

## FEATURES

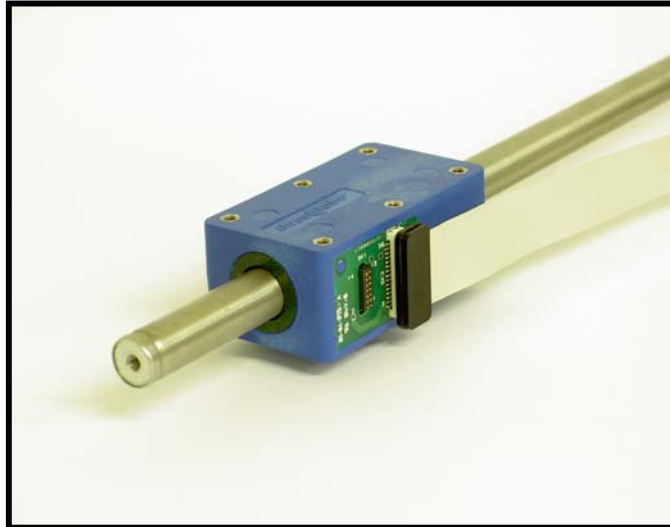
- 4~14 N (0.9~3.1 lb) continuous force
- 19~67 N (4.3~15 lb) peak force
- Speeds up to 10.6 m/s
- Acceleration up to 309 m/s<sup>2</sup>
- Low mass, rugged polymer forcer
- Optimal solution for light loads
- High performance from 24-75V supply
- Plug-and-play with Accelus and Accelnet amplifiers

## APPLICATIONS

- Laboratory Automation
- Material Handling
- Automated Assembly

## THE OEM ADVANTAGE

- Clean, quiet operation
- High throughput
- Easy mechanical integration
- No maintenance or adjustment



The TT *Micro* meets the industry challenge for miniaturization, simplicity of installation and performance in linear motion. Linear forcer cost is redefined with advanced polymers and manufacturing methods. The ruggedness of the *Micro*'s tubular design sets a new standard for low cost of ownership.

The TT *Micro* design enables the load to be mounted directly on the forcer without heatsinking. With a moving mass of just 76 grammes, the forcer makes optimal use of available thrust to accelerate the load. A large air gap and bearing mounting surface makes mechanical integration easy.

The TT *Micro* delivers up to 67N peak force with 4 forcer lengths. Multiple forcers can be used for additional thrust. Speeds of up to 10m/s are attainable over a travel length up to 454mm.

The TT *Micro* is complemented by the Accelus and Accelnet (CANopen enabled) digital servo amplifiers. Accelus and Accelnet deliver optimal servo performance in a range of compact, cost-effective packages. Matched solutions with plug-and-play cables, Copley amplifiers and the TT *Micro* combine for fast, simple system commissioning.

## ELECTRICAL SPECIFICATIONS

FORCER TYPE	1102	1104	1106	1108	units
Peak force @ 25°C ambient for 1 sec	19.1	38.3	57.4	67.6	N
Peak current @ 25°C ambient for 1 sec	10	10	10	8.83	A <sub>pk</sub>
<b>With 25x25x2.5cm heatsink plate</b>					
Continuous stall force @ 25°C ambient (1)	3.81	7.43	10.96	14.40	N
Continuous stall current @ 25°C ambient	1.41	1.37	1.35	1.33	A <sub>rms</sub>
	1.99	1.94	1.91	1.88	A <sub>pk</sub>
<b>Without heatsink plate</b>					
Continuous stall force @ 25°C ambient (1)	3.08	5.20	7.06	8.77	N
Continuous stall current @ 25°C ambient	1.14	0.96	0.87	0.81	A <sub>rms</sub>
	1.61	1.36	1.23	1.15	A <sub>pk</sub>
Force constant (sine commutation)	2.70	5.42	8.12	10.83	N/A <sub>rms</sub>
	1.91	3.83	5.74	7.66	N/A <sub>pk</sub>
Back EMF constant (phase to phase)	2.21	4.42	6.63	8.84	V <sub>pk</sub> /m/s
Fundamental forcer constant	1.24	1.76	2.15	2.47	N/√W
Resistance @ 25°C (phase to phase)	2.45	4.90	7.35	9.81	Ohm
Resistance @ 100°C (phase to phase)	3.16	6.32	9.48	12.64	Ohm
Inductance @ 1kHz (phase to phase)	0.58	1.15	1.73	2.30	mH
Electrical time constant	0.23	0.23	0.23	0.23	ms
Continuous working voltage	75	75	75	75	V d.c.
Pole pitch (one electrical cycle)	25.6	25.6	25.6	25.6	mm
Peak acceleration (2)	251	290	309	275	m/s <sup>2</sup>
Maximum speed (3)	10.6	8.6	6.5	5.2	m/s

### Notes: -

- (1) Reduce continuous stall force to 89% at 40°C ambient
- (2) Based on a moving forcer with no payload
- (3) Based on a moving forcer with a triangular move over maximum stroke and no payload

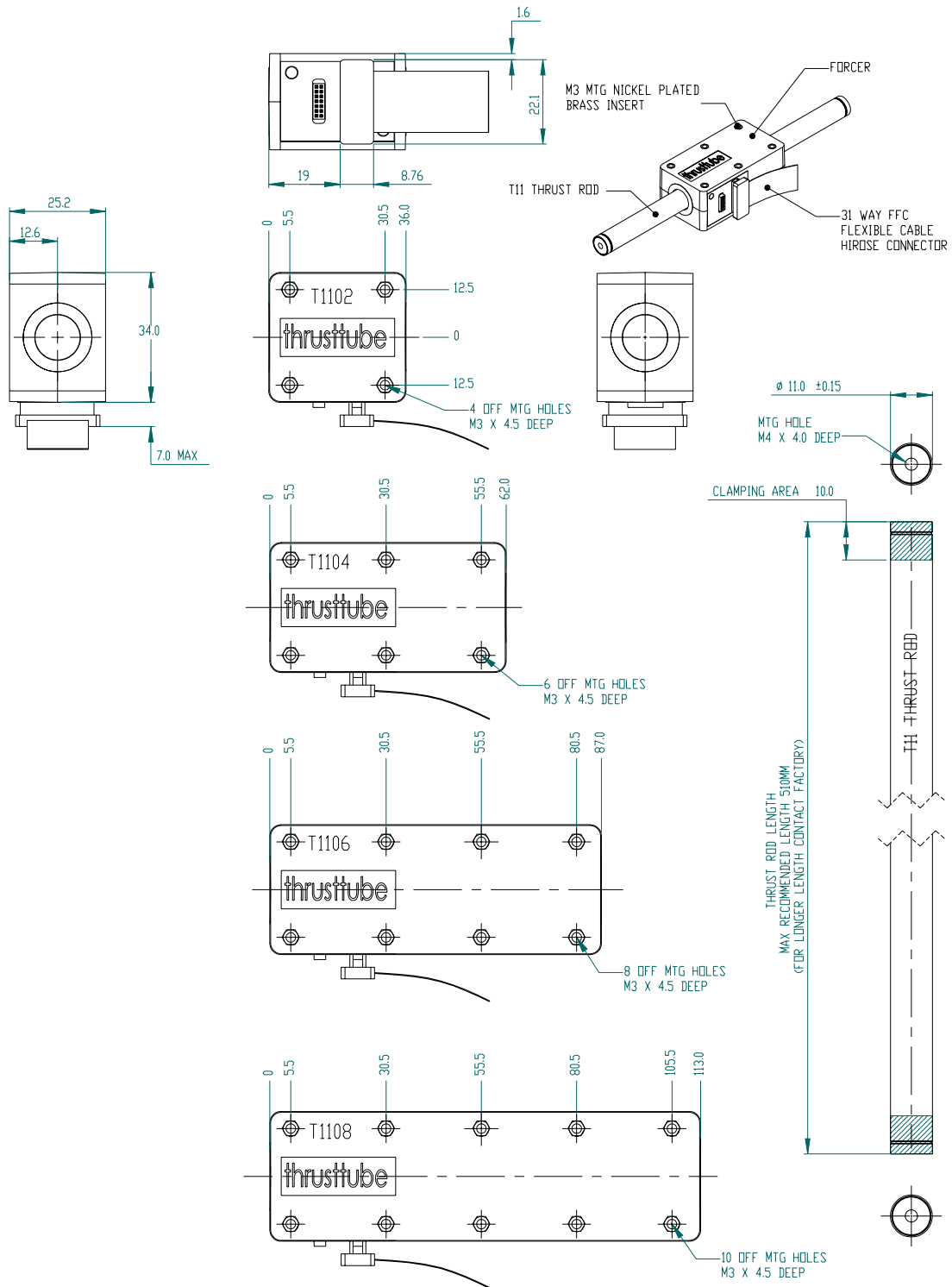
## THERMAL SPECIFICATIONS

FORCER TYPE	1102	1104	1106	1108	units
Maximum phase temperature	100	100	100	100	°C
Thermal resistance R <sub>th</sub> <sub>phase-housing</sub>	1.00	0.40	0.24	0.16	°C/W
<b>With 25x25x2.5cm heatsink plate</b>					
Power dissipation @ 25°C ambient	9.49	17.77	25.77	33.33	Watt
Thermal resistance R <sub>th</sub> <sub>housing-ambient</sub>	6.90	3.82	2.67	2.09	°C/W
<b>Without heatsink plate</b>					
Power dissipation @ 25°C ambient	6.15	8.77	10.81	12.58	Watt
Thermal resistance R <sub>th</sub> <sub>housing-ambient</sub>	11.20	8.15	6.70	5.80	°C/W
Thermal time constant	600	840	1200	1380	s

## MECHANICAL SPECIFICATIONS

FORCER TYPE	1102	1104	1106	1108	units
Maximum stroke	454	428	403	377	mm
Forcer mass	76	132	186	246	gramme
Thrust rod mass/metre	0.68	0.68	0.68	0.68	kg/m

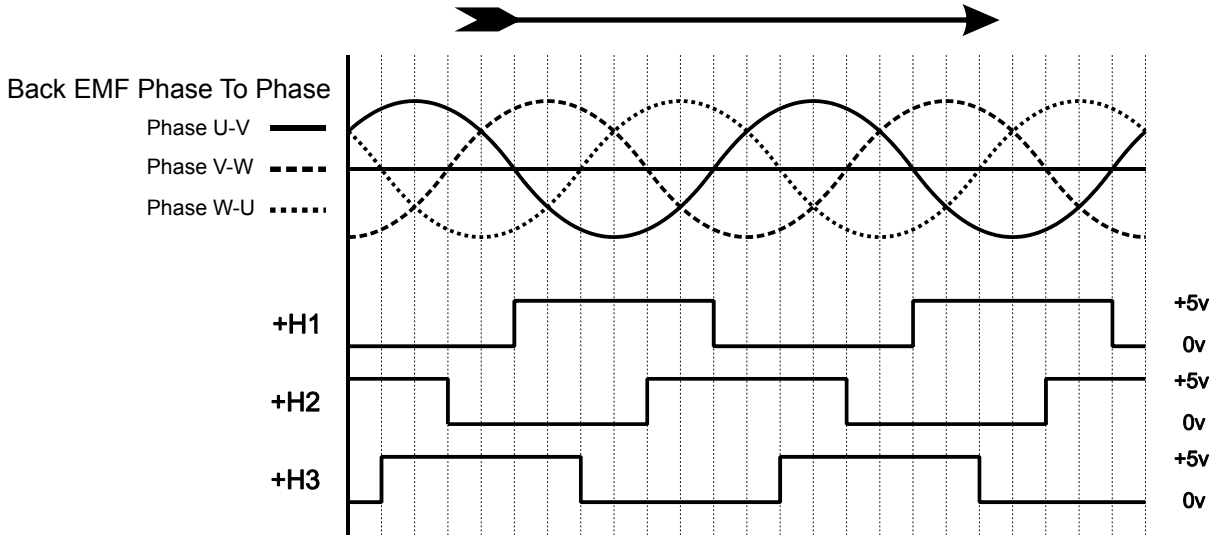
**OUTLINE DRAWINGS**



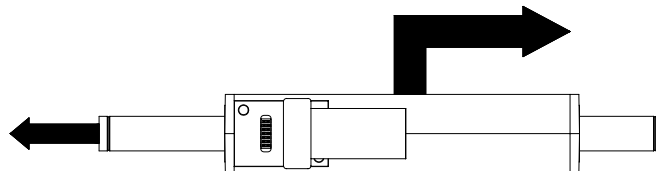
DIMENSION IN MM  
TOLERANCE UNLESS OTHERWISE STATED  
X ±0.50mm  
X.X ±0.20mm  
X.XX ±0.10mm  
X.XXX ±0.05mm  
ANGULAR ±2°

**COMMUTATION (D OPTION)**

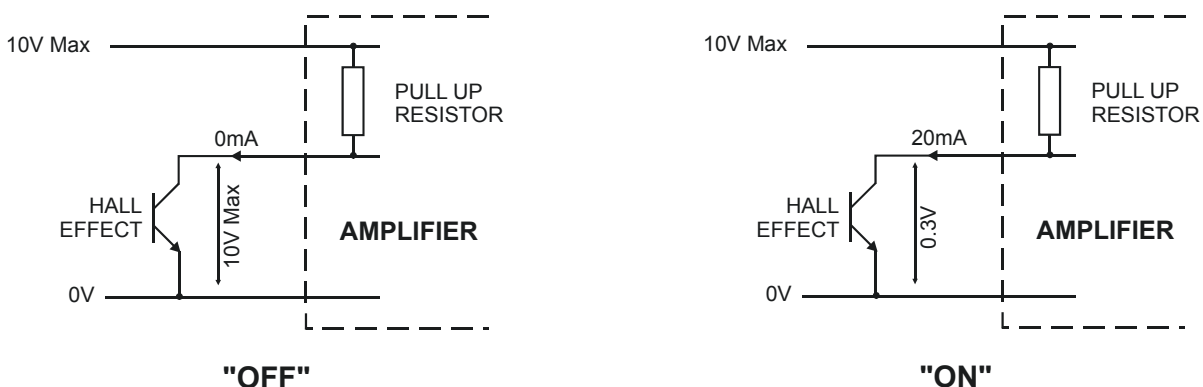
Six-step commutation is realized by employing three digital Hall effect switches arranged to provide the correct switching points in relation to forcer back EMF. Shown below are the relationships between forcer phase back EMF and Hall effect outputs for one direction of motion (as shown by arrows).



Specification	minimum	typical	maximum	units
Supply voltage	4.2	5.0	10	Vd.c.
Supply current	-	12	-	mA
Open collector output maximum "ON" voltage @ 20mA	-	0.3	-	Vd.c.
Open collector output maximum "OFF" voltage @ 0mA	-	10	-	Vd.c.
Open collector output maximum sink current	-	20	-	mA



The outputs of each of these Hall effect devices are open collector NPN transistors. This type of output is designed to work with amplifiers that have Hall effect inputs with an internal "pull up" resistor.



**FORCER OVER TEMPERATURE SENSOR**



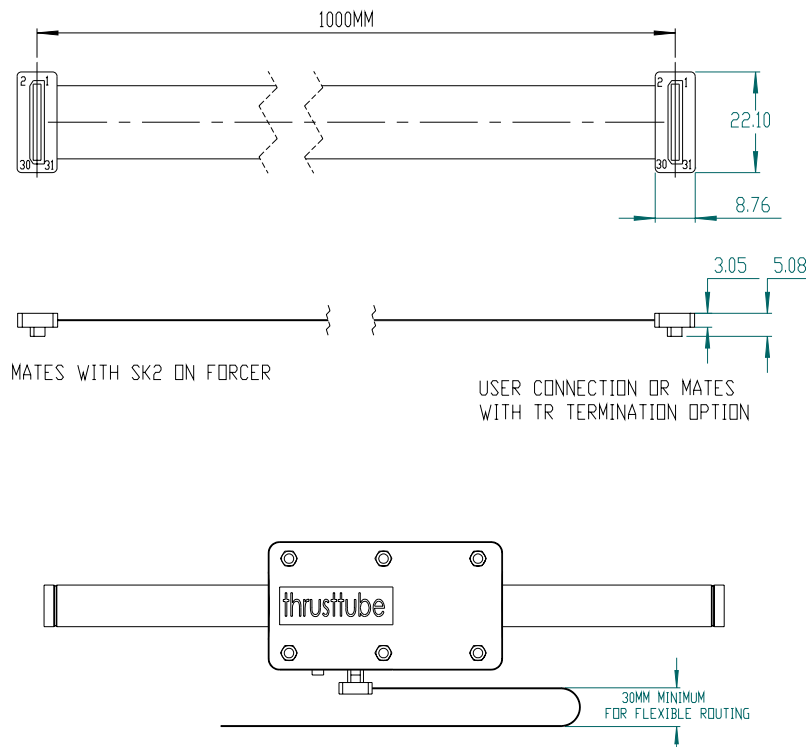
It is strongly recommended that the forcer over-temperature sensor is connected to the drive amplifier or servo controller **at all times** in order to reduce the risk of damage to the forcer due to excessive temperatures.

Protection is provided by a positive temperature coefficient (PTC) thermistor embedded in the forcer phases. As the forcer phase temperature approaches 100°C, the PTC thermistor exhibits a sharp increase in electrical resistance. This change in resistance can be detected by circuitry within the drive amplifier or servo controller and used to reduce or disable the output of the drive amplifier in order to protect the forcer.

Specification	value	units
Resistance at 25°C	235 to 705	Ohms
Resistance at 95°C	4700	Ohms
Resistance at 100°C	10000	Ohms
Maximum continuous voltage	32	Vd.c.

**CABLE (CJ OPTION)**

The *Micro* is available with a high density Flat Flexible Cable (FFC) with 31 conductors at a pitch of 0.5mm with an overall screen designed for continuous flexing applications. Each end of the cable is terminated with a Hirose DF9C-31S-1V connector over-moulded with Nylon and connected pin to pin. The complete assembly is available from Parlex, part number PS-563-AB-1000-S-C-SH2-G16.

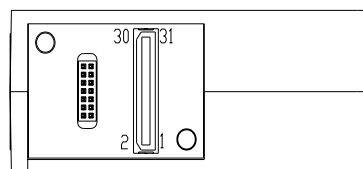


Specification	value
Overall size (nominal)	16.76mm x 0.25mm
Outer jacket material	Polyester
Number of conductors	31
Size of conductors	0.28 x 0.076mm
Screened / Unscreened	Screened
Continuous current / conductor	0.5Arms
Operating voltage	90Vrms
Minimum bending radius- fixed routing	0.8mm
Minimum bending radius- flexible routing	15mm
Operating temperature	-55°C to + 105°C
Cable life at bend radius 5mm	Greater than 33,000 cycles
Cable life at bend radius 10mm	Greater than 1.5 million cycles
UL style	20890

**FORCER CONNECTIONS (MB OPTION)**

Connections on the forcer are available via a 31-way connector (Hirose DF9A-31P-1V). Connections are as follows: -

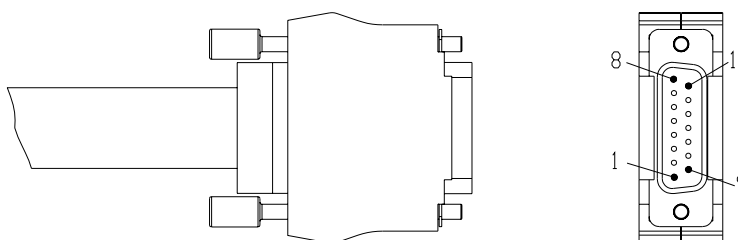
SK2	Function
1, 2, 3, 4	Forcer phase W
5, 6, 7, 8	Forcer phase U
9, 10, 11, 12	Forcer phase V
13	Forcer over temperature sensor (TH2)
14	Forcer over temperature sensor (TH1)
15, 16, 17	Screen
18, 19	+Hall (H1)
20, 21	+Hall (H2)
22, 23	+Hall (H3)
24, 25, 26, 27	0V
28, 29, 30, 31	+5V



**Note:** Where a function has multiple pins it is essential that all pins be connected.

**HIGH DENSITY FFC CABLE TO 15-WAY D MALE TERMINATION (TR OPTION)**

This termination provides access to the forcer and Hall effect connections when used with the CJ cable option.



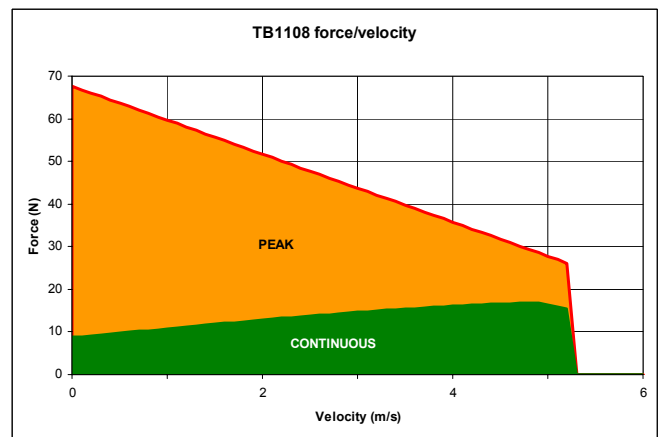
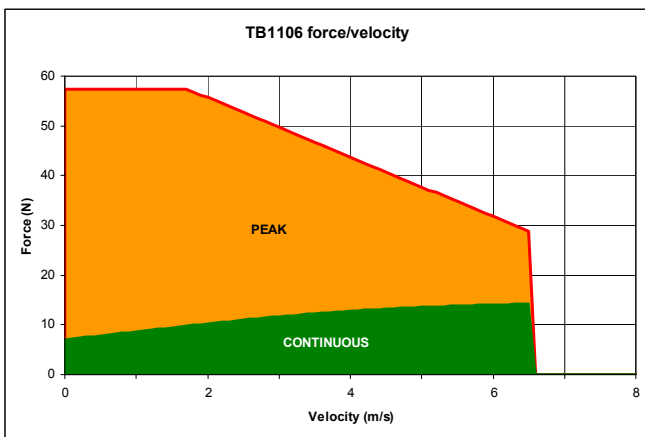
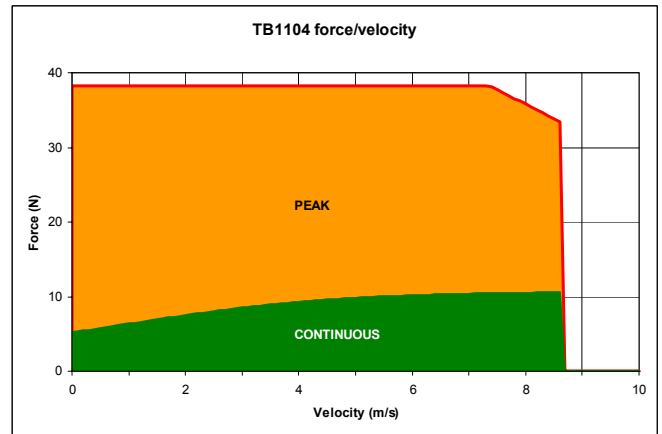
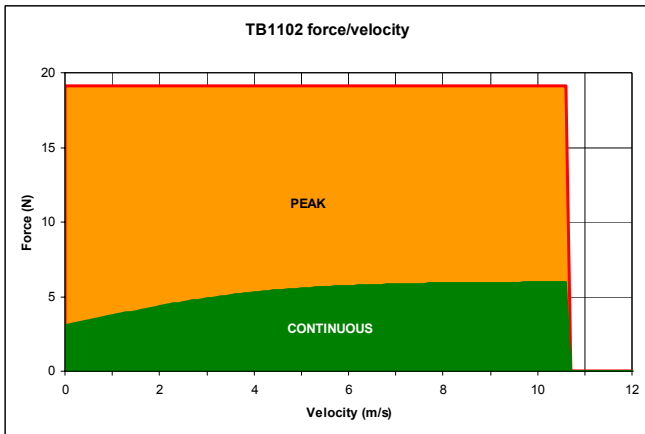
D pin number	Function
1	Screen
2	Not connected
3	0V
4	+5V
5	Forcer phase W
6	Forcer phase V
7	Not connected
8	Not connected
9	Forcer over temperature thermistor (TH1)
10	Forcer over temperature thermistor (TH2)
11	Forcer phase U
12	+Hall (H1)
13	+Hall (H3)
14	+Hall (H2)
15	Not connected
Body	Screen

**ENVIRONMENT**

The *Micro* is intended for use in an environment within the following conditions: -

Operating temperature	0 to +40 °C
Storage temperature	-25 to +70 °C
Humidity (relative)	0 to 95% non-condensing
Altitude (above mean sea level)	1000m
Overvoltage category	II
Pollution degree	2
EMC	light industrial

**FORCE/VELOCITY PROFILES (WITH AN OPERATING VOLTAGE OF 75V.D.C. AND NO PAYLOAD)**



**ORDER CODES**

**Forcer**

**TB11**   **-D-MB-CJ-1000-TR**

**Forcer**  
02, 04, 06, 08

**Commutation**  
D=Digital

**Forcer connection**  
MB=High density FFC

**Termination**  
TR=15 way D male

**Cable length**  
in mm

**Cable**  
CJ=High density FFC

**Thrust rod**

**TR11**

**Thrust rod length**  
in mm