

Force

- Peak: 744-1860 N
- Continuous: 215- 434 N

Maximum Velocity

- Up to 7.6 m/s

Feedback

- Built-in position sensor
- Incremental encoder output
- Digital Halls output
- 10 micron resolution
- 25 micron repeatability

Range of motion

- Strokes to 1316 mm

Dimensions

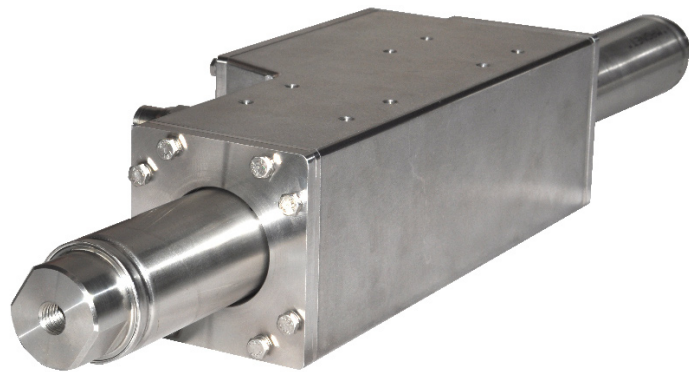
- W x H: 108 x 72mm
- Rod diameter: 38mm

Applications

- Packaging
- Food & Beverage
- Pharmaceutical

The OEM advantage

- Reliable and cost-effective
- Flexible position control
- High speed and acceleration
- Clean, quiet operation
- No maintenance or adjustment



The Hygienic ServoTube is a stainless steel, water-cooled, 600V version of the XTB38 component. Two models are available, delivering peak forces up to 1860 N. With smooth surfaces and IP69K high-pressure wash-down rating, ServoTube is ideal for material handling applications in the Packaging, Food & Beverage and Pharmaceutical industries.

The IP69K rating of Hygienic ServoTube facilitates high-pressure wash-down techniques which use significantly less water and cleansing agents than typical low-pressure hose-down. The cleaning process itself is easier and quicker. Cost is reduced and there is less environmental impact.

The ruggedness and mechanical simplicity of Hygienic ServoTube can bring significant cost savings to sterile environment applications. Simply mount the load directly to the forcer typically supported by a single bearing rail. The thrust rod is mounted at both ends, similar to a ballscrew. A large air gap reduces alignment constraints.

Hygienic ServoTube features a standard incremental encoder output and digital Halls. The encoder delivers 10 micron resolution with 25 micron repeatability. The drive power interface is three phase and can operate at 600V. While drive connectivity and configuration is simplest with Copley drives, it is possible to use any third party drive with Hygienic ServoTube.

ELECTRICAL SPECIFICATIONS

FORCER TYPE	3804		3810		units
	S ⁽¹⁾	P ⁽¹⁾	S ⁽¹⁾	P ⁽¹⁾	
Peak force @ 25°C ambient for 1 sec	744	372	1860	930	N
Peak current @ 25°C ambient for 1 sec	20				Apk
With water cooling option ⁽²⁾					
Continuous stall force @ 25°C ambient ⁽³⁾	215		434		N
Continuous stall current @ 25°C ambient	4.10	8.20	3.30	6.61	Arms
	5.80	11.60	4.67	9.34	Apk
Without water cooling option					
Continuous stall force @ 25°C ambient ⁽³⁾	100.5		190.6		N
Continuous stall current @ 25°C ambient	1.91	3.82	1.45	4.91	Arms
	2.70	5.41	2.05	6.94	Apk
Force constant (sine commutation)	52.6	26.3	131.5	65.7	N/Arms
	37.2	18.6	93.0	46.5	N/Apk
Back EMF constant (phase to phase)	43.0	21.5	107.4	53.7	Vpk/m/s
Fundamental forcer constant	14.5		22.9		N/√W
Eddy current loss	3.7				N/m/s
Sleeve cogging force	7.3		5.6		+/-N
Resistance @ 25°C (phase to phase)	6.77	1.69	16.93	4.23	Ohm
Resistance @ 100°C (phase to phase)	8.73	2.18	21.82	5.45	Ohm
Inductance @ 1kHz (phase to phase)	8.52	2.13	21.30	5.32	mH
Electrical time constant	1.26				ms
Maximum working voltage	650				V d.c.
Pole pitch (one electrical cycle)	71.2				mm
Peak acceleration ⁽⁴⁾	120	60	163	81	m/s ²
Maximum speed ⁽⁵⁾	5.5	7.6	2.6	4.7	m/s

Notes: -

- (1) S=series forcer phases, P=parallel forcer phases
(2) Water at 25°C and a flow rate of 80 litres/hour. Maximum pressure 5 bar.
(3) Reduce continuous stall force to 89% at 40°C ambient
(4) Based on a moving forcer with typical bearings and no payload
(5) Based on a moving forcer with triangular move over maximum stroke and no payload

THERMAL SPECIFICATIONS

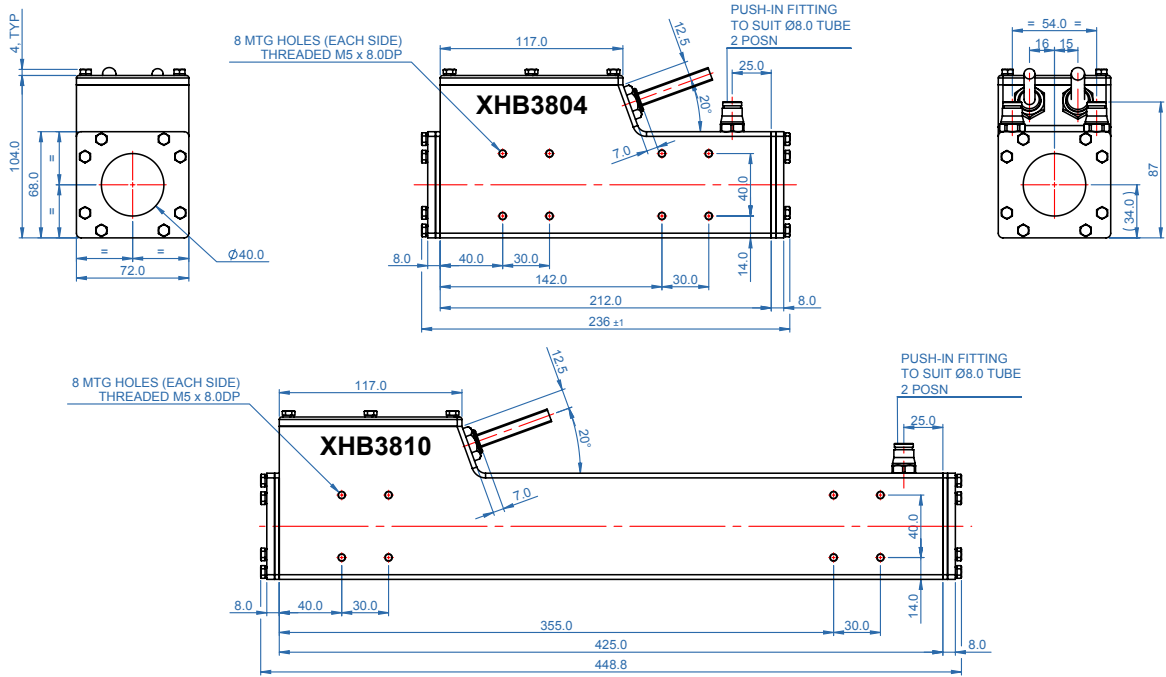
FORCER TYPE	3804	3810	units
Maximum phase temperature	100		°C
With water cooling option			
Power dissipation @ 25°C ambient	220	357	Watt
Thermal resistance Rth _{housing-ambient}	0.06	0.07	°C/Watt
Thermal resistance Rth _{phase-housing}	0.28	0.14	°C/Watt
Without water cooling option			
Power dissipation @ 25°C ambient	47.8	69.4	Watt
Thermal resistance Rth _{housing-ambient}	1.22	0.88	°C/Watt
Thermal resistance Rth _{phase-housing}	0.35	0.20	°C/Watt

MECHANICAL SPECIFICATIONS

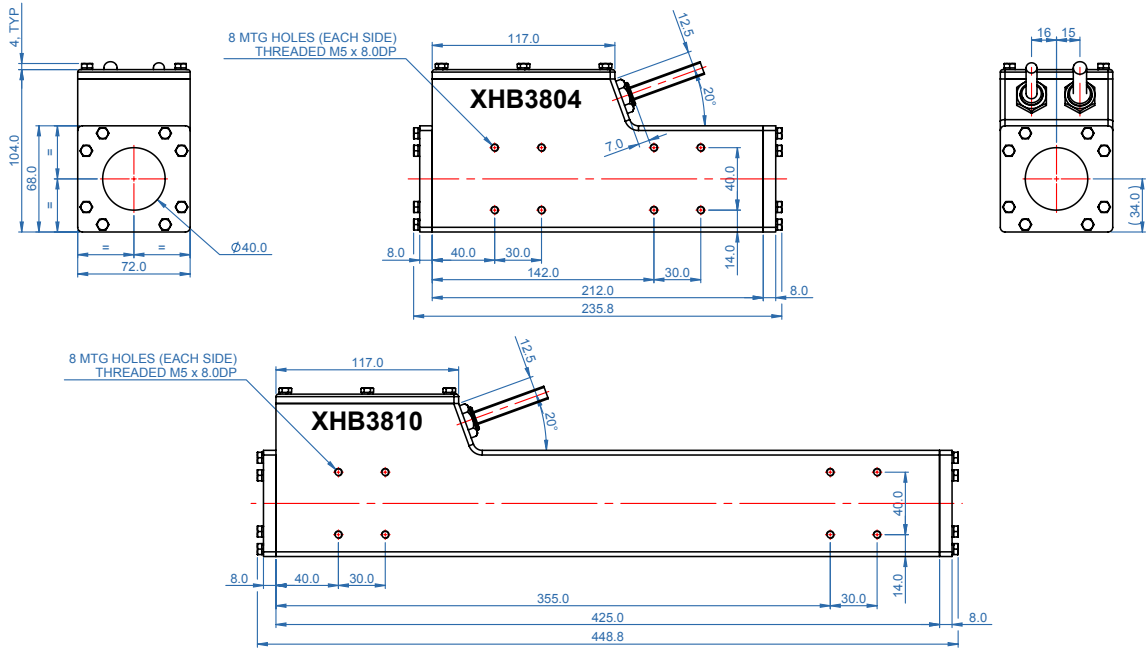
FORCER TYPE	3804	3810	units
Maximum stroke	1316	1103	mm
Forcer mass (excluding bearings)	6.1	11.3	kg
Thrust rod mass/metre	8.3		kg/m

OUTLINE DRAWINGS

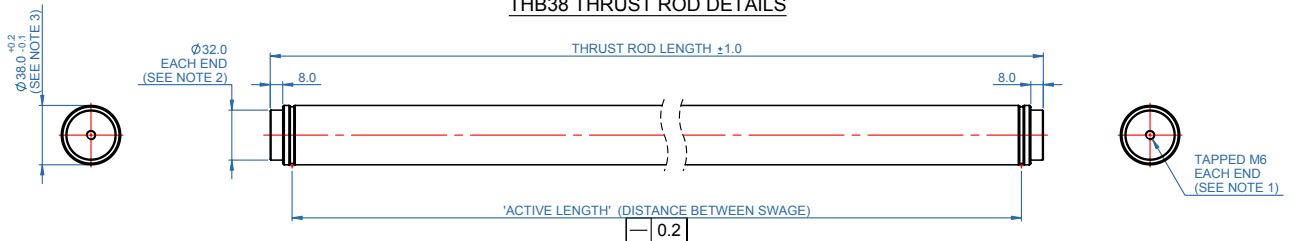
XHB3804/10 HYGIENIC WATER COOLED FORCER INSTALLATION DIMENSIONS



XHB3804/10 HYGIENIC NON WATER COOLED FORCER INSTALLATION DIMENSIONS



THB38 THRUST ROD DETAILS



ALL DIMENSIONS IN MM

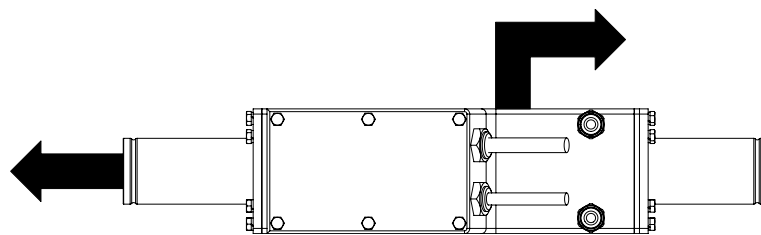
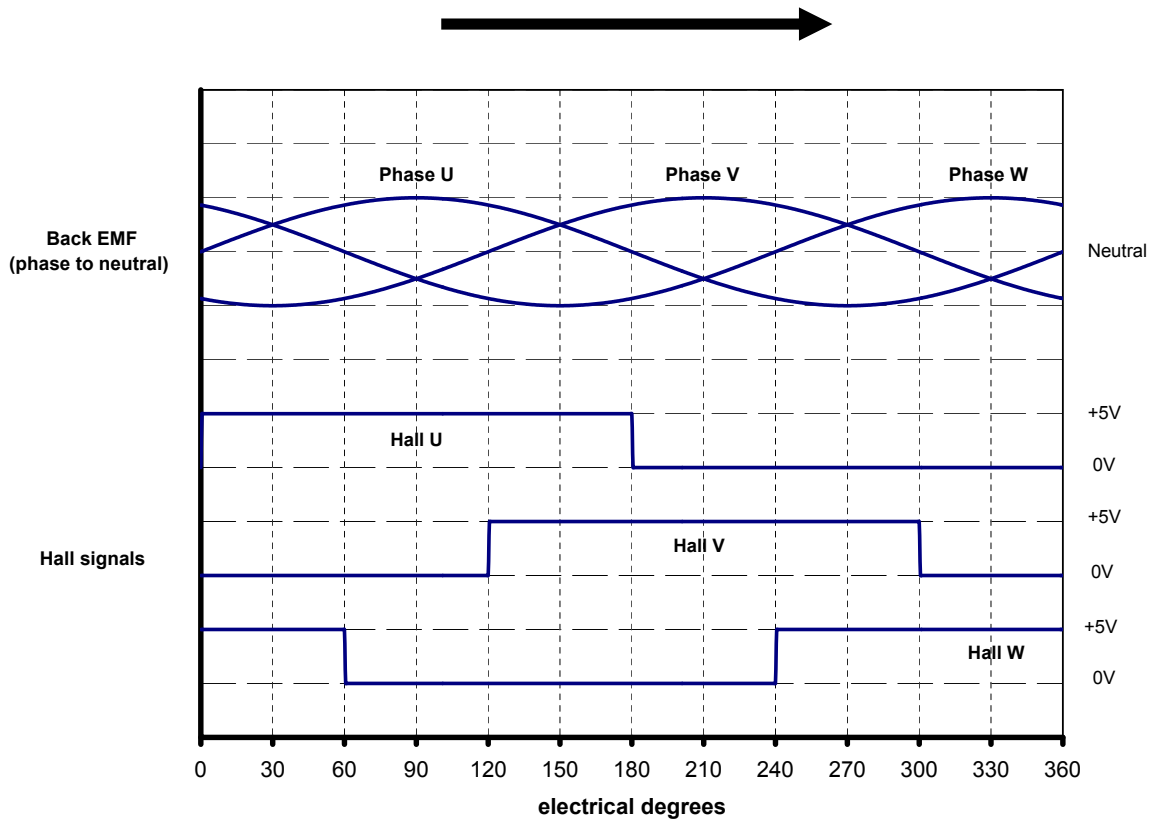
NOTE 1: M6 TAPPED HOLES (EACH END), NOT RECOMMENDED FOR MOUNTING.

NOTE 2: $\phi 32.0$ x 8.0 (EACH END), NOT RECOMMENDED FOR MOUNTING.

NOTE 3: TOLERANCE AROUND SWAGED AREA MAY VARY.

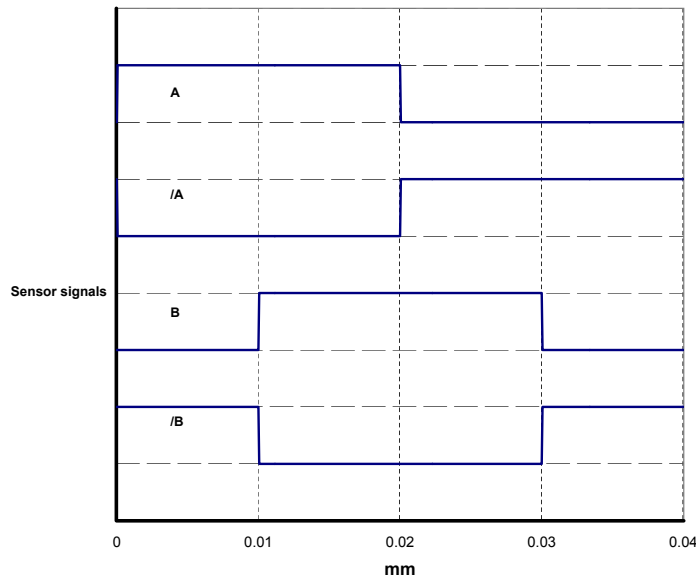
POSITION SENSOR

The position sensor comprises Hall effect sensors and incremental encoder. The Hall sensors output signals providing coarse position feedback for commutation. Shown below are the relationships between forcer phase back EMF and Hall sensor outputs for one direction of motion (as shown by arrows). It should be noted each Hall output is always in phase with its respective forcer phase back EMF for the motion shown. For motion in the opposing direction each Hall output is inverted with relation to its respective forcer phase back EMF.



The Hall sensor outputs use 74AHCT125 line drivers.

The incremental encoder outputs signals providing fine position feedback for forcer control. It is in the form of phase quadrature as shown below. The outputs use RS422/485 compatible line drivers.



SPECIFICATION	VALUE	units
Supply voltage	5 ± 0.25	Vd.c.
Supply current (output current=0)	150 ± 20	mA
Resolution	10	micron
Position repeatability ⁽¹⁾	± 20	micron
Absolute accuracy ⁽²⁾	± 400	micron

Notes: -

⁽¹⁾ Dependent on amplifier. Under constant operating conditions. Self-heating of the forcer will cause expansion in the thrust rod during the initial warm up period. In high duty applications (corresponding to an internal forcer temperature of 80°C) a 1 metre thrust rod will expand typically by 250 microns.

⁽²⁾ Maximum error over 1 metre under constant operating conditions.

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.

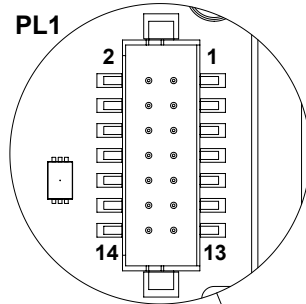
Protection is provided by three positive temperature coefficient (PTC) thermistors embedded in the forcer phases. As the forcer phase temperature approaches 100°C, the PTC thermistors exhibits a sharp increase in electrical resistance. This change in resistance can be detected by circuitry within the 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 in the temperature range -20°C to + 70°C	60 to 750	Ohms
Resistance at 85°C	≤1650	Ohms
Resistance at 95°C	≥3990	Ohms
Resistance at 105°C	≥12000	Ohms
Maximum continuous voltage	30	Vd.c.

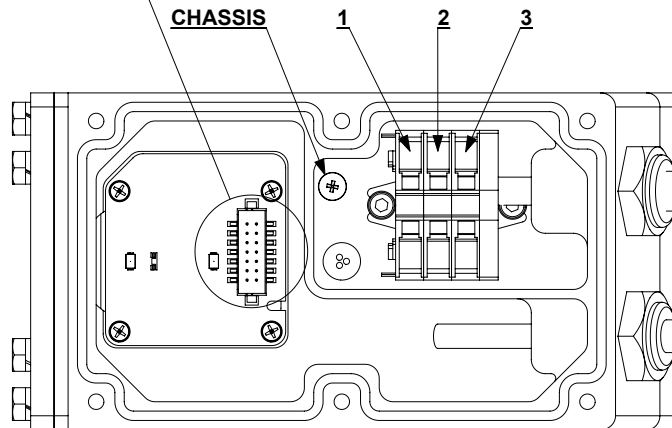
FORCER ELECTRICAL CONNECTIONS

Connections are made within the termination box.

PIN NUMBER	FUNCTION
1	A
2	/A
3	B
4	/B
5	+5Vd.c.
6	0V
7	+TH (Thermistor)
8	-TH (Thermistor)
9	Do not use
10	Do not use
11	Hall U
12	Hall V
13	Hall W
14	No connection



PIN NUMBER	FUNCTION
1	Phase U
2	Phase V
3	Phase W
Chassis	Earth/Screen



CABLE TYPE

The XHB has two separate cables providing connections for forcer power and position sensor. There are two options available with option R being supplied as standard. Both cable types are available in 3 metre or 5 metre lengths.

Option S cables are flexible but are not intended for continuous flex or drag chain applications.

OPTION S SPECIFICATION	POWER	SENSOR
Overall diameter (nominal)	8.2mm	7.2mm
Outer jacket material	PVC	PVC
Number of conductors	4	6 x twisted pair
Size of conductors	1.5mm ² (16 AWG)	0.14mm ² (26AWG)
Screened / Unscreened	Screened	Screened
Minimum bending radius - fixed routing	41mm	36mm
Operating temperature - fixed routing	-40°C to +90°C	-30°C to +70°C

Option R cables are suitable for continuous flex or drag chain applications.

OPTION R SPECIFICATION	POWER	SENSOR
Overall diameter (nominal)	7.6mm	6.7mm
Outer jacket material	PUR	PUR
Number of conductors	4	7 x twisted pair
Size of conductors	1.5mm ² (16 AWG)	0.14mm ² (26AWG)
Screened / Unscreened	Screened	Screened
Minimum bending radius - flexible routing	38mm	51mm
Operating temperature - flexible routing	-40°C to +80°C	-40°C to +90°C
Operating temperature - fixed routing	-40°C to +80°C	-50°C to +90°C

CABLE TERMINATION

The XHB cable is available with four termination options. **Option F** has the wire ends stripped and solder tinned ready for termination. All other options are terminated with connectors that plug directly into the desired amplifier. The connections for all options are shown below: -

SENSOR FUNCTION	U-(XEL, XML, XPL)	T-(XTL)	J-(XSJ)	F-Flying leads
A	13	14	4	Blue
/A	12	13	14	Red
B	11	12	5	White
/B	10	11	15	Brown
+5Vd.c.	6	4	17	Yellow
0V	5	5	7	Green
+TH (Thermistor)	7	10	20	Pink
-TH (Thermistor)	16	15	19	Grey
HALL U	2	3	18	Black
HALL V	3	6	8	Violet
HALL W	4	9	9	Red/Blue
SCREEN	1+ shell	1+ shell	1+ shell	SCREEN
Connector type	26-way high density D	15-way high density D	20-way 2.54mm Mini Mate	-
Amplifier connection	J10	J8	J6	-
POWER FUNCTION				
Forcer phase U	4	4	4	Black <u>1</u>
Forcer phase V	3	3	3	Black <u>2</u>
Forcer phase W	2	2	2	Black <u>3</u>
Earth (forcer body)	1	1	1	Green/Yellow
SCREEN	1	1	1	SCREEN
Connector type	4-way 5mm pluggable terminal	4-way 5mm pluggable terminal	4-way 5mm pluggable terminal	-
Amplifier connection	J2	J2	J2	-

ENVIRONMENT

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

SPECIFICATION	VALUE
Operating temperature	0°C to +40°C
Storage temperature	-25°C to +70°C
Ingress protection	IP69K
Altitude (above mean sea level)	1000m
Overvoltage category	II
Pollution degree	2
EMC	light industrial

MATERIALS

The XHB contains the following materials that could be exposed to the outside environment: -

All metal parts including fixings are stainless steel 316 apart from: -
Thrust rod tube and water push in fittings (if fitted) - stainless steel 316L.

All gaskets and o-ring seals are red silicone apart from: -
water push in fitting o-ring (if fitted) - FKM fluoroelastomer.

Cable jackets are PVC for option S and PUR for option R. Cable gland grommets are PVC.

ORDER CODES

Forcer

XHB38 □ □ □ - □ - □ □ □ □

Forcer
04, 10

Winding
S - Series
P - Parallel

Cooling
N - Non-water cooled
W - Water cooling

Cable Termination
U - Copley Xenus^{PLUS} (XEL, XMP, XPL)
T - Copley Xenus (XTL)
J - Copley Xenus Micro Panel (XSJ)
F - Flying leads

Cable Length
03 - 3 metre
05 - 5 metre

Cable Type
S - Non-Robotic
R - Robotic

Thrust rod

THB38 □ □ □ □

Thrust rod length

0349	0527	0705	0883	1062	1240	1418	1596
0384	0562	0741	0919	1097	1275	1454	1632
0420	0598	0776	0955	1133	1311	1489	
0456	0634	0812	0990	1169	1347	1525	
0491	0669	0848	1026	1204	1382	1561	

Length in mm