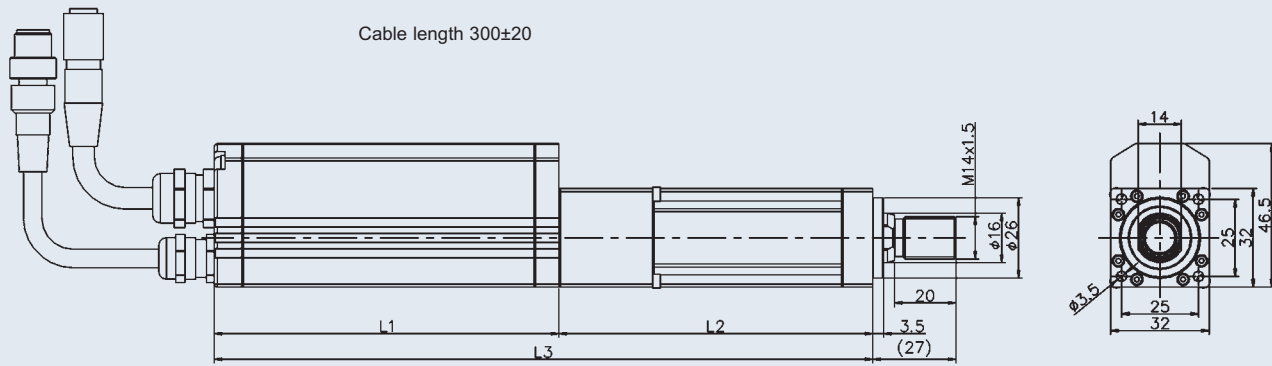
The ternary system provides flexibility and control that is impossible to obtain with a pneumatic actuator. It allows the design of flexible, higher value machines with greater functionality, which can easily accommodate changing product styles and future expansion.

Linear ternary® models			
Size		032	046
		linear	linear
Max. Stroke	mm	25 - 300	25 - 300
Max. Thrust Force	lb _f N	8 (35) - 43 (190)	33 (150) - 135 (600)
Max. Velocity	mm	185 - 900	225 - 900
Max. Repeatability	n _{1Max} mm	±0.004 - ±0.018	±0.0045 - ±0.018
Pages		8 - 9	10 - 13

Rotary ternary® models			
Size		032	046
		rotary	rotary
Max. Force	in.lb Nm	0.71 (0.08)	2.9 (0.33) - 61 (6.9)
Resolution	pulses/rev	800	800 - 20,000
Max. Velocity	rpm	4500	160 - 4500
Pages		16 - 17	18 - 20



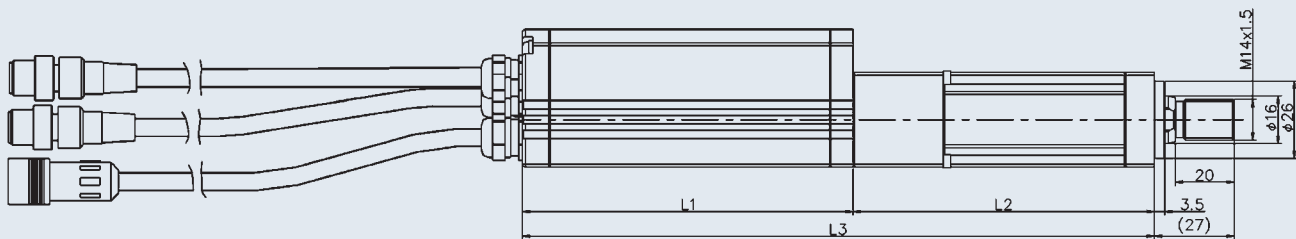
Serial / Parallel Interface



Fieldbus Interface

Cable length 300±20

Fieldbus cable is defined according to each bus type.
See manuals for details.



Type Code ◆ = B, Q / ● = P, C / ■ = B, N	Stroke [mm]	L1 [mm] ¹⁾	L2 [mm]	L3 [mm] ¹⁾	L3 [mm] ¹⁾ Fieldbus	Mass [kg] ¹⁾	Mass [kg] ¹⁾ Fieldbus
TLSA032AA ◆-●02 ■ 01-001	25		106	218 (238.5)	234 (254.5)	0.82 (0.92)	0.89 (1.02)
TLSA032AA ◆-●05 ■ 01-001	50		131	243 (263.5)	259 (279.5)	0.86 (0.96)	0.93 (1.06)
TLSA032AA ◆-●07 ■ 01-001	75		156	268 (288.5)	284 (304.5)	0.90 (1.00)	1.00 (1.10)
TLSA032AA ◆-●10 ■ 01-001	100	112 (148.5)	181	293 (313.5)	309 (329.5)	0.95 (1.05)	1.06 (1.15)
TLSA032AA ◆-●15 ■ 01-001	150		231	343 (363.5)	359 (379.5)	1.03 (1.13)	1.12 (1.23)
TLSA032AA ◆-●22 ■ 01-001	225		306	418 (438.5)	434 (454.5)	1.11 (1.12)	1.21 (1.30)
TLSA032AA ◆-●30 ■ 01-001	300		381	493 (513.5)	509 (529.5)	1.19 (1.29)	1.29 (1.37)

1) Values in parentheses are for brake-equipped versions.

Tip Type	T [mm]	Ms x P	Length [mm]	W [mm]	d [mm]
Male thread with double "D" cut	27	M10 x 1.25	20	12	14
Female with double "D" cut	7	M8 x 1.25	12	12	14
Older style male thread ¹	20	M14 x 1.5	20	-	-

Technical Specifications TLSA032			
Type	Unit	TLSA032AA*-C***01-00*	TLSA032AA*-P***01-00*
Stroke	mm	25 / 50 / 75 / 100 / 150 / 225 / 300	
Maximum force	lb _f (N)	8 (35)	43 (190)
Maximum velocity	mm/sec	900	185
Front flange size	mm	32 x 32	32 x 32
Mechanical interface of rod		16 mm dia. rod, selectable tip ¹ M10 x 1.25 mm male thread M8 x 1.25 mm female M14 x 1.5 mm male (older syle, avail. for replacements)	
Drive mechanism		ballscrew and nut	
Ballscrew lead	mm/rev	12	2.5
Resolution (lead/800 pulses)	mm/pulse	0.015	0.003125
Repeatability	mm	+/- 0.018	+/- 0.004
Lost motion	mm	0.05	0.07
Optional brake type ²	-	Electrically lifted static holding brake	
Brake holding force	lb _f (N)	8 (35)	43 (190)
Maximum thrust available at initialization ³			
- Unit without brake	lb _f (N)	3 (13)	16 (70)
- Unit with brake	lb _f (N)	6 (25)	32 (140)
Protection level	-	IP65*	
Ambient temperature	°C	Operating: 0 to +40 / Storage: -20 to +60	
Ambient humidity	%	Operating and storage: 90 % RH, max, non-condensing	
Supply power required		24 Vdc +/-10 %, 1.5A (1.7A for unit with brake)	
Control command and function		Event driven control. Position, speed and acceleration are controllable 16 pre-stored points. Press mode, software stroke limit, zone signal, alarm detection	
Command interface		Serial I/O (RS485) plus Parallel I/O (sink or source type) Devicenet plus Parallel I/O (sink or source type) PROFIBUS plus Parallel I/O (sink or source type) CANopen (special request) (sink or source type)	

1) Newer output tips (first two listed) include double-D flats for holding with a wrench; older version does not.

2) Static holding brake only. Cannot be used for dynamic braking.

3) Maximum force during ternary initialization at power-up. Thereafter, full maximum force is available.

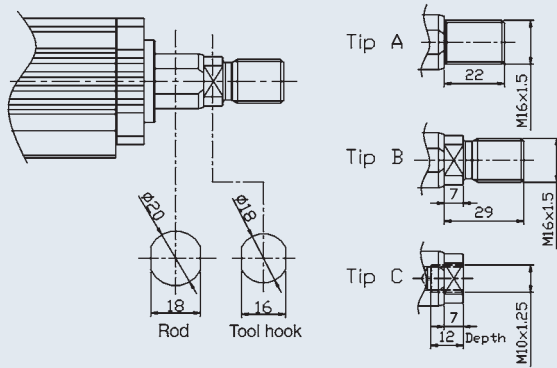
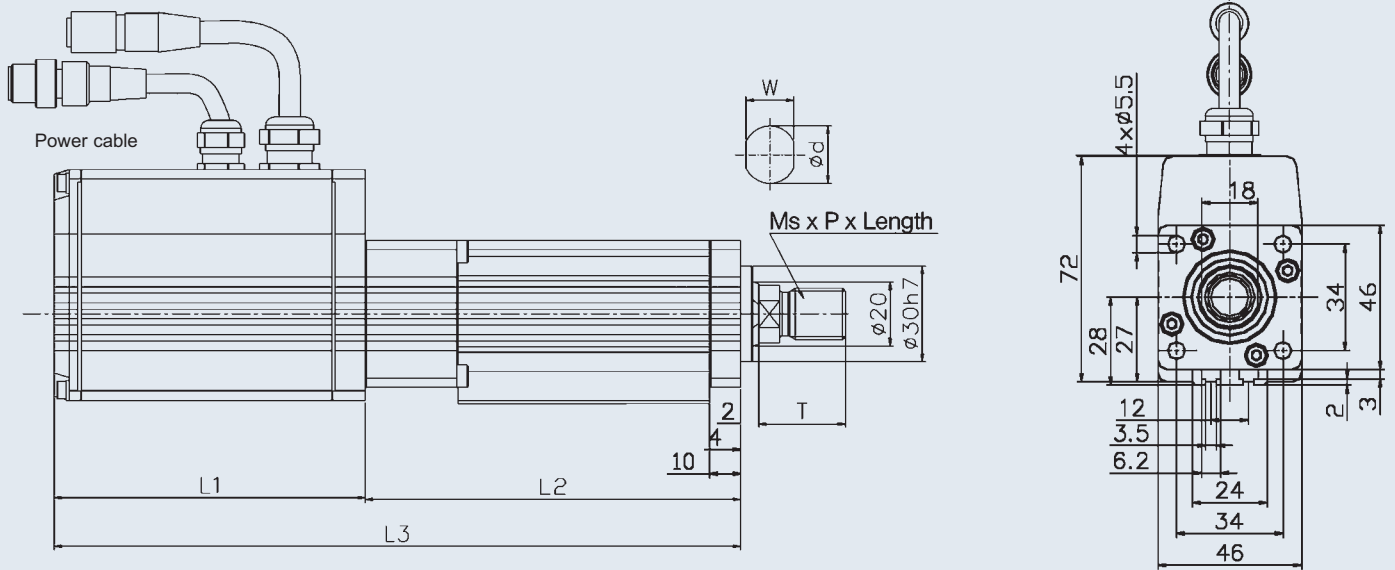
* Caution: IP65 is a guarantee of protection against dust and low pressure water spray coming from any direction for up to 3 minutes at a time. For applications outside of this rating, i.e. the use of cutting fluid or continuous spray of water, please consult with us to determine additional protection measures that might be needed.

Conversion table

1 in	=	25.4 mm
1 in.lb	=	0.113 Nm
1 in.lb.s ²	=	1130 kgcm ²
1 lb _f	=	4.44 N
1 lb _m	=	0.4535 kg

PIO/SIO Cable

Cable length 300±20



Note:
Double D cut surfaces between
Rod and Tool hook are not
arranged in rotational position.

Type Code (Serial/Parallel) ● = 3, C / ■ = B, N	Stroke [mm]	L1 [mm] ¹⁾	L2 [mm]	L3 [mm] ¹⁾	Mass [kg] ¹⁾
TLSA046AAB - ●02 ■01-001	25		117.5	221.5 (247.5)	1.42 (1.6)
TLSA046AAB - ●05 ■01-001	50		142.5	246.5 (272.5)	1.55 (1.73)
TLSA046AAB - ●07 ■01-001	75		167.5	271.5 (297.5)	1.68 (1.86)
TLSA046AAB - ●10 ■01-001	100	104 (130)	192.5	296.5 (322.5)	1.8 (1.98)
TLSA046AAB - ●15 ■01-001	150		242.5	346.5 (372.5)	2.05 (2.23)
TLSA046AAB - ●22 ■01-001	225		317.5	421.5 (447.5)	2.44 (2.62)
TLSA046AAB - ●30 ■01-001	300		392.5	496.5 (522.5)	2.82 (3.0)
TLSA046AAB - 602 ■01-001	25		125.5	229.5 (255.5)	1.42 (1.6)
TLSA046AAB - 605 ■01-001	50		150.5	254.5 (280.5)	1.55 (1.73)
TLSA046AAB - 607 ■01-001	75		175.5	279.5 (305.5)	1.68 (1.86)
TLSA046AAB - 610 ■01-001	100		200.5	304.5 (330.5)	1.8 (1.98)
TLSA046AAB - 615 ■01-001	150	104 (130)	250.5	354.5 (380.5)	2.05 (2.23)
TLSA046AAB - 622 ■01-001	225		325.5	429.5 (455.5)	2.44 (2.62)
TLSA046AAB - 630 ■01-001	300		400.5	504.5 (530.5)	2.82 (3.0)

1) Values in parentheses are for brake-equipped versions.

Tip Type	T [mm]	Ms x P	Length [mm]	W [mm]	d [mm]
Male thread with double "D" cut	29	M16 x 1.5 male	22	16	18
Female with double "D" cut	7	M10 x 1.25 female	12	16	18
Older style male thread ¹	22	M16 x 1.5 male	22	-	-

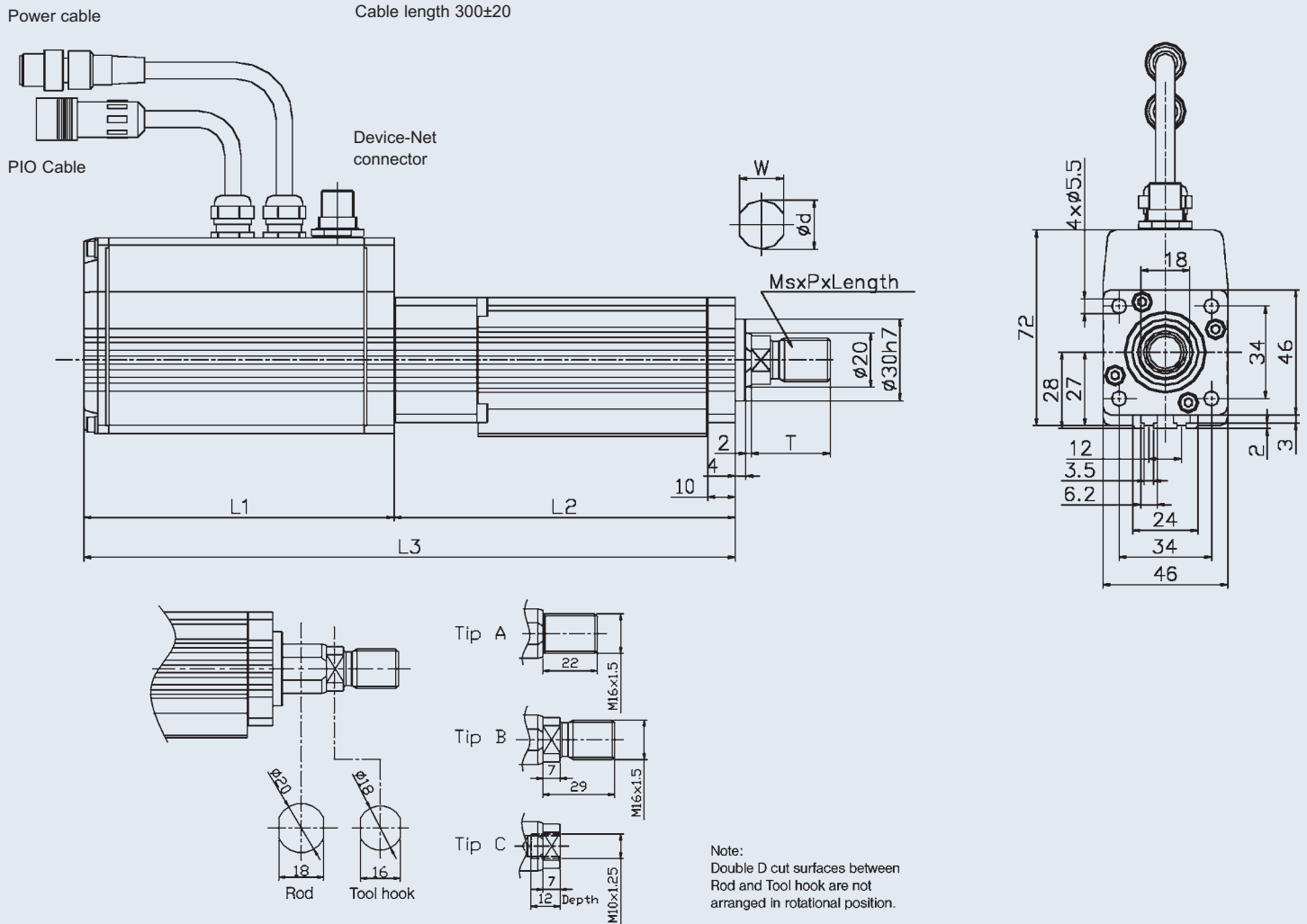
Technical Specifications **TLSA046** Serial/Parallel

Type	Unit	TLSA046AAB- 3***01-001	TLSA046AAB- 6***01-001	TLSA046AAB- C***01-001
Stroke	mm	25 / 50 / 75 / 100 / 150 / 225 / 300		
Maximum force	lb _f (N)	135 (600)	67 (300)	33 (150)
Maximum velocity	mm/sec	225	450	900
Front flange size	mm	46 x 46	46 x 46	46 x 46
Mechanical interface of rod		20 mm dia. rod, selectable tip ¹ M16 x 1.5 mm male thread M10 x 1.25 mm female M16 x 1.5 mm male (older syle, avail. for replacements)		
Drive mechanism		ballscrew and nut		
Ballscrew lead	mm/rev	3	6	12
Resolution (lead/800 pulses)	mm/pulse	0.00375	0.0075	0.0015
Repeatability	mm	+/- 0.0045	+/- 0.009	+/- 0.018
Lost motion	mm	0.05	0.05	0.05
Optional brake type ²	-	Electrically lifted static holding brake		
Brake holding force	lb _f (N)	135 (600)	67 (300)	33 (150)
Maximum thrust available at initialization ³				
- Unit without brake	lb _f (N)	47 (210)	24 (105)	12 (52)
- Unit with brake	lb _f (N)	101 (450)	50 (220)	25 (110)
Protection level	-	IP65*		
Amient temperature	°C	Operating: 0 to +40 / Storage: -20 to +60		
Ambient humidity	%	Operating and storage: 90 % RH max. non-condensing		
Supply power required		24 Vdc +/-10 %, 1.5A (1.7A for unit with brake)		
Control command and function		Event driven control. Position, speed and acceleration are controllable 16 pre-stored points. Press mode, software stroke limit, zone signal, alarm detection		
Command interface		Serial I/O (RS485) plus Parallel I/O (sink or source type) Devicenet plus Parallel I/O (sink or source type) PROFIBUS plus Parallel I/O (sink or source type) CANopen (special request) (sink or source type)		

- 1) Newer output tips (first two listed) include double-D flats for holding with a wrench; older version does not.
2) Static holding brake only. Cannot be used for dynamic braking.
3) Maximum force during ternary initialization at power-up. Thereafter, full maximum force is available.
* Caution: IP65 is a guarantee of protection against dust and low pressure water spray coming from any direction for up to 3 minutes at a time. For applications outside of this rating, i.e. the use of cutting fluid or continuous spray of water, please consult with us to determine additional protection measures that might be needed.

Conversion table

1 in	=	25.4 mm
1 in.lb	=	0.113 Nm
1 in.lb.s ²	=	1130 kgcm ²
1 lb _f	=	4.44 N
1 lb _m	=	0.4535 kg



Type Code (Fieldbus) ◆ = Q, S / ● = 3, C / ■ = B, N	Stroke [mm]	L1 [mm] ¹⁾	L2 [mm]	L3 [mm] ¹⁾	Mass [kg] ¹⁾
TLSA046AA ◆-●02 ■01-001	25		117.5	231.5 (257.5)	1.5 (1.71)
TLSA046AA ◆-●05 ■01-001	50		142.5	256.5 (282.5)	1.66 (1.84)
TLSA046AA ◆-●07 ■01-001	75		167.5	281.5 (307.5)	1.79 (1.97)
TLSA046AA ◆-●10 ■01-001	100	114 (140)	192.5	306.5 (332.5)	1.91 (2.09)
TLSA046AA ◆-●15 ■01-001	150		242.5	356.5 (382.5)	2.16 (2.34)
TLSA046AA ◆-●22 ■01-001	225		317.5	431.5 (457.5)	2.55 (2.73)
TLSA046AA ◆-●30 ■01-001	300		392.5	506.5 (532.5)	2.93 (3.11)
TLSA046AA ◆-602 ■01-001	25		125.5	239.5 (265.5)	1.5 (1.71)
TLSA046AA ◆-605 ■01-001	50		150.5	264.5 (290.5)	1.66 (1.84)
TLSA046AA ◆-607 ■01-001	75		175.5	289.5 (315.5)	1.79 (1.97)
TLSA046AA ◆-610 ■01-001	100		200.5	314.5 (340.5)	1.91 (2.09)
TLSA046AA ◆-615 ■01-001	150	114 (140)	250.5	364.5 (390.5)	2.16 (2.34)
TLSA046AA ◆-622 ■01-001	225		325.5	439.5 (465.5)	2.55 (2.73)
TLSA046AA ◆-630 ■01-001	300		400.5	514.5 (540.5)	2.93 (3.11)

1) Values in parentheses are for brake-equipped versions.

Tip Type	T [mm]	Ms x P	Length [mm]	W [mm]	d [mm]
Male thread with double "D" cut	29	M16 x 1.5 male	22	16	18
Female with double "D" cut	7	M10 x 1.25 female	12	16	18
Older style male thread ¹	22	M16 x 1.5 male	22	-	-

Technical Specifications **TLSA046** Fieldbus

Type	Unit	TLSA046AA*- 3***01-00*	TLSA046AA*- 6***01-00*	TLSA046AA*- C***01-00*
Stroke	mm	25 / 50 / 75 / 100 / 150 / 225 / 300		
Maximum force	lb _f (N)	135 (600)	67 (300)	33 (150)
Maximum velocity	mm/sec	225	450	900
Front flange size	mm	46 x 46	46 x 46	46 x 46
Mechanical interface of rod		20 mm dia. rod, selectable tip ¹ M16 x 1.5 mm male thread M10 x 1.25 mm female M16 x 1.5 mm male (older syle, avail. for replacements)		
Drive mechanism		ballscrew and nut		
Ballscrew lead	mm/rev	3	6	12
Resolution (lead/800 pulses)	mm/pulse	0.00375	0.0075	0.0015
Repeatability	mm	+/- 0.0045	+/- 0.009	+/- 0.018
Lost motion	mm	0.05	0.05	0.05
Optional brake type ²	-	Electrically lifted static holding brake		
Brake holding force	lb _f (N)	135 (600)	67 (300)	33 (150)
Maximum thrust available at initialization ³				
- Unit without brake	lb _f (N)	47 (210)	24 (105)	12 (52)
- Unit with brake	lb _f (N)	101 (450)	50 (220)	25 (110)
Protection level	-	IP65*		
Ambient temperature	°C	Operating: 0 to +40 / Storage: -20 to +60		
Ambient humidity	%	Operating and storage: 90 % RH, max, non-condensing		
Supply power required		24 Vdc +/-10 %, 1.5A (1.7A for unit with brake)		
Control command and function		Event driven control. Position, speed and acceleration are controllable 16 pre-stored points. Press mode, software stroke limit, zone signal, alarm detection		
Command interface		Serial I/O (RS485) plus Parallel I/O (sink or source type) Devicenet plus Parallel I/O (sink or source type) PROFIBUS plus Parallel I/O (sink or source type) CANopen (special request) (sink or source type)		

- 1) Newer output tips (first two listed) include double-D flats for holding with a wrench; older version does not.
2) Static holding brake only. Cannot be used for dynamic braking.
3) Maximum force during ternary initialization at power-up. Thereafter, full maximum force is available.
* Caution: IP65 is a guarantee of protection against dust and low pressure water spray coming from any direction for up to 3 minutes at a time. For applications outside of this rating, i.e. the use of cutting fluid or continuous spray of water, please consult with us to determine additional protection measures that might be needed.

Conversion table

1 in	=	25.4 mm
1 in.lb	=	0.113 Nm
1 in.lb.s ²	=	1130 kgcm ²
1 lb _f	=	4.44 N
1 lb _m	=	0.4535 kg

TLSA032 Characteristics

Maximum Force During Initialization

When the TLSA 032 is initialized at power up, the maximum force available is:

without brake:

TLSA032AA*-P**N01-00* 16 lbf (70 N)

TLSA032AA*-C**N01-00* 3 lbf (13 N)

with brake:

TLSA032AA*-P**B01-00* 32 lbf (140 N)

TLSA032AA*-C**B01-00* 6 lbf (26 N)

When a unit with Brake is used, these max. allowable force values are doubled.

The load on the ternary from any source (including gravity) must not exceed this value during start-up and initialization, or the TLSA may enter an alarm state, with the system failing to initialize. After initialization, these limitations are no longer valid and full maximum force is available.

Allowable Torsional Moment on Rod

Allowable torsional moment on the output rod is 0.5 Nm. This is independent of the rod position.

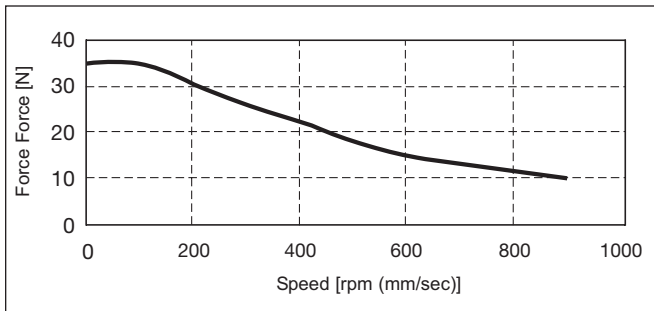
Optional Holding Brake

The TLSA 032 is available with an optional holding brake.

When ordered, this is integrated into the mechatronic unit. Specifications, additional dimensions, and additional mass are:

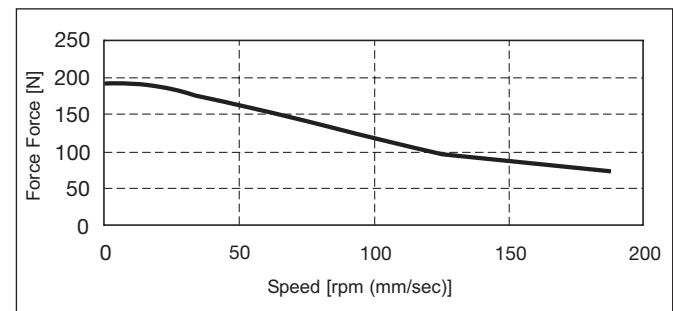
Data	Value	
	2.5 mm pitch	12 mm pitch
Holding Force l_b (N)	43 (190)	8 (35)
Additional Mass kg	0.1	0.1
Additional Length mm	20.5	20.5

TLSA032AA*-C**N01-00*



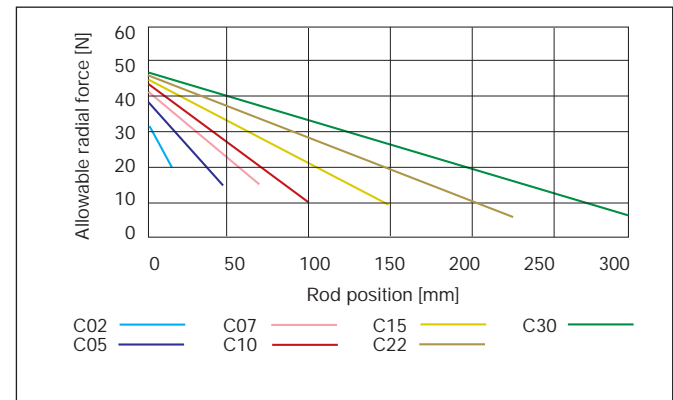
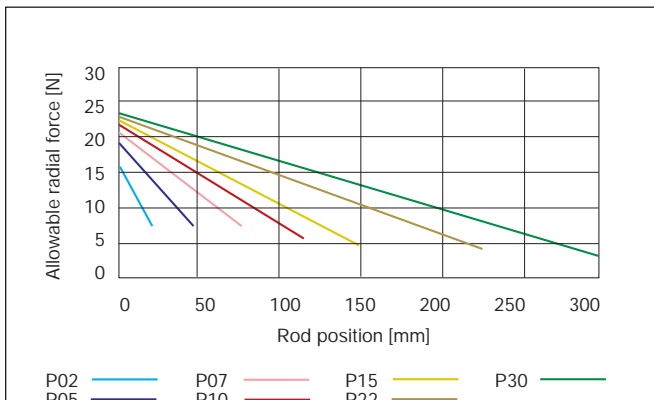
Under nominal conditions: 24 Vdc supply voltage, 25 °C ambient temperature.

TLSA032AA*-P**N01-00*



Allowable Radial Force

Allowable radial force is specified as the maximum value for each stroke length. Unsupported loads on the output rod should be avoided. Do not exceed the radial forces specified in the illustration. Exceeding these forces during installation or operation may result in loss of performance and/or premature wear of the actuator.



TLSA046 Characteristics

Maximum Force During Initialization

When the TLSA 046 is initialized at power up, the maximum force available is:

without brake:

TLSA046AA*-3**N01-00* 47 lbf (210 N)

TLSA046AA*-6**N01-00* 24 lbf (105 N)

TLSA046AA*-C**N01-00* 12 lbf (52 N)

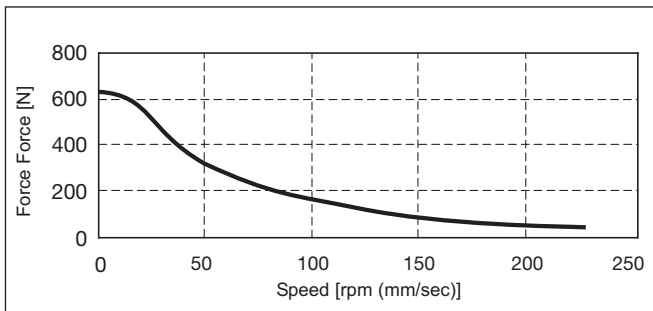
with brake:

TLSA046AA*-3**B01-00* 101 lbf (450 N)

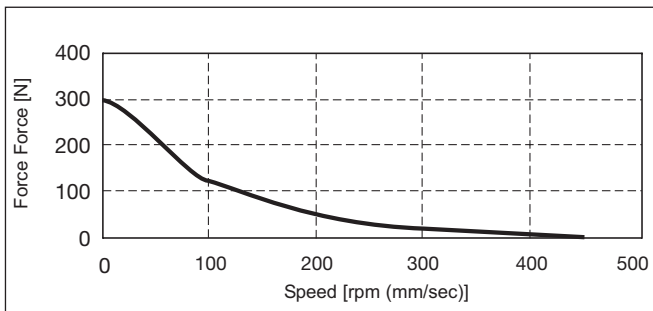
TLSA046AA*-6**B01-00* 50 lbf (220 N)

TLSA046AA*-C**B01-00* 25 lbf (110 N)

TLSA046AA*-3**N01-00*



TLSA046AA*-6**N01-00*



The load on the ternary from any source (including gravity) must not exceed this value during start-up and initialization, or the TLSA may enter an alarm state, with the system failing to initialize. After initialization, these limitations are no longer valid and full maximum force is available.

Allowable Torsional Moment on Rod

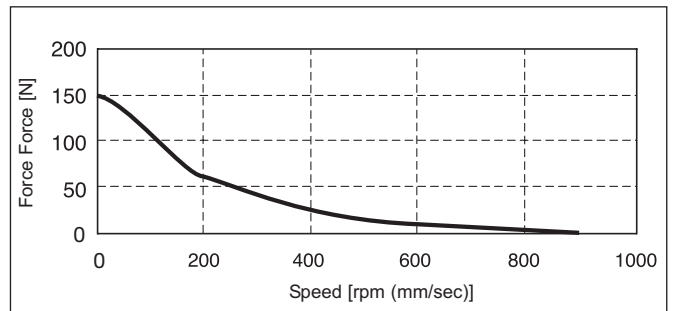
Allowable torsional moment on the output rod is 0.5 Nm. This is independent of the rod position.

Optional Holding Brake

The TLSA 046 is available with an optional holding brake. Then ordered, this is integrated into the mechatronic unit. Specifications, additional dimensions, and additional mass are:

Data	Value		
	3 mm pitch	6 mm pitch	12 mm pitch
Holding Force lbf (N)	135 (600)	67 (300)	33 (150)
Additional Mass kg	0.18	0.18	0.18
Additional Length mm	26	26	26

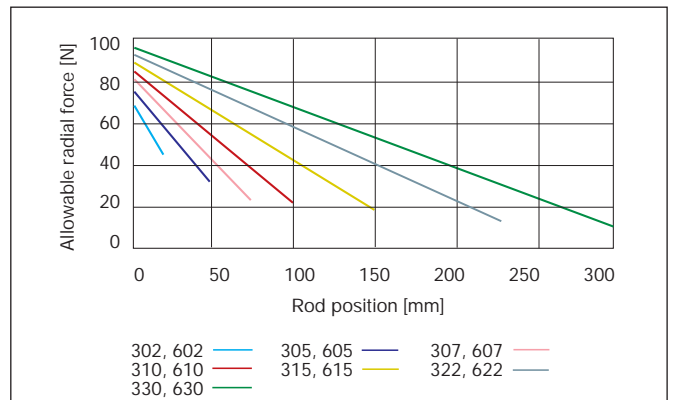
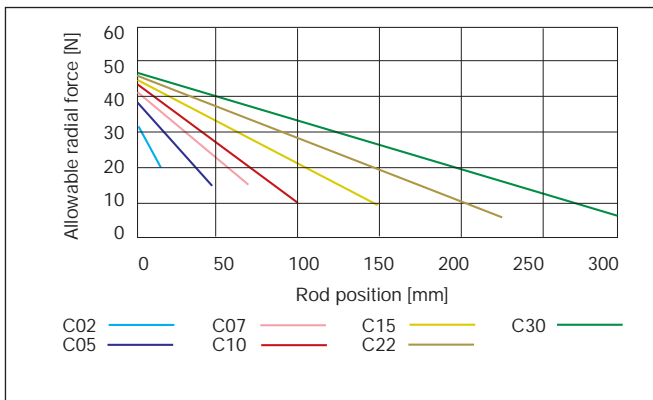
TLSA046AA*-C**N01-00*



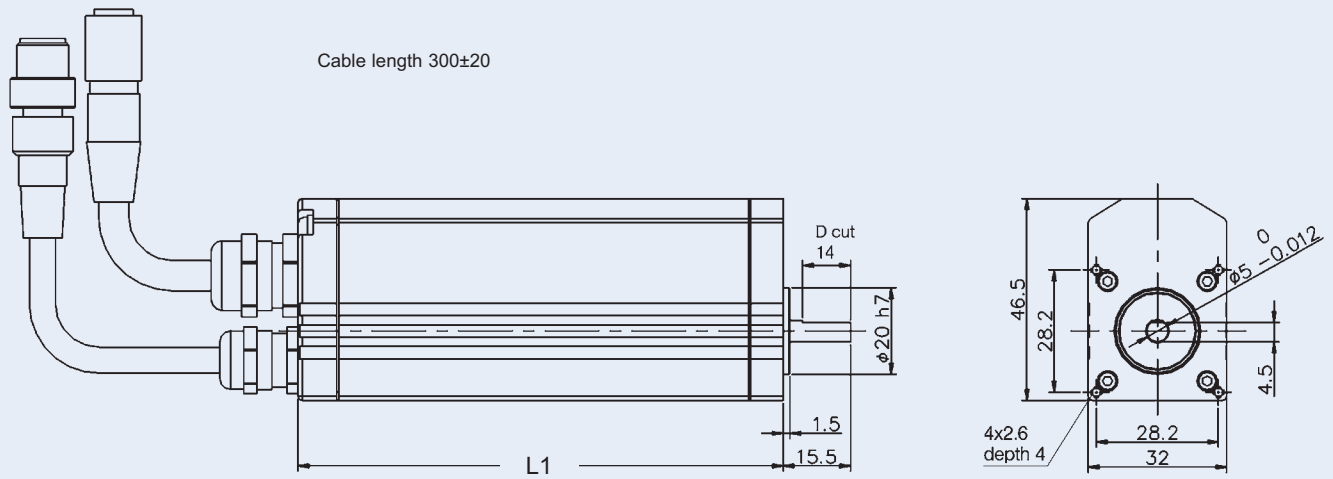
Under nominal conditions: 24 Vdc supply voltage, 25 °C ambient temperature.

Allowable Radial Force

Allowable radial force is specified as the maximum value for each stroke length. Unsupported loads on the output rod should be avoided. Do not exceed the radial forces specified in the illustration. Exceeding these forces during installation or operation may result in loss of performance and/or premature wear of the actuator.



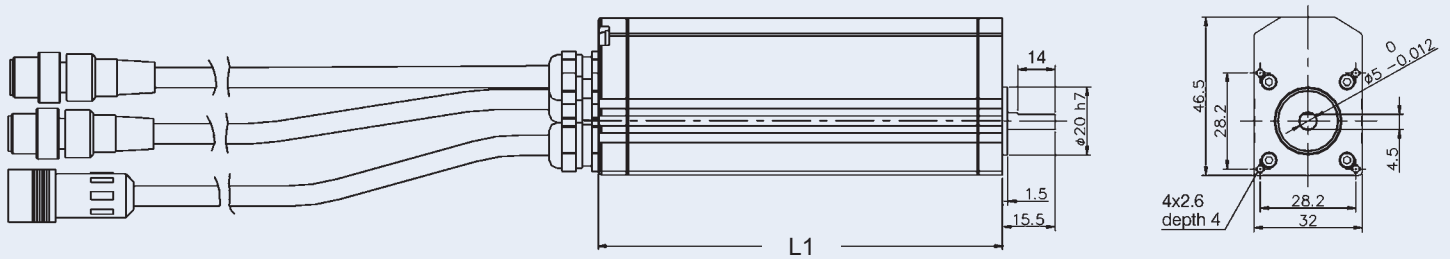
Serial/Parallel Interface without brake



Fieldbus Interface

Cable length 300 ± 20

Fieldbus cable is defined according to each bus type.
See manuals for details.



For optional holding brake, add 20.5 mm to length; add 0.6 kg to mass.

Type	L1 [mm]	L1 [mm] Fieldbus
TLSA046AA*-XXXN01-001	112	128
TLSA046AA*-XXXB01-001	132.5	148.5

Available on special order.
Contact factory for information

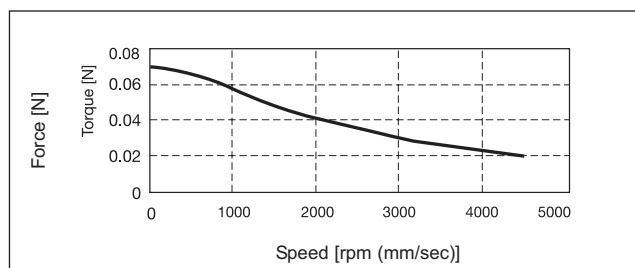
Technical Specifications TRBA032

Type	Unit	TRBA032AAB-XXX*01-001	TRBA032AAQ-XXX*01-001
Maximum force	in.lb (Nm)	0.71 (0.08)	
Maximum velocity	rpm	4500	
Gear ratio		none	
Mechanical shaft interface		Diameter 5 mm, D-cut	
Mass	kg	0.46 (0.52 with brake)	0.53 (0.59 with brake)
Resolution	pulses/rev	800	
Motor rotor moment of inertia	in.lb.s ² (gcm ²)	18	
Maximum radial force on output shaft ¹	lb _f (N)	11.3 (50)	
Maximum axial force on shaft	lb _f (N)	4.5 (20)	
Optional brake type ²		Electrically lifted static holding brake	
Brake holding force	in.lb (Nm)	1.8 (0.2)	
Maximum force available at initialization ³			
- Unit without brake	in.lb (Nm)	0.35 (0.040)	
- Unit with brake		0.42 (0.048)	
Protection level		IP65*	
Ambient temperature	°C	Operating: 0 to +40 / Storage: -20 to +60	
Ambient humidity	%	Operating and storage: 90 % RH, max, non-condensing	
Supply power required		24 Vdc +/-10 %, 1.5A (1.7 for unit with brake)	
Control command and function		Event driven control. Position, speed and acceleration are controllable 16 pre-stored points. Press mode, shortest path control, software stroke limit, zone signal, alarm detection	
Command interface		Serial I/O (RS485) plus Parallel I/O (sink or source type) Devicenet plus Parallel I/O (sink or source type) PROFIBUS plus Parallel I/O (sink or source type) CANopen (special request) (sink or source type)	

- 1) Radial force is specified at midpoint of the output shaft.
 2) Static holding brake only. Cannot be used for dynamic braking.
 3) Maximum force during ternary initialization at power-up. Thereafter, full maximum force is available.
 * Caution: IP65 is a guarantee of protection against dust and low pressure water spray coming from any direction for up to 3 minutes at a time. For applications outside of this rating, i.e. the use of cutting fluid or continuous spray of water, please consult with us to determine additional protection measures that might be needed.

Velocity vs Force Characteristics

TRBA032AA*-XXX*01-001



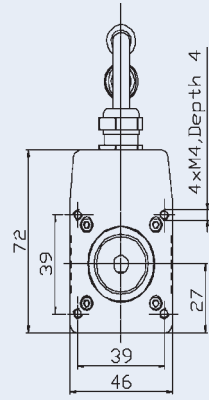
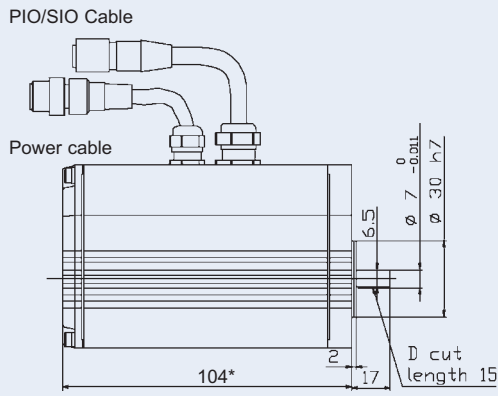
Conversion table

1 in	= 25.4 mm
1 in.lb	= 0.113 Nm
1 in.lb.s ²	= 1130 kgcm ²
1 lb _f	= 4.44 N
1 lb _m	= 0.4535 kg

TRBA046

Serial/Parallel Interface
without gear reducer

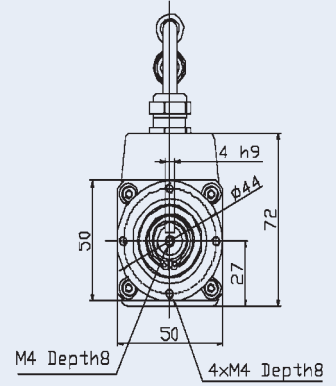
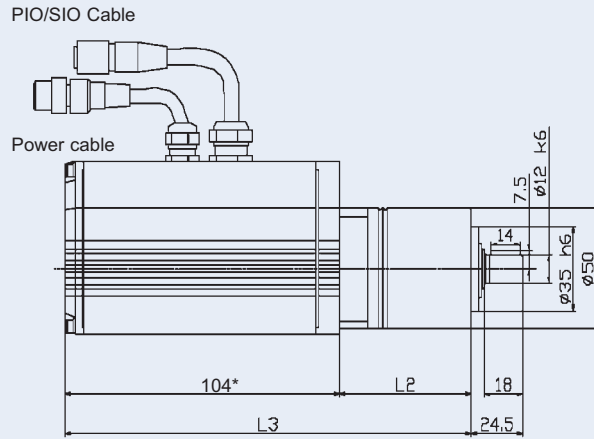
Cable length 300±20



TRSA046

Serial/Parallel Interface
with gear reducer

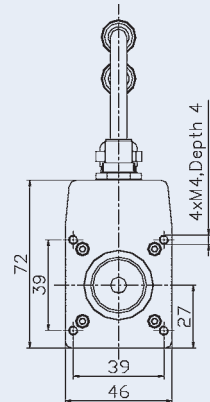
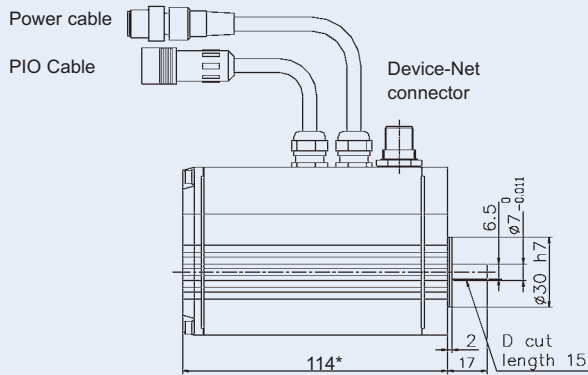
Cable length 300±20



TRBA046

Fieldbus Interface
without gear reducer

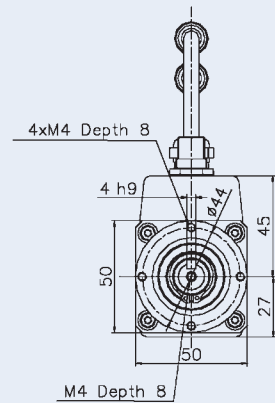
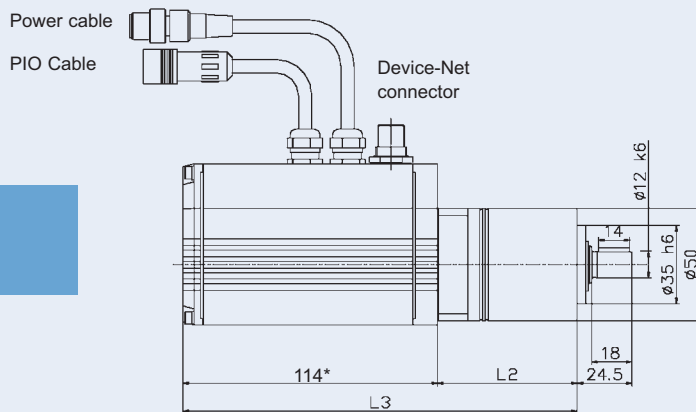
Cable length 300±20



TRSA046

Fieldbus Interface
with gear reducer

Cable length 300±20



* For optional holding brake, add 26 mm to length; add 0.18 kg to mass.
Dimension drawings provided for illustration only. Contact factory for the latest engineering drawings. DXF and 3-D step files are available on request.

Technical Specifications TRBA046 / TRSA046

Type	Unit	TRBA046AA*- XXXN01-001	TRBA046AA*- XXXN05-001	TRSA046AA*- XXXN10-001	TRSA046AA*- XXXN25-001
Maximum force	in.lb (Nm)	2.9 (0.33)	12.4 (1.4)	24.8 (2.8)	61 (6.9)
Maximum velocity	rpm	4500	800	400	160
Gear ratio		1	5	10	25
Gear reducer backlash	arcmin	N/A	12	12	15
Mechanical shaft interface		7mm dia, D-cut		12 mm dia, with keyway	
Mass (without brake) ¹	kg	0.79	1.55	1.55	1.75
Resolution	pulses/rev	800	4,000	8,000	20,000
Motor rotor moment of inertia	in.lb.s ² (kgcm ²)	7.35E-5 (0.083)	7.35E-5 (0.083)	7.35E-5 (0.083)	7.35E-5 (0.083)
Moment of gear inertia at input	in.lb.s ² (kgcm ²)	NA	5.22E-5 (0.059)	5.22E-5 (0.059)	4.87E-5 (0.055)
Maximum radial force on output shaft ²	lb _f (N)	16 (70)	146 (650)	146 (650)	146 (650)
Maximum thrust force on shaft	lb _f (N)	78 (30)	158 (700)	158 (700)	158 (700)
Optional brake type ³	-	Electrically lifted static holding brake			
Brake holding force	in.lb (Nm)	2.9 (0.33)	14.6 (1.65)	29.2 (3.3)	73 (8.25)
Maximum force available at initialization ⁴					
- Unit without brake	in.lb (Nm)	1.2 (0.14)	5.6 (0.63)	11.2 (1.26)	27.9 (3.15)
- Unit with brake	in.lb (Nm)	1.8 (0.2)	8.8 (1.0)	17.7 (2.0)	44.2 (5.0)
Protection level		IP65*	IP64	IP64	IP64
Ambient temperature	°C	operation: 0 to +40 / storage: -20 to +60			
Ambient humidity	%	operation & storage: 90 % RH max., non-condensing			
Supply power required		24 Vdc +/-10 %, 1.5 A (1.7 A with brake)			
Control command and function		Event driven control. Position, speed and acceleration are controllable 16 pre-stored points. Press mode, shortest path control, software stroke limit, zone signal, alarm detection Serial I/O (RS485) plus Parallel I/O (sink or source type)			
Command interface		Devicenet plus Parallel I/O (sink or source type) PROFIBUS plus Parallel I/O (sink or source type) CANopen (special request) (sink or source type)			

1) Add 0.18 kg to mass for units with brake.

2) Radial force is specified at midpoint of the output shaft.

3) Static holding brake only. Cannot be used for dynamic braking.

4) Maximum force during ternary initialization at power-up. Thereafter, full maximum force is available.

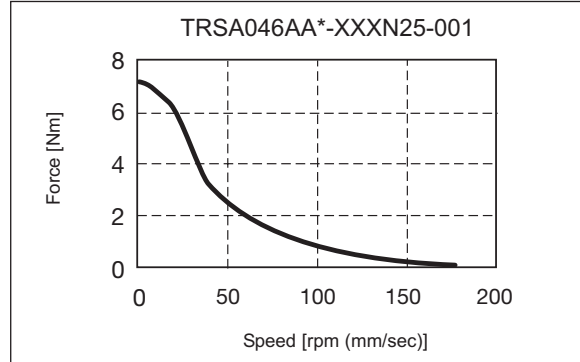
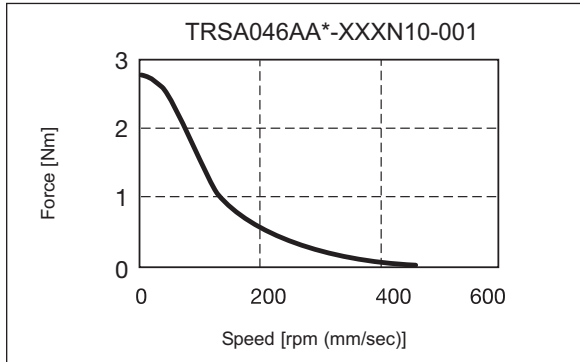
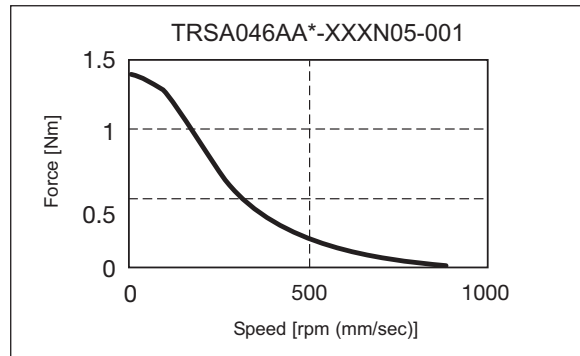
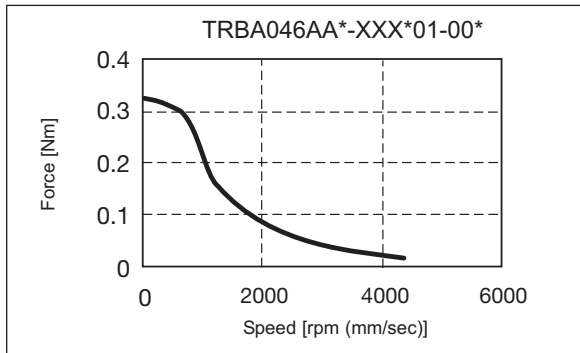
* Caution: IP65 is a guarantee of protection against dust and low pressure water spray coming from any direction for up to 3 minutes at a time. For applications outside of this rating, i.e. the use of cutting fluid or continuous spray of water, please consult with us to determine additional protection measures that might be needed.

Type	L2 [mm]	L3 [mm]*	L3 [mm]* Fieldbus
TRSA046AA*-XXXN05-001	63	167	177
TRSA046AA*-XXXN10-001	63	167	177
TRSA046AA*-XXXN25-001	78	182	192

Conversion table

1 in	= 25.4 mm
1 in.lb	= 0.113 Nm
1 in.lb.s ²	= 1130 kgcm ²
1 lb _f	= 4.44 N
1 lb _m	= 0.4535 kg

Velocity vs Force Characteristics



Under nominal conditions:
24 Vdc supply voltage, 25 °C ambient temperature.

Optional Holding Brake

The rotary ternary is available with an optional holding brake. When ordered, this is integrated into the mechatronic unit. Specifications, additional dimensions and additional mass are:

Type	Unit	TRBA046AA*- XXX B01 -001	TRSA046AA*- XXX B05 -001	TRSA046AA*- XXX B10 -001	TRSA046AA*- XXX B25 -001
Brake Holding Force	in.lbf (Nm)	2.9 (0.33)	14.6 (1.65)	29.2 (3.3)	73 (8.25)
Additional Mass	kg	0.18	0.18	0.18	0.18
Additional Length	mm	26	26	26	26
Motor Rotor Moment of Inertia	$\times 10^{-7}$ kgm ²	87	87	87	87

Mounting rotary

Mounting – without gear reducer

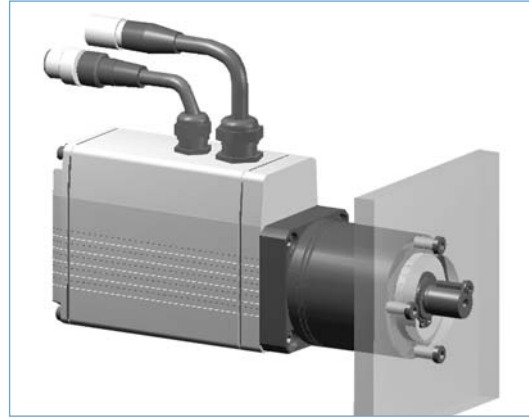
The size 46 (without gear reducer) is mounted to a flange via four tapped holes in the faceplate, using M4 bolts. The size 32 is mounted using M2.6 bolts.



Mounting – with planetary gear reducer

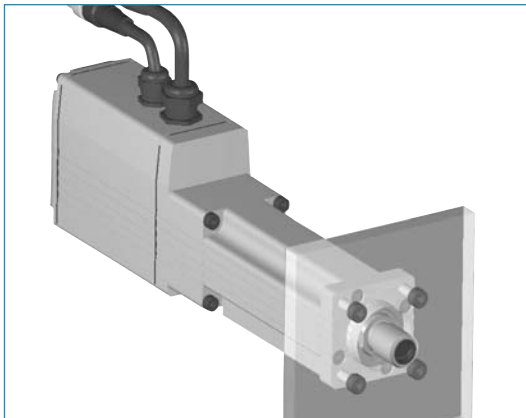
The TR units with gear reducer are mounted to a flange via four tapped holes in the faceplate using M4 bolts, as illustrated. The gear reducer is the alpha LP-50 series. Contact a sales representative or alpha gear drives, Inc. for a brochure with more detailed information on this gear reducer.

A NEMA 23 output flange is available. Contact WITTENSTEIN for details.



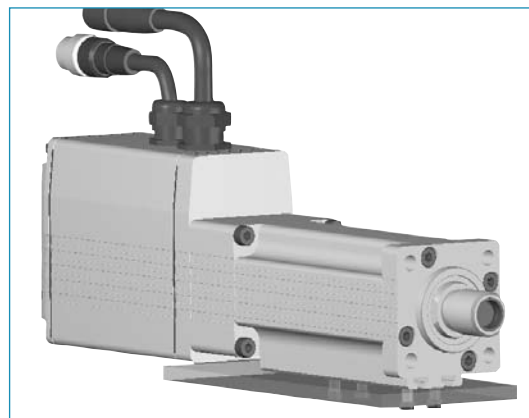
Mounting linear

Both the TLSA 032 and TLSA 046 can be flange mounted as illustrated. The TLSA 032 uses M3 bolts, while the TLSA 046 uses M5 bolts.



The TLSA 046 ternary can also be mounted via T-slots on the bottom of the unit, as illustrated. T-slot mounting nuts are available (see page 42). They are square nuts that slide into the T-slots and are used for mounting the ternary to a surface using M3 bolts.

T-slot mounting is not available on the 032 flange version.



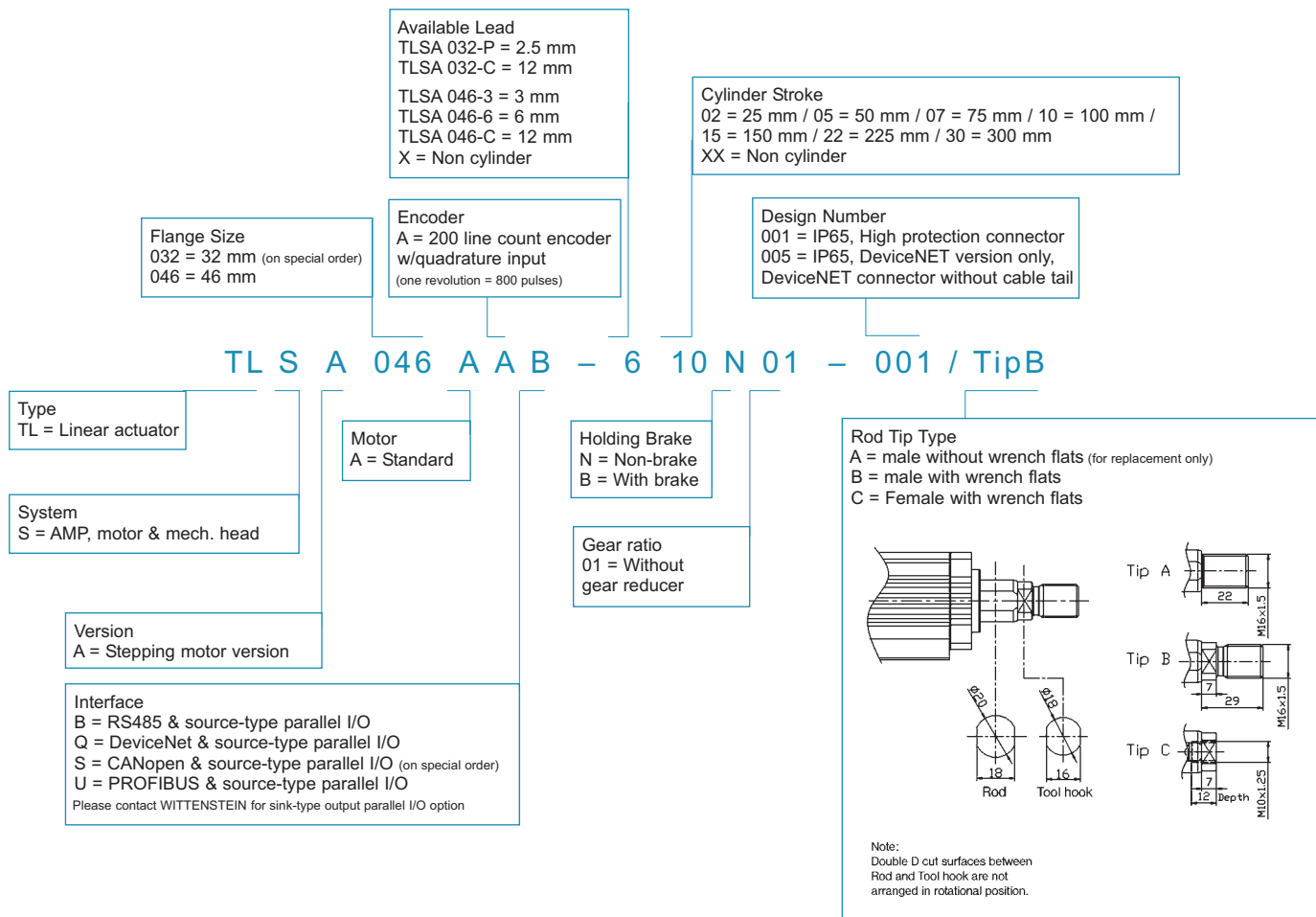
Mounting Cautions

1. Mount the output rod of the ballscrew to an external load using a “jam nut” on the ballscrew. Thus, an external fastener tightens against the jam nut, avoiding twisting stress on the output rod and its bearings.
2. Do not fasten a wrench on the extended ballscrew rod when tightening a load. Doing so can twist the rod and damage the device.

Ordering Key **linear actuator**

Type Code

Select and specify the linear ternary actuator per the type code below. Various type/length cables and accessories are available, as described beginning on page 31.

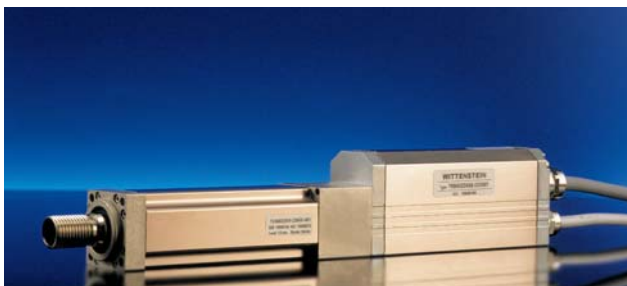


TLSA032 Linear ternary Actuator

- 32 mm flange size
- 2.5 or 12 mm ballscrew pitch
- up to 900 mm/sec
- up to 300 mm stroke length
- RS 485 serial I/O plus either sinking or sourcing type parallel I/O interface
- Optional DeviceNet or Profibus interface
- Optional holding brake

TLSA046 Linear ternary Actuator

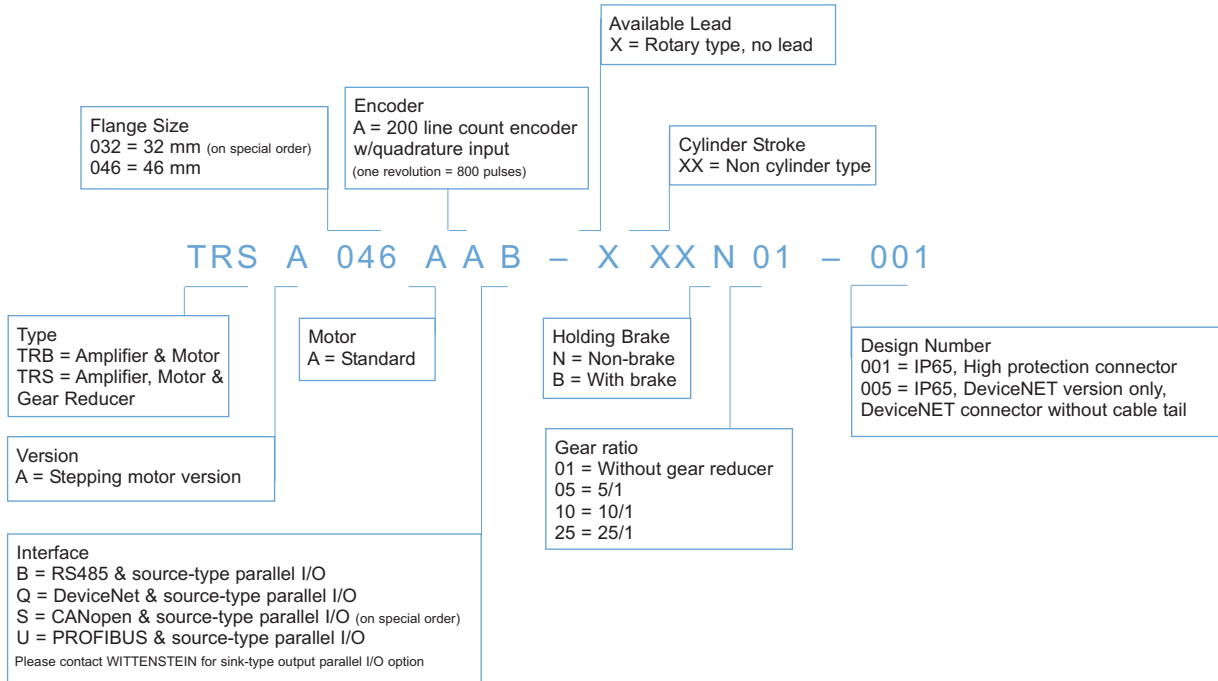
- 46 mm flange size
- 3, 6 or 12 mm ballscrew pitch
- up to 900 mm/sec
- up to 300 mm stroke length
- RS 485 serial I/O plus either sinking or sourcing type parallel I/O interface
- Optional DeviceNet or Profibus interface
- Optional holding brake



Ordering Key **rotary actuator**

Type Code

Select and specify the rotary ternary actuator per the type code below. Various type/length cables and accessories are available, as described beginning on page 31.



TRBA032 / 046 rotary actuator without a gear reducer.

- Select RS485 serial I/O plus either sinking or sourcing type parallel I/O interface.
- Fieldbus interface plus either sinking or sourcing type parallel I/O interface

TRSA rotary actuators include an integrated planetary gear reducer.

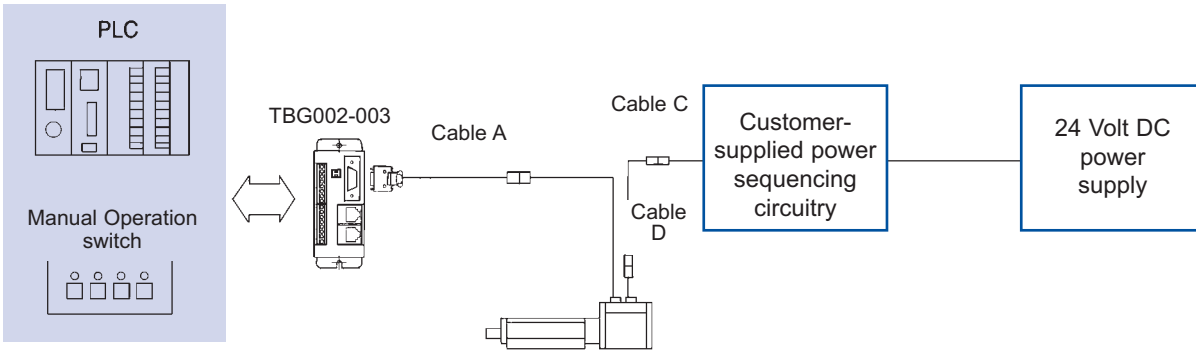
- Standard 5:1, 10:1 or 25:1 planetary gear reducer; 50:1 and 100:1 optional
- RS485 serial I/O plus either sinking or sourcing type parallel I/O interface
- Fieldbus interface plus either sinking or sourcing type parallel I/O interface



System Configuration Diagrams

Single axis control with parallel interface

PIO Base Controller

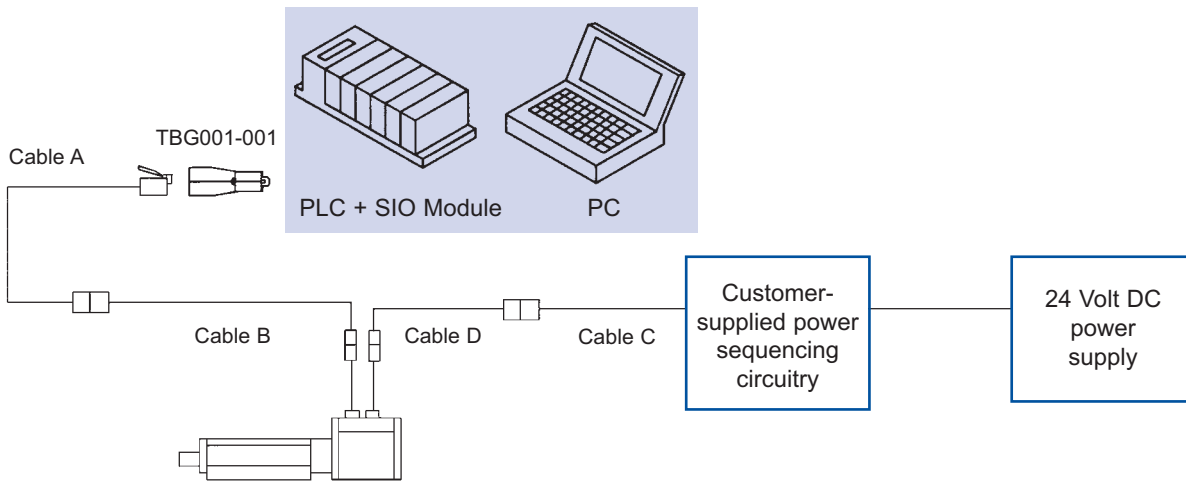


Cable	Cable Type	IP65 Cable No.
Cable A	Command Cable	TCC002-008-***
Cable C	Power Cable	TCC001-001-***
Cable D	Extension Power Cable	TCC001-002-***

*** indicates cable length of 1, 2 or 5 meters. 10 or 15 meter cables available on request.

Single axis control with serial interface

Host Controller

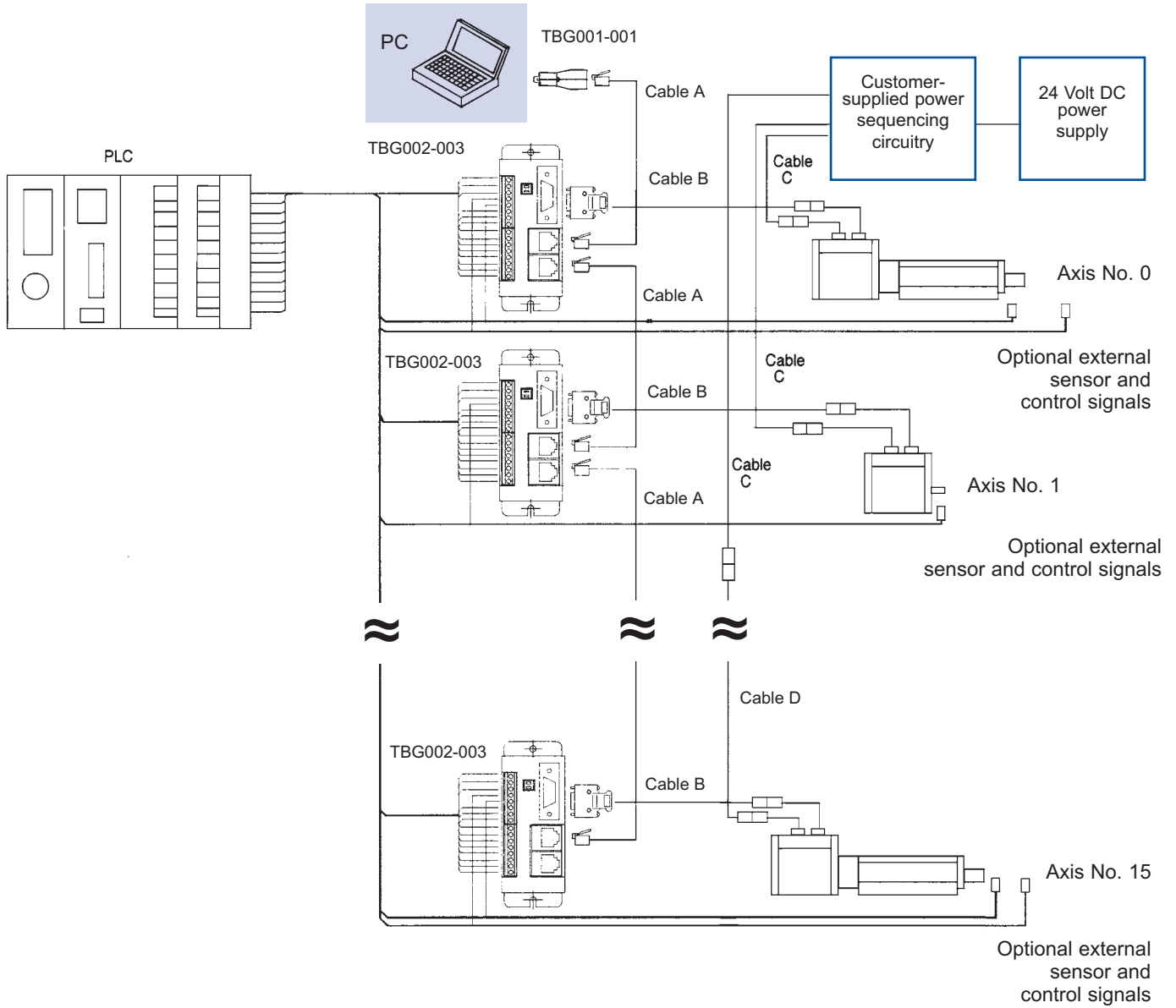


Cable	Cable Type	IP65 Cable No.
Cable A	Serial Cable	TCC002-005-***
Cable B	Extension Command Cable	TCC002-004-***
Cable C	Power Cable	TCC001-001-***
Cable D	Extension Power Cable	TCC001-002-***

*** indicates cable length of 1, 2 or 5 meters. 10 or 15 meter cables available on request.

System Configuration Diagrams

Multi-axis control with parallel interface

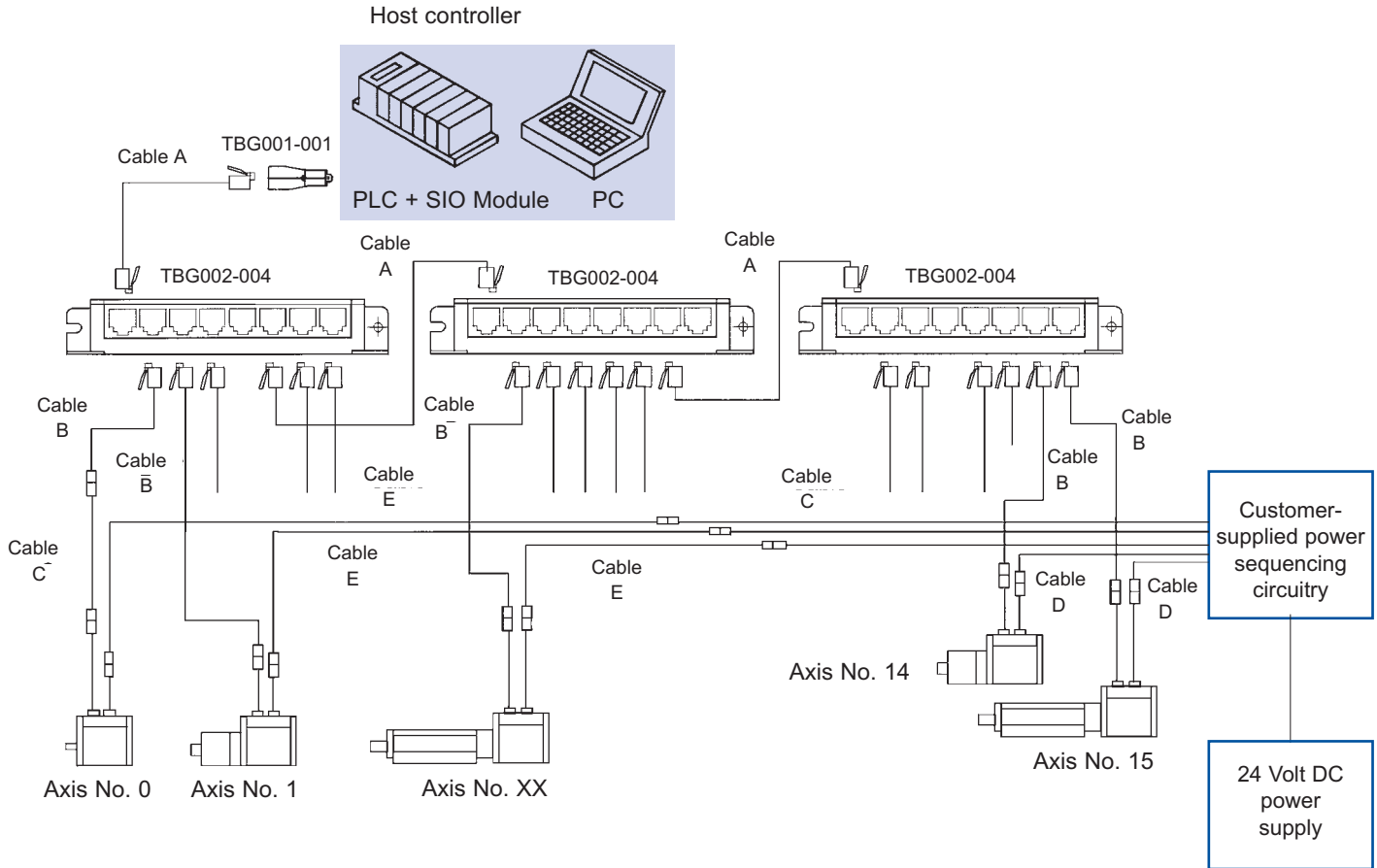


Cable	Cable Type	IP65 Cable No.
Cable A	Serial Cable	TCC002-001-***
Cable B	Command Cable	TCC002-008-***
Cable C	Power Cable	TCC001-001-***
Cable D	Extension Power Cable	TCC001-002-***

*** indicates cable length of 1, 2 or 5 meters. 10 or 15 meter cables available on request.

System Configuration Diagrams

Multi-axis control with serial interface

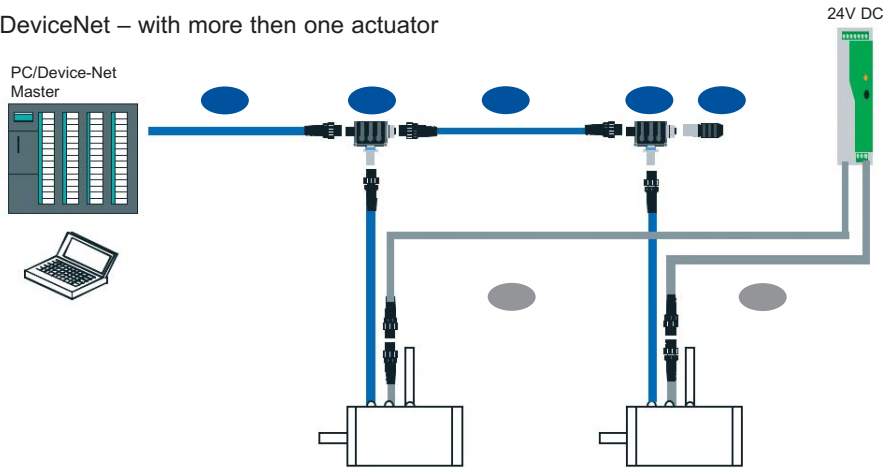


Cable	Cable Type	IP65 Cable No.
Cable A	Serial Cable	TCC002-001-***
Cable B	Serial Cable	TCC002-005-***
Cable C	Extension Command Cable	TCC002-004-***
Cable D	Power Cable	TCC001-001-***
Cable E	Extension Power Cable	TCC001-002-***

*** indicates cable length of 1, 2 or 5 meters. 10 or 15 meter cables available on request.

System Configuration Diagrams

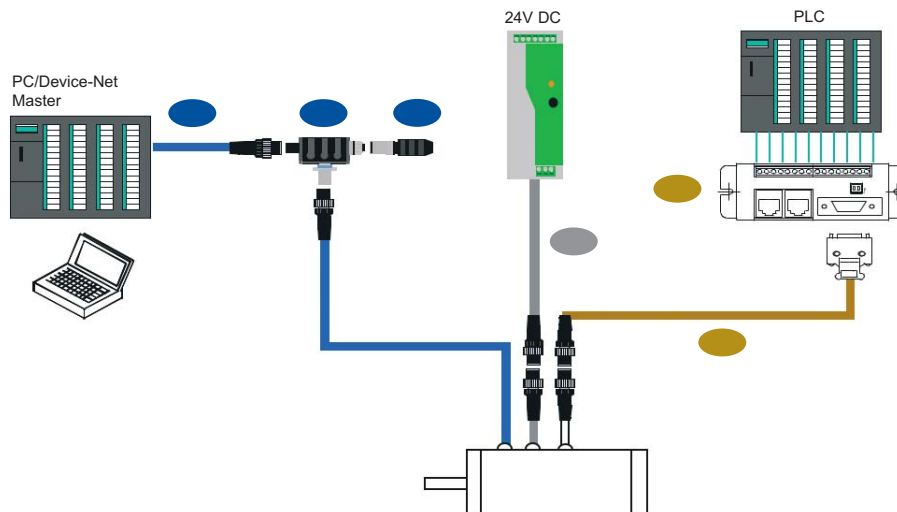
DeviceNet – with more then one actuator



1. Power cable: TCC001-001-XXX
2. Fieldbus cable: TCC002-013-XXX
3. Terminal connector: TBG002-006
4. T connector: TBG002-005
5. Fieldbus cable: TCC002-014-XXX

Attention: in additional for every actuator you need the positions 1, 4, 5 in additional.

DeviceNet – with Fieldbus and parallel IO's



1. Power cable: TCC001-001-XXX
2. Fieldbus cable: TCC002-013-XXX
3. Terminal resistor: TBG002-006
4. T connector: TBG002-005
5. Signal cable: TCC002-012-XXX
6. Chaining terminal: TBG002-003

Attention: If the actuator use the parallel IO's you need the positions 5 and 6.

Cable or Accessory	Description/Cable Type	Type Code
Chaining Terminal	Serial/Parallel Chaining Terminal	TGB002-003
T Connector	Fieldbus Option	TGB002-005
Terminating Resistor	Fieldbus Option	TGB002-006
Cable A	DC Power Cable	TCC001-001-***
Cable B	Extension DC Power Cable	TCC001-002-***
Cable C	DeviceNet Extension Command Cable	TCC002-014-***
Cable D	DeviceNet Command Cable	TCC002-013-***
Cable E	Extension Parallel I/O Command Cable	TCC002-011-***
Cable F	Parallel Command Cable	TCC001-012-***

*** indicates cable length of 1, 2 or 5 meters. 10 or 15 meter cables available on request.

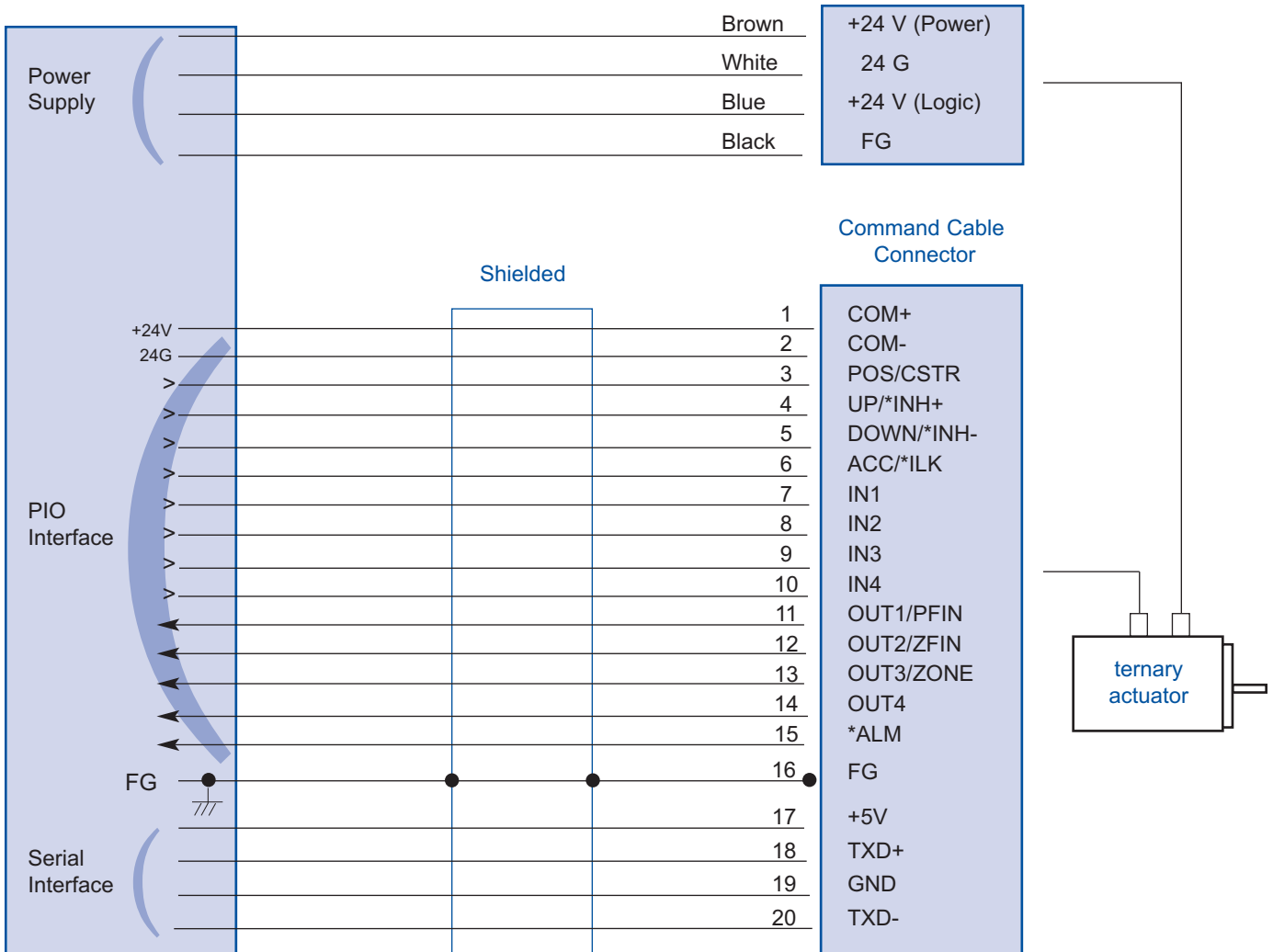
Control Interface and Wiring Diagramm – Serial/Parell

Control Interface

Signal Type	PIN No. & symbol	Function	Interface Circuit Sink-Type PIO	Interface Circuit Source- Type PIO
Power	1 : COM + 2 : COM -	Logic power + for PIO interface Logic power - for PIO interface		
Input	3 : POS/CSTR	Position teaching mode / start trigger		
	4 : UP/*INH+	Count up for teaching / inhibit signal +		
	5 : DOWN/*INH-	Count down for teaching / inhibit signal -		
	6 : ACC/*ILK	Acceleration teaching mode / interlock signal		
	7 - 10 : INn	Position No. selection		
Output	11 : OUT1/PFIN	Position indicator 1 / Positioning completed		
	12 : OUT2/ZFIN	Position indicator 2 / Homing completed		
	13 : OUT3/ZONE	Position indicator 3 / Zone signal		
	14 : OUT4	Position indicator 4 / No connection		
	15 : *ALM	Alarm signal		
GND	16 : FG	Frame ground		
Power	17 : +5V	Logic power for SIO interface		
I/O	18 : TXD +	RS485 signal +		
GND	19 : GND	Logic GND for SIO interface		
I/O	20 : TXD -	RS485 signal -		

* Active low signal

Wiring Diagram



Control Interface and Wiring Diagramm – Fieldbus

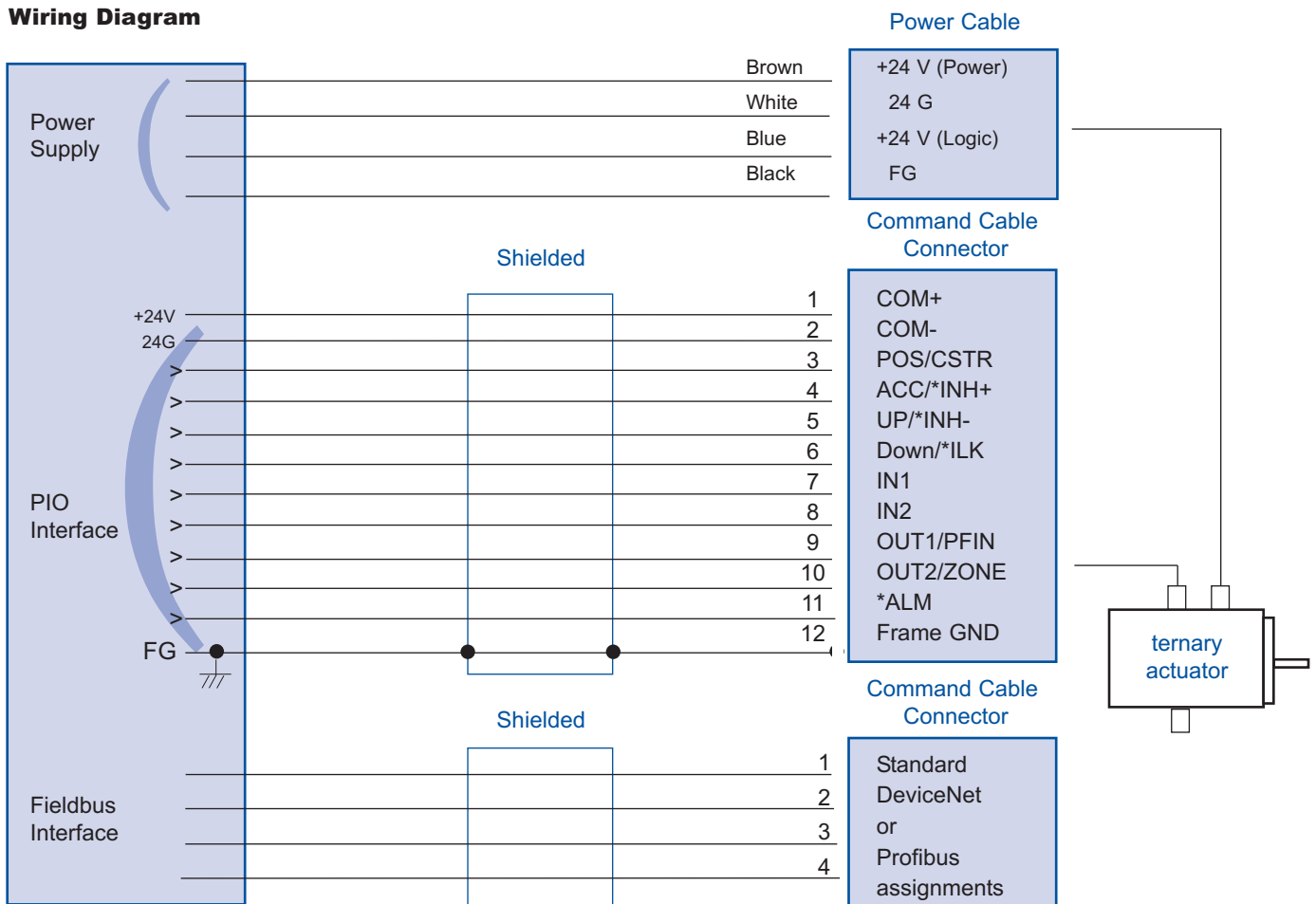
DeviceNet Interface		Profibus Interface	
PIN No.	Function	Pin No.	Function
1 : Drain	Frame Ground	1 : Drain	DC+ 5V
2 : V+	Logic power +	2 : V+	Bus A
3 : V-	Logic power -	3 : V-	Ground
4 : CAN_H	Serial High	4 : CAN_H	Bus B
5 : CAN_L	Serial Low	5 : CAN_L	Shield

Parallel I/O Control Interface

Signal Type	PIN No. & symbol	Function	Interface Circuit Sink-Type PIO	Interface Circuit Source-Type PIO
Power	1 : COM +	Logic power + for PIO interface		
	2 : COM -	Logic power - for PIO interface		
Input	3 : POS/CSTR	Position teaching mode / start trigger		
	4 : ACC/*INH+	Acceleration teaching mode / interlock signal +		
	5 : UP/*INH-	Count up for teaching / inhibit signal -		
	6 : Down/*ILK	Count down for teaching / interlock signal		
	7 - 8 : IN1+IN2	Position No. selection		
Output	9 : OUT1/PFIN	Position indicator 1 / Positioning completed		
	10 : OUT2/ZONE	Position indicator 2 / Zone signal		
	11 : *ALM	Alarm signal		
GND	12 : FG	Frame ground		

* Active low signal

Wiring Diagram



Selection of a ternary™ Actuator

Ordering Sheet

			A	046	A	A		-							-	0	0	1	/ Tip		
1	↓	2	↓	↓	3	4	5	6	7	8	9										
Type	Version	Flange Size	Std. Motor	En-coder	Interface	Lead	Stroke	Brake	Gear Ratio	Connector Style	Rod Tip Type										

1 Determine if a Linear or Rotary Actuator is required for the application.

- TLS - Linear Actuator
- TRB - Rotary Actuator without gear reducer
- TRS - Rotary Actuator with gear reducer

2 Select appropriate flange size.

- 032 - 32 mm (special order - contact supplier)
- 046 - 46 mm

3 Select the appropriate interface type.

- B = RS485 & source-type (positive logic) parallel I/O
- Q = DeviceNet & source-type parallel I/O
- S = CANopen & source-type parallel I/O
(special request - contact WITTENSTEIN)
- U = PROFIBUS & source-type parallel I/O

Please contact WITTENSTEIN for sink-type output option.

For the Linear ternary Actuator, refer to the Velocity vs Force curves on pages 14 and 15 and determine the performance required in the system. Then enter the ballscrew lead.

For TLSA 032:

- P = 2.5 mm/rev. Maximum thrust is 190 N.
Maximum travel speed is 185 mm/sec
- C = 12 mm/rev. Maximum force is 35 N.
Maximum travel speed is 900 mm/sec

For TLSA 046:

- 3 = 3 mm/rev. Maximum thrust is 600 N.
Maximum travel speed is 225 mm/sec
- 6 = 6 mm/rev. Maximum force is 300 N.
Maximum travel speed is 450 mm/sec
(not applicable)
- C = 12 mm/rev. Maximum force is 150 N.
Maximum travel speed is 900 mm/sec

For Rotary ternary Actuator:

- Enter X - not applicable

5 For the Linear ternary Actuator, determine the maximum stroke required. Note the allowable radial loadings, described on pages 14 and 15. Enter the stroke as:

- 02 = 25 mm
- 05 = 50 mm
- 07 = 75 mm
- 10 = 100 mm
- 15 = 150 mm
- 22 = 225 mm
- 30 = 300 mm
- For the Rotary ternary Actuator, enter XX
(not available)

6 Determine if the holding brake is required.

- N = No brake
- B = With brake.

7 For the Rotary ternary Actuator, select the gear ratio.

- 01 = Without gear reducer
- 05 = 5/1 gear ratio
- 10 = 10/1 gear ratio
- 25 = 25/1 gear ratio

Note: 50/1 and 100/1 gear ratios are available. Contact WITTENSTEIN for technical and ordering information.

For the Linear ternary Actuator, enter 01 (without gear reducer)

Enter the connector type.

- 001 = IP65, High protection connector
- 005 = IP65, DeviceNET Version only,
DeviceNET connector without cable tail

Enter the Rod Tip Type

- A = male without wrench flats
(for replacement units only)
- B = male with wrench flats
- C = female with wrench flats

Accessories and Cables

Multi-axis control with parallel interface and/or DeviceNet interface

Cables and connectors

Connecting the ternary actuator is very simple. Only two cables are required for the standard system: a command interface cable, which includes the wiring for both parallel and serial I/O interfaces, and a power supply cable. The same cables connect either the rotary or linear ternary actuator. A third cable is required using parallel I/O with a fieldbus version.

All cables are supplied pre-cut and connectorized and are available in 1, 2 or 5 meter standard lengths. 10 and 15 meter lengths may be available when longer cables are required.

Power Cables

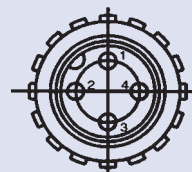
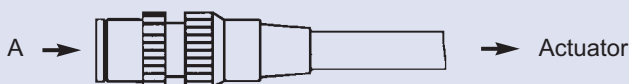
10

Select the power cables. One power cable is required for each ternary ordered 1, 2 or 5 m in length. (10 and 15 m lengths available on request)

Order an extension power cable if additional cable length is required.

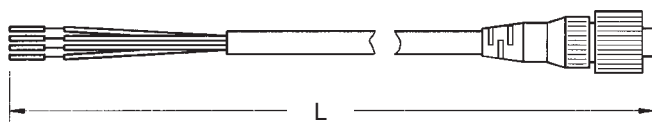
Power cable connector type

IP65 type power cable connector



View from A

Power cable with flying leads and IP65 connector



Extension power cable with IP65 connectors



Power Cable Type	Length [m]
TCC001-001-010	1
TCC001-001-020	2
TCC001-001-050	5

Extension Power Cable Type	Length [m]
TCC001-002-010	1
TCC001-002-020	2
TCC001-002-050	5

Command Cables

11

Select the command cables. 1, 2 and 5 m length connectorized cables are available for easy hookup. 10 and 15 m cables are available on request.

One command cable with a serial I/O connector is required for each system for use in setting up the ternary using proTern software.

Refer to the system configuration diagrams on pages 24-29 to help determine the cables needed. At minimum, one command cable, and possible an extension cable, is required for each ternary. Additional cables are required when using chaining terminals to connect multiple ternary devices. It would be helpful to create a connection diagram of the proposed system prior to ordering cables.

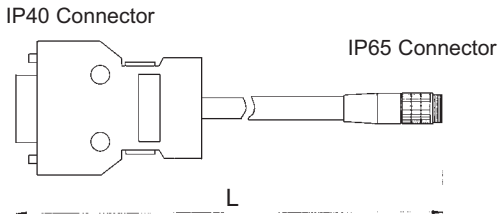


ternary high protection and standard cable connectors.



TCC 002-005-xxx serial cable with IP40 & IP65 connectors.

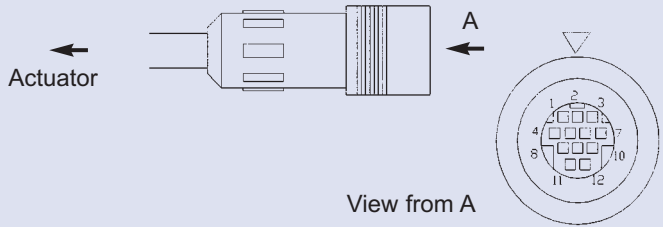
Cable from TBG002-003 chaining terminal to ternary.



20-pin SIO/PIO Command Cable used with Standard ternary

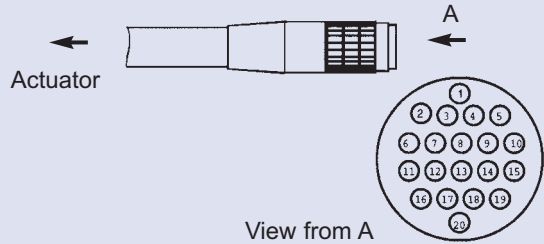
PIO interface connector (used with fieldbus ternary)

IP65 type PIO cable connector



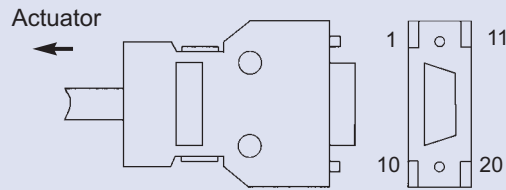
SIO/PIO Command cable connector type

IP65 type command cable connector



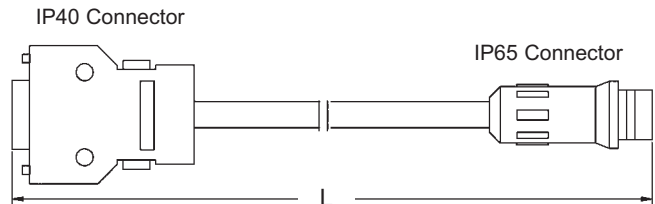
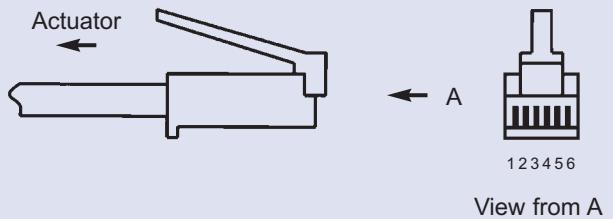
SIO/PIO Command cable connector type

IP40 type command cable connector



RJ11-Serial cable connector type

IP40 type serial cable connector



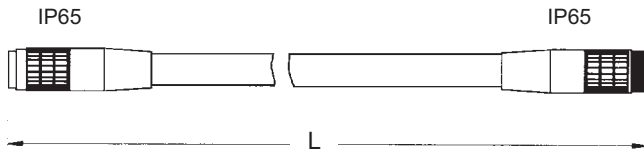
12-pin PIO command Cable used with Fieldbus ternary

Command Cable Type	Length [m]
TCC002-008-010	1
TCC002-008-020	2
TCC002-008-050	5

Command Cable Type	Length [m]
TCC002-012-010	1
TCC002-012-020	2
TCC002-012-050	5

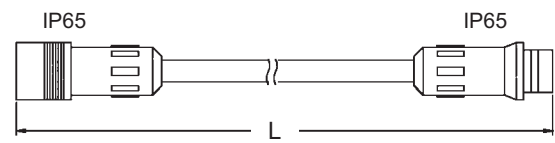
Command Cables

Extension command cable



20-pin SIO/PIO Extension
Command Cable used with Standard ternary

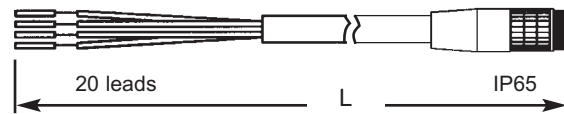
Extension Command Cable Type	Length [m]
TCC002-004-010	1
TCC002-004-020	2
TCC002-004-050	5



12-pin PIO Extension Cable
used with Fieldbus ternary

Extension Command Cable Type	Length [m]
TCC002-011-010	1
TCC002-011-020	2
TCC002-011-050	5

Command Cable with Flying Leads



20-pin SIO/PIO Command Cable used with Standard ternary

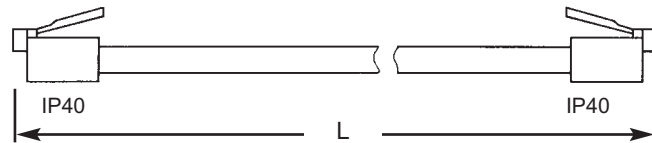
Command Cable Type	Length [m]
TCC002-009-010	1
TCC002-009-020	2
TCC002-009-050	5



12-pin PIO Command Cable used with Fieldbus ternary

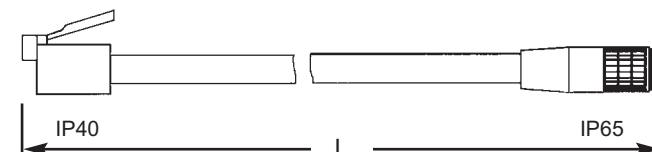
Command Cable Type	Length [m]
TCC002-010-010	1
TCC002-010-020	2
TCC002-010-050	5

Daisy chaining command cable for serial connection



Serial Command Cable Type	Length [m]
TCC002-001-010	1
TCC002-001-020	2
TCC002-001-050	5

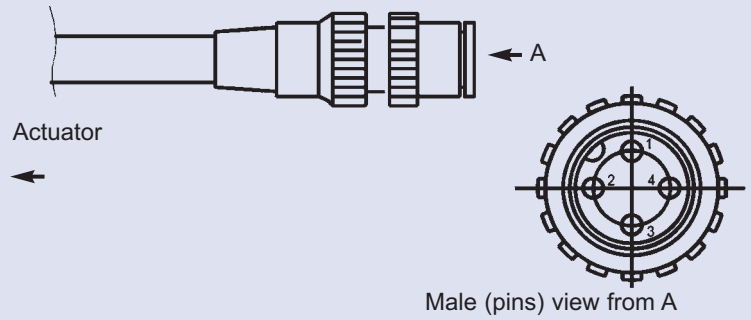
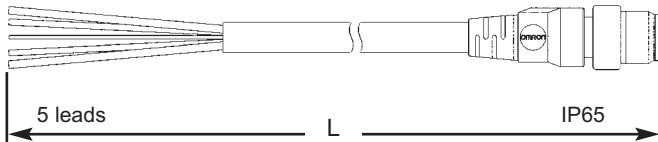
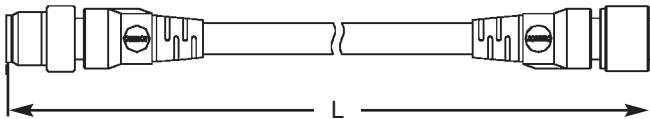
Command cable for serial I/O connection



Serial Command Cable Type	Length [m]
TCC002-005-010	1
TCC002-005-020	2
TCC002-005-050	5

DeviceNet interface connector

IP65 type DeviceNet interface connector

**DeviceNet Cable with Flying Leads****DeviceNet Extension Cable****Command Cable Type****Length [m]**

TCC002-013-010

1

TCC002-013-020

2

TCC002-013-050

5

Command Cable Type**Length [m]**

TCC002-014-010

1

TCC002-014-020

2

TCC002-014-050

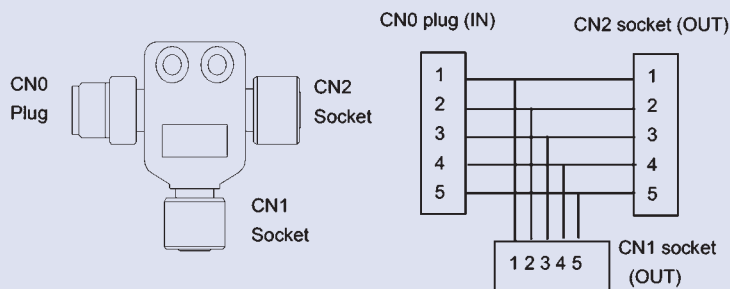
5

Note: Contact the factory for information on ternary Profibus cables.

Comment	Type Code
DeviceNet T-Connection	TGB002-005

DeviceNet T connector

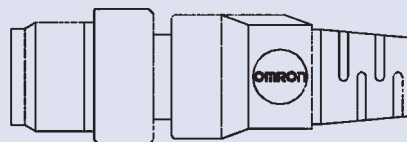
The T connector is used for linking multiple DeviceNet actuators in an environment that requires high protection. To order, specify TGB002-005.



Comment	Type Code
DeviceNet Terminating Resistor	TGB002-006

DeviceNet terminating resistor

The terminating resistor is connected to the last T-connector of the DeviceNet link. To order, specify TGB002-006.

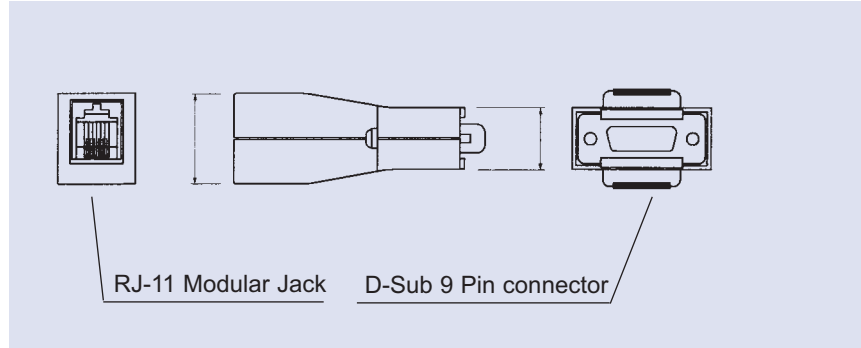


Accessory	Comment	Type Code
proTern™ ternary Digital Assistant (software)	Required -- The proTern™ software is required to set up a Serial Interface ternary actuator. Reference manual is included.	TET002-002
pockeTern™ Portable ternary Software Toolkit	Optional - Provides same software functionality as proTern™, but operates on a PDA or Pocket PC. Reference manual is included.	
DLL command library for C++	Optional -- Specify this library if you will be programming the ternary actuator for serial operating using C++.	TDL001-001
ternary Actuator Reference Manual	Recommended -- Provides information on mounting, installation, start-up, command interface programming/operation.	DC1091-320460
Commissioning Kit 1 (for use without chaining terminal)	Includes: proTern™ software, TGB001-001 bus converter and TCC002-005-020 2 m command cable (direct from PC to ternary)	TUK001
Commissioning Kit 2 (for use with chaining terminal)	Includes: proTern™ software, TGB001-001 bus converter and TCC002-001-020 2 m command cable (from PC to chaining terminal)	TUK002
T-Slot-Nut	Used for mounting linear ternary size 46 to a surface using the T-Slots. Specify required quantity.	T-Slot-Nut

Accessories and Cables

Serial bus converter

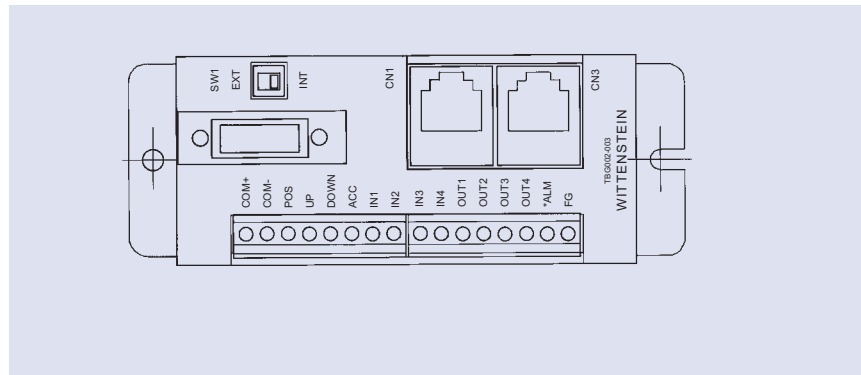
When using a PC or PDA to communicate via the RS485 serial channel, an RS232/RS485 serial bus converter is required. Plug the 9-pin connector into an RS232 port on a PC. Plug a ternary command cable into the connector's modular jack.



Comment	Type Code
RS232/RS485 bus converter	TBG001-001 serial channel bus converter

Serial / Parallel chaining terminal

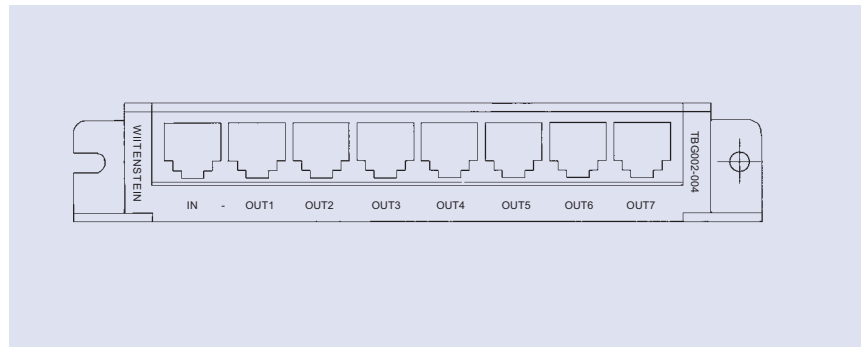
This terminal is used for connection of conventional PLC and external control signals. In a system using parallel I/O, one terminal can be used for connection of each ternary actuator. The modular jacks can be used to connect a PC for setup and monitoring, using the serial channel.



Comment	Type Code
Serial / parallel chaining terminal	TBG002-003

Serial chaining terminal

This chaining terminal is used to connect up to 7 ternary actuators via the serial I/O interface, using command cables with modular jacks. Multiple serial chaining terminals may be used to connect up to 16 devices.



Comment	Type Code
Serial chaining terminal	TBG002-004

Selection of a ternary™ Actuator

13 Select a power supply

WITTENSTEIN offers the model SP-75-24 power supply (Type Code TUP24-3.2) 24V, 3.2A, for powering 1 or 2 ternary devices. Contact the factory to discuss additional requirements.

Note: Each ternary actuator in a system requires 1.5 A of 24 Vdc power (1.7 A if the ternary has a brake installed.) Note that the use of power control devices, such as a sequencing relay, disconnect, thermistor, fuses, etc. is recommended for safety reasons.

The user must observe all local electrical codes and regulations regarding wiring of the power supply, fusing and disconnects.

Contact WITTENSTEIN for further information.

14

Check with a representative or distributor to confirm pricing and delivery, then submit the order.

Additional **alpha** & **WITTENSTEIN** products



TP+ & TP+ HIGH TORQUE® – Compact Precision

Low-backlash planetary gear reducers with output flange. Torsional backlash ≤ 1 arcmin. Acceleration torque up to 10.000 Nm. TP+ HIGH TORQUE best qualified for highest positioning accuracy and high-dynamic cycle operation.



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Low-backlash planetary gear reducers with output shaft. Torsional backlash ≤ 1 arcmin. Acceleration torque up to 3400 Nm. SP+ HIGH SPEED best qualified for highest speed in continuous operation.



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Low-backlash gear reducers with output shaft for economical servo applications. Torsional backlash ≤ 10 arcmin. Acceleration torque up to 450 Nm. Optional available as LPB+, with geared pulley mount.



Rack & Pinion System

PREMIUM CLASS

For exacting dynamics and precision requirements in high-end applications

SMART CLASS

For flexible mounting with more degrees of freedom in mid-range applications

VALUE CLASS

For standard linear tasks in economy applications



Hypoid Gear reducer

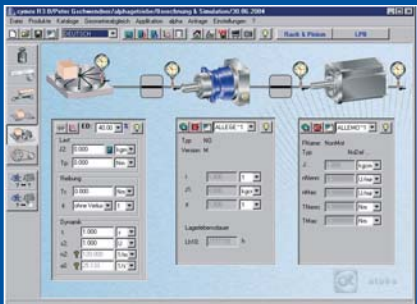
Right-angle gear reducer of highest precision and compactness. Torsional backlash ≤ 4 arcmin. Acceleration torque up to 640 Nm. Output shaft variations: SK+: smooth, keywayed, involute toothing to DIN 5480, TK+: flange HG+: hollow-shaft



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