

Execução:



Financiamento:



Projeto **ROSA**

**Robô para Operação de Stoplogs Alagados**

Título **Relatório de Material Permanente**

Documento **ROSA.2014.MP.01**

PD **6631-0002/2013**

Contrato **Jirau 151/13**

Coordenador **Ramon Romankevicius Costa**

Gerente **Breno Bellinati de Carvalho**

Data: **13 de junho de 2014**

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## **1 Introdução**

O objetivo deste documento é discriminar os materiais permanente, rubrica Material Permanente (MP), comprados para o projeto ROSA, Contrato Jirau 151/13 (P&D – 6631-0002/2013 - Robôs para Operação de Stoplogs Alagados – ROSA).

## 2 Sonar

Especificação	Profiler Super Seaking DFP
Data	26/03/2014
Beneficiado	Tritech
CNPJ	Internacional
Número Nota	Pendente a entrega do equipamento
Quantidade	1
Valor	R\$41.904,16
Data Sheet	<a href="#">Anexo I - A</a>
Função no projeto	O Sonar será utilizado para realizar o mapeamento 3D do trilho do Stoplog. O mapeamento permite que o operador observe se existe ou não detritos no trilho que impossibilitariam o posicionamento correto do Stoplog para a vedação.
Razão da Escolha	Dentre os sonares analisados que possuem a especificação necessária para o projeto o Profiler Super Seaking da Tritech apresentou o menor custo. <ul style="list-style-type: none"><li>• Super Seaking da Tritech por R\$41.904,16</li><li>• BV5000 da Blueview por \$ 138.000,00</li><li>• DT-101 da Imagenex por R\$ 365.000,00</li></ul>



Figura 1: Profiler Super Seaking

**Invoice Address:-**  
Fundacao Coppetec  
UFRJ-Centro de Tecnologia, Bloco H, Sala 203  
Cidade Universitaria, ILHA DO DUNDAO  
Rio De Janeiro  
CEP 21949-900

**Delivery Address:-**

\*\*\*\* Customer to collect \*\*\*\*

Bank Details:-
Bank of Scotland, Queens Cross Branch, Aberdeen, UK
IBAN No: GBP - GB48 BOFS 8005 1400 7927 61
Swift Bic: BOFSGBZ1353
Bank Sort Code: 80-05-14
Bank Account: GBP - 00792761

Terms:- Payment before delivery

PRO FORMA INVOICE No. 1134B /EN

Our Sales Order No SQ005657		Your Purchase Order No TBC	Delivery Date TBC	Delivery Method Customer collect	Invoice Date 21/02/14
Quantity	Part Number	Description		Unit Price	Amount
1 1	S04127 S00761 3M	Profiler, Super Seaking DFP 600/1100 kHz Connector Straight, 3 Metre tail  Weight: 7.5kgs Dims: 48 x 19 x 32 cms		8,878.00 00.00	8,878.00 00.00
Customs Tariff:			Freight/Carriage	00.00	
			Sub-Total	8,878.00	
			VAT @ Zero rated	00.00	
			TOTAL GBP £	8,878.00	

F143.3

**Tritech International Ltd**  
Registered Office:  
Peregrine Road,  
Westhill Business Park,  
Aberdeenshire, AB32 6JL.  
VAT No: GB384888679  
Registered in Scotland No: 85501

**Tritech International Ltd**  
Peregrine Road,  
Westhill Business Park  
Aberdeenshire, AB32 6JL  
United Kingdom  
Tel: +44 (0)1224 744111  
Fax: +44 (0)1224 741771  
www.tritech.co.uk

Figura 2: Cotação Super Seaking DFP da Tritech

**A2**  
Comércio, Representações e Serviços Ltda

### Proposta Comercial

Grupo GSCAR (LEAD/LABCON) - Coppetec  
Universidade Federal do Rio de Janeiro  
Renan Salles de Freitas

Data: 05/12/2013  
Nº Proposta: 05122013

A A2 MARINE SOLUTION, tem o prazer de apresentar a proposta para o seguinte material solicitado:

Qtd.	Descrição	Valor Total
1	Imagenex DT-101 Multibeam Echosounder	R\$ 365.000,00
	Frequency 240 KHz	
	DT101 – SIR Topside Interface Box	
	Swath Width 120° x 3	
	Number of Beams 120 - 240 - 480	
	Range 60 m	
	Range resolution 0.02% of range	
	PPS-Box	
	Imagenex DT-101 System Manual	
	Integrated motion reference unit	
	Integrated SVS	
1	Digitar S	
1	FlexPak6 Align System - Dual receiver - GPS + Glonass + Heading	
1	Software Hypack / Hysweep	
1	Computador Panasonix ToughbookExpresscard serial 4 portas + PPS BOX	
	Total em reais	R\$ 365.000,00

**Notas:**

- Condicão de Pagamento: Antecipado.
- Prazo de Validação da Proposta: 30 (trinta) dias.
- Prazo de Entrega: Até 30 dias.
- Garantia: 12 meses.
- Nos preços cotados já estão inclusos todos os impostos para emissão de Nfe.

A2 Solutions Comércio e Serviços Ltda ME  
CNPJ: 16.543.110/0001-30  
I.E.: 79.705.829  
I.M.: 0550717-0  
Av. Dom Helder Camara, 5200 Sala 521 – Pilares – Rio de Janeiro – RJ – Cep:20771-004  
Banco Itaú Agencia 3071 C/C 24990-2

Alexandre Franco  
Tel: (21) 8254-9999 / (21) 4141-8588 / (21) 3564-4466  
[franco@a2marinesolution.com](mailto:franco@a2marinesolution.com)  
A2 Marine Solution  
Departamento Comercial  
A2 Marine Solution  
Setor Comercial

Figura 3: Cotação DT-101 da Imagenex

From: Brian Berna <[Brian.Berna@teledyne.com](mailto:Brian.Berna@teledyne.com)>  
Date: 2013/9/17  
Subject: Teledyne BlueView Sonars  
To: "[marco.fsantosx@gmail.com](mailto:marco.fsantosx@gmail.com)" <[marco.fsantosx@gmail.com](mailto:marco.fsantosx@gmail.com)>

Hi Marco,

Pricing for our Sonars:

M900-130: \$31,950 US Dollars  
P900-130: \$30,849 US Dollars  
BV5000 3D: \$138,000 US Dollars

Let me know what questions I can answer here.

Best Regards,

Brian Berna  
Teledyne BlueView, Inc.  
Commercial Sales Manager – America's & Australia  
Direct: +[1.303.949.2360](tel:1.303.949.2360)  
Skype: brian.berna  
Email: [brian.berna@teledyne.com](mailto:brian.berna@teledyne.com)



Figura 4: Cotação BV5000 da Blueview

### 3 Notebooks

Especificação	Notebooks Dell - MODELO
Data	30/04/2014
Beneficiado	DELL Computador do Brasil LTD
CNPJ	72.381.189/0001-10
Número Nota	???
Quantidade	3
Valor	R\$9.298,39
Data Sheet	-
Função no projeto	O robô ROSA terá suas funções testados no canteiro de obras da Usina Hidroelétrica Jirau. Logo, para a execução dos testes será necessário Laptops para acompanhar os mesmos e realizar as correções necessárias.
Razão da Escolha	-

## 4 Sensor Indutivo

Especificação	Sensor Indutivo - NBB20-L2-E2-V1
Data	08/04/2014
Beneficiado	Pepperl Fuchs Ltda
CNPJ	64.126.675/0001-64
Número Nota	40885
Quantidade	3
Valor	R\$379,03 (Sensor) + R\$185,61 (Cabo)
Data Sheet	<a href="#">Anexo II - A</a>
Função no projeto	O sensor indutivo será utilizado para detectar o contato entre a garra pescadora e o Stoplog, verificando assim se o mesmo está corretamente enganchado.
Razão da Escolha	Os fornecedores pesquisados para sensores indutivos que atendem aos requisitos de projeto são: Contrinex, Pepperl-Fuchs e Turck. Diversos modelos foram avaliados, juntamente com os técnicos das respectivas empresas. A lista dos modelos de cada fabricante que seriam ideais à aplicação no projeto se encontra na tabela abaixo. Por os modelos serem equivalente em aplicabilidade, foi selecionado o sensor que apresenta o menor custo ao projeto o NBB20-L2-E2-V1. Os sensores indutivos serão instalados nas garras pescadoras e serão conectados a eletrônica embarcada, sendo a distância entre os itens de até 5 mestro, dependendo do modelo de garra pescador. Logo, a necessidade da compra do cabo.
	<ul style="list-style-type: none"><li>• <b>NBB20-L2-E2-V1 da Pepperl Fuchs por R\$131,37</b></li><li>• NI35-CP40-VP4X2 da TURCK por R\$ 428,97</li><li>• NI50-Q42 da TURCK por R\$ 414,75</li></ul>



Figura 5: Sensor Indutivo - NBB20-L2-E2-V1

## PROPOSTA COMERCIAL

Nº **155763A PA**

Elaborado : **16/12/13** Revisado : **19/12/13**  
Enviado por: **Lucas Multini**

**Validade da Proposta: 18/01/14**



**Pepperl+Fuchs Ltda**

R.Jorge Ordonhes, 58 – Jd. São Francisco  
S.Bernardo do Campo - SP - Brasil  
CEP: 09890-170  
Telefone: +55 (11) 4007 1448  
Telefax: +55 (11) 4393 0401  
<http://www.pepperl-fuchs.com>  
e-mail:[vendas@br.pepperl-fuchs.com](mailto:vendas@br.pepperl-fuchs.com)

**Nome/Dep.:** RENAN FREITAS - COMPRAS  
**Empresa:** FUNDACAO COPPETEC  
**Fone:** (21) 3622-3400 **Fax:** 2290662625  
**e-mail:** renan028@gmail.com

**Vendedor PA:** 00 - DISPONIVEL  
**Vendedor FA:** 00 - DISPONIVEL

**Segmento (BU):INT**

Prezado(a) Senhor(a), em atenção a solicitação de V.S.a, apresentamos nossa proposta comercial como segue:

<b>Item</b>	<b>Qtde.</b>	<b>P.N.</b>	<b>Descrição</b>	<b>Valor Un.</b> [R\$]	<b>Prazo</b>	<b>ST</b>	<b>IPI</b>	<b>ICM</b>	<b>NBM</b>
						[%]	[%]	[%]	[%]
001	3	187481	NBB20-L2-E2-V1 SENSOR INDUTIVO	131,37	24 H	0,00	10,0	4	85437099
002	3	035073	V1-G-5M-PVC CONECTOR C/ CABO 5M Conector M12 Femea - 4 pinos; Reto; Cabo de 5m em PVC	49,80	24 H	0,00	5,0	4	85444200
<b>Total da Proposta</b>				<b>543,51</b>					
<b>Total da Proposta com IPI</b>				<b>590,39</b>					

ICMS incluso nos preços, IPI não incluso. FATURAMENTO MINIMO R\$ 200,00

PREÇOS FIXOS E IRREAJUSTÁVEIS LIMITADO A DATA DE VALIDADE DA PROPOSTA.

### CONDIÇÕES DE FORNECIMENTO:

Cond.Pagto : 10 DDL

Frete : FOB  
Transportadora :

HORÁRIO PARA COLETA: 9h às 12h e das 13h às 16h. Embalagem e inspeção inclusas.

MULTAS: A cláusula de multa por atraso aceitável, quando aplicável e negociada, é de 0,1% ao dia, com teto MÁXIMO de 0,5%, calculados sobre o valor do item em atraso. Valores diferentes somente serão aceitos após APROVAÇÃO por escrito da PEPPERL+FUCHS LTDA. Em casos onde houver atrasos decorrentes de fortuitos, como greves de portos, aeroportos e agentes aduaneiros ou força maior, nenhuma multa será considerada.

PRAZO: Os prazos acima fornecidos estão sujeitos à alteração sem prévio aviso, ficando atrelados à disponibilidade a ser confirmada na data do pedido. Os mesmos também poderão sofrer alterações em casos fortuitos como greves de portos, aeroportos e agentes aduaneiros que possam comprometer os prazos normais de fornecimento, pelos quais a Pepperl+Fuchs não poderá ser responsabilizada. Nestes casos os prazos ficam sujeitos à regularização dos processos de desembarque alfandegário.

CONFIRMAÇÃO DE PEDIDO E MANUTENÇÃO DAS CONDIÇÕES ORÇADAS: O recebimento dos pedidos por parte da Pepperl+Fuchs Ltda será confirmado por escrito em até 24 horas do recebimento do mesmo, com suas condições definitivas, validando ou alterando a disponibilidade, valores e alíquotas de impostos para os produtos orçados. O não recebimento pelo cliente da confirmação supra, indicará o extravio do referido pedido e, consequentemente, o não processamento do mesmo, não cabendo qualquer reclamação por parte do cliente ao fornecedor dos termos desta proposta.

GARANTIA: Todos os produtos constantes nesta proposta têm garantia de 12 meses contados a partir da data de entrega para defeitos de fabricação. A reposição dos produtos defeituosos ficam sujeitos aos prazos normais de fornecimento e a disponibilidade de nossos estoques, além da verificação da causa dos problemas que levaram a avaria do mesmo. Esta garantia não cobre danos elétricos ou mecânicos resultantes de mau uso ou de instalação em condições não conformes com as características do catálogo do produto em questão.

Nos colocamos à sua inteira disposição para esclarecer possíveis dúvidas ou para informações adicionais que se façam necessárias.

Figura 6: Cotação Sensor Indutivo - NBB20-L2-E2-V1

**TURCK NI35-CP40-VP4X2**

Products > Sensors, Switches & Relays > Sensors > NI35-CP40-VP4X2  
[View More TURCK Sensors, Switches & Relays >>](#)



**TURCK**  
works

**SENSOR: LIMIT SWITCH: INDUCTIVE: DC; 4 WIRE; 10-65VDC; PNP**

Mfr. Part#:	NI35-CP40-VP4X2
Allied Stock#:	70034556

Quantity  Add to Cart ►►►

[View larger image](#)

[Documents](#) [Notes](#)

**Pricing (USD) & Availability****Standard Pricing**

**\$217.29** (Each)  
 1 \$217.290

**Availability**

0 can ship immediately.  
[Request Lead Time](#)  
 Minimum Quantity: 1 | Multiples Of: 1

Figura 7: Cotação NI35-CP40-VP4X2 da TURCK

**TURCK NI50U-Q42FWD-VP6X-H1141**

Products > Extended Offer > NI50U-Q42FWD-VP6X-H1141

**NO IMAGE AVAILABLE**

**TURCK**  
works

**NI50U-Q42FWD-VP6X-H1141 (M1538305)**

Mfr. Part#:	NI50U-Q42FWD-VP6X-H1141
Allied Stock#:	E2473712

Quantity  Add to Cart ►►►

[View larger image](#)

[Documents](#) [Notes](#)

**Pricing (USD) & Availability****Standard Pricing**

**\$175.29** (Each)  
 1 \$175.290

**Availability**

0 can ship immediately.  
[Request Lead Time](#)  
 Minimum Quantity: 1 | Multiples Of: 1

Figura 8: Cotação NI50-Q42 da TURCK

## 5 Encoder

Especificação	Encoder - RM9000
Data	??/2014
Beneficiado	IFM
CNPJ	??
Número Nota	87596
Quantidade	3
Valor	R\$3.589,61
Data Sheet	<a href="#">Anexo III - A</a>
Função no projeto	O encodear será utilizado para medir a posição angular do gancho da garra pescadora. Auxiliando assim a visualização do processo de açoLAGEM entre a garra pescadora e o stoplog.
Razão da Escolha	Os requisitos para o encoder no projeto são operação submersa até uma profundida de 30m, resistente a choques e precisão mínima de 5 graus. Os modelos e fabricantes que possuem um produto com especificações adequadas está listado na tabela abaixo. O modelo escolhido foi o RM9000 da IFM, pois o mesmo apresenta um menor custo ao projeto.

- **RM9000 da IFM por R\$ 1.298,69**
- SUBXWD da Hohner por R\$ 3.101,63
- G360 da Rotay Encoder Solutions por R\$ 2.816,86



Figura 9: Encoder - RM9000



**Patrick Blochle** <patrick@hohner.com>  
para mim, qualidade-hohn. ▾

20 de nov (2 dias atrás) ★ 🔍 ⏪ ⏴

Bom dia Renan,

Este encoder sim está disponível. Porém é fabricado e testado na Hohner do Reino Unido.

Nosso encoder serve para profundidades de até 1,000 metros e é bem forte, todas as peças são de aço inox.

O preço por peça começa em 825 libras por unidade.

Voces precisam de absoluto single turn ou multiturn?

O cabo do encoder é a parte, e custa bastante também.

<http://www.encoderonline.com/UK/Data-Sheets/Position/Data-absolute-Subxwd-analog.htm>

Temos uma fábrica no Brasil, que possa ajudar na importação ou que possam prover uma solução deles.  
Entre em contato com o Jorge, [qualidade@hohner.com.br](mailto:qualidade@hohner.com.br) e com certeza eles te ajudarão.

Obrigado, Patrick

Figura 10: Cotação SUBXWD da Hohner

 **Rotary Encoder Solutions Limited**  
para mim

06:52 (1 hora atrás)   

Hi Renan,  
Many thanks for your reply. Here is the quote for the G360. The cost of the 180 is the same anyway, you would just need to modify the part number accordingly if you decide to go that way.

Note: The cable is only a short length (1.5 meters), so I am currently obtaining the price to add a 20 Meter cable instead. I will quote that as soon as available, in the meantime, here is the price for the 1.5 Meter length...

Part description	<b>AR63/G360FL.92A4F</b>
List price 1-2 pc	£749.00 each
Lead time	About 2-3 weeks

Best regards,  
Kelvin  
Industrial Encoders Direct Ltd.  
Dutton Road  
Redwither Business Park  
Wrexham  
United Kingdom  
LL13 9UL  
Tel.: [+44 \(0\)1978 664722](tel:+44(0)1978664722)  
Fax: [+44 \(0\)1978 664733](tel:+44(0)1978664733)  
Web: [www.industrialencodersdirect.co.uk](http://www.industrialencodersdirect.co.uk)  
Email: [sales@industrialencodersdirect.co.uk](mailto:sales@industrialencodersdirect.co.uk)  
VAT Registration Number: GB-701 2727 74  
Company Registration Number: 3427825

Figura 11: Cotação G360 da Rotay Encoder Solutions

## 6 Pan e Tilt

Especificação	Pan e Tilt - OE10-102
Data	??/2014
Beneficiado	Kongsberg
CNPJ	Internacional
Número Nota	Pendente - Produto em trânsito
Quantidade	1
Valor	R\$39.358,18
Data Sheet	<a href="#">Anexo IV - A</a>
Funcão no projeto	O motor de posicionamento será acoplado ao Sonar 2D aumento o grau de liberdade do sistema de mapeamento, possibilitando assim cobrir toda a extensão do trilho do Stoplog.
Razão da Escolha	O fator mais importante na escolha do motor de posicionamento é a precisão que o mesmo consegue operar, pois o sonar mede a distância ao meio que se encontra de 3 a 50 metros de distância do mesmo, logo um pequeno erro de posicionamento angular do motor resultará em um erro grande na reconstrução do meio. Exemplo: 1 grau de erro a 50m de distância significaria 0,87m de erro na reconstrução do ambiente. Logo, o modelo escolhido para o projeto foi o OE10-102 que oferece a menor folga mecânica.

- **OE10-102 da Kongsber com 0.08 graus por \$12.563**
- SS109 da Sidus com 0.5 graus por \$6.220 dolares, data sheet em anexo [A](#)
- PT-10FB da ROS com 0.6 graus por \$10.285, data sheet em anexo [A](#)



Figura 12: OE10-102 da Kongsber

  
KONGSBERG

**Kongsberg Maritime Ltd**

Campus 1, Aberdeen Innovation Park, Balgownie Road,  
Bridge of Don, Aberdeen, AB22 8GT  
Phone +44 (0)1224 226500 Fax +44 (0)1224 226598  
km.camsales.uk@kongsberg.com

QUOTATION NUMBER : 309022  
DATE: 4-DEC-13

QUOTE VALIDITY : 30 DAYS

To ensure that we comply with UK export legislation we require to know the end user of any equipment purchased from ourselves at point of order.

**TO Fernando Portella**  
Demo Offshore  
Your Reference: RFQ Multi Purpose Pan & Tilt Unit OE10-102  
e-mail: fportella@demo-offshore.com.br

**Comment:**

ITEM	QTY	PART NUMBER	DESCRIPTION	UNIT PRICE	LINE TOTAL
1	1	OE10-102SS-0109	Compact Ruggedised Pan and Tilt Unit, Stainless Steel, DC switched or serial control, digital feedback, 5506-2008 connector	12,392.00	12,392.00
2	1	10-102-6915	Over The Top twin mount bracket kit	171.00	171.00

PRICING	PRICES QUOTED ARE EX WORKS ABERDEEN AND EXCLUDE ALL VAT AND DUTIES.
CURRENCY	PRICES QUOTED ARE IN US DOLLARS.
DELIVERY	CURRENTLY ONE (1) OF EACH IN STOCK.
DELIVERY TERMS	DELIVERY TIMES ARE DEEMED TO COMMENCE FROM RECEIPT OF YOUR WRITTEN PURCHASE ORDER AND ARE SUBJECT TO PRODUCTION SCHEDULING AT THE TIME OF ORDER PLACEMENT AND THEREFORE SUBJECT TO CHANGE. FIRM DELIVERY WILL BE ADVISED ON PLACEMENT OF ORDER. PLEASE BEAR IN MIND THE FESTIVE SHUTDOWN FROM 24 <sup>th</sup> DECEMBER TO 3 <sup>rd</sup> JANUARY WHICH DEPENDING ON WHEN ORDER IS PLACED MAY IMPACT DELIVERY SCHEDULE.
PAYMENT TERMS	STRICTLY 30 DAYS WITH APPROVED CREDIT OR BY ARRANGEMENT, MOST CREDIT CARDS ARE ACCEPTED.
MINIMUM ORDER VALUE	100 US DOLLARS.
TERMS AND CONDITIONS	KONGSBERG MARITIME LTD's STANDARD TERMS AND CONDITIONS OF SALE SHALL APPLY UNLESS AGREED OTHERWISE.
WARRANTY	MANUFACTURERS STANDARD WARRANTY TERMS APPLY, COPY AVAILABLE ON REQUEST.
QUOTATION PREPARED BY	BILL STUART

Visit the camera web site at: <http://www.km.kongsberg.com/cameras>

THANK YOU FOR YOUR BUSINESS!

Figura 13: Cotação OE10-102 da Kongsber



Rick Longabaugh <R.Longabaugh@sidus-solutions.com>  
para mim, Accounting

4 de dez (2 dias atrás) ☆



Renan,

Sorry for the delay. It has been very busy the past couple of days. The standard aluminum pan and tilt, the SS109, 24VDC, RS485 control retails for \$6220. There is a high torque version and an ATP version that are more. There are optional brackets available too. I have attached data sheets for each of the version. We can provide a formal quote if you let us know which one you are interested in and what the application is. We have several brackets specific to certain sonar units and others for cameras and lights. All versions are also available in stainless steel or titanium for a premium. Please have a look and let us know how to proceed.

Best regards,

**Rick Longabaugh**  
**General Manager**



Figura 14: Cotação SS109 da Sidus



Quote Number 31375  
 Created Date 12/3/2013  
 Expiration Date 1/2/2014

**Prepared for:**  
 Contact Name Renan Salles de Freitas  
 Email renan028@gmail.com  
 Ship To Name University of Rio De Janeiro

Prepared By Kendra Ksiazek  
 Company Address 5618 Copley Drive  
 San Diego, CA 92111  
 E-mail kendrak@rosys.com

Description PT-10

Product	Product Description	List Price	Quantity	Total Price
21-10036-01	PT-10FB AL 24VDC RS485 AIR 88:1 GRS	\$8,845.00	1.00	\$8,845.00
CA-88-01-20	CBL ASSY 20FT LPMIL-4F RS485/232/USB	\$1,440.00	1.00	\$1,440.00

Subtotal	\$10,285.00
Total Price	\$10,285.00
Grand Total	\$10,285.00

**Terms**  
 1) Freight: 30 Days  
 2) Validity: ExWorks (San Diego CA. 92111)  
 3) Payment: Net 30  
 4) Packaging: Prices include standard commercial packaging  
 5) Additional: ROS standard terms and conditions of sale available upon request  
 6) Quantity: Purchase quantities other than those herein specific require a separate quotation  
 7) ROS Terms and Conditions must be added to each Purchase Order  
 8) Actual delivery time is subject to change depending on when your purchase order or payment is received at ROS

Figura 15: Cotação PT-10FB da ROS

## 7 Tablet

Especificação	Tablet Samsung -
Data	07/04/2014
Beneficiado	Magazine Luiza
CNPJ	???
Número Nota	000.244.521
Quantidade	1
Valor	R\$1.583,12
Data Sheet	-
Função no projeto	O tablet será utilizado para a visualização da interface de usuário, que representa as informações do robô em um formato facilmente comprehensível.
Razão da Escolha	O tipo de Tablet foi definido baseado nos requisitos de sistema operacional Android para funcionamento da interface desenvolvida. Dentre os tablets Androids, foi escolhido o que apresentou o menor preço dada a configuração mínima necessária.

- ...
- ...
- ...

## 8 Sensor de Pressão

Especificação	Sensor de Pressão - ??
Data	???
Beneficiado	Velki
CNPJ	???
Número Nota	???
Quantidade	1
Valor	R\$1.6525,50
Data Sheet	-
Função no projeto	O sensor de pressão será utilizado para medir a profundidade do robô durante o processo de inserção da garra pescadora.
Razão da Escolha	?????
	• ...
	• ...
	• ...

## A Anexo I - Seaking Profiler

# Super SeaKing Profiler

## Dual Frequency Profiling Sonar



Using side lobe suppression techniques, improved signal to noise reduction and a reduced beamwidth the Super SeaKing Dual Frequency Profiler provides high quality profiling in a compact mechanical scanning sonar.

The Super SeaKing Profiler uses a 1.1MHz operating mode for high accuracy work at short ranges or in clear water.

Additionally the Super SeaKing Profiler is a dual frequency device, and when required a 0.6MHz operating mode can be used in water containing suspended particles. The lower frequency can also be used if longer ranges are required.

As part of the SeaKing suite of survey sensors the Super SeaKing Dual Frequency Profiler can run simultaneously with a number of SeaKing sensors on one network.

**Composite transducer technology for increased range and image resolution**

The Super SeaKing Dual Frequency Profiler uses the latest technological advances available in transducer design. A composite transducer technology has been used to ensure that this sonar offers substantially increased range and image resolution.

### Benefits

- Simultaneous use with SeaKing sensors
- Robust, reliable, proven design
- High quality profile data
- Easy system integration

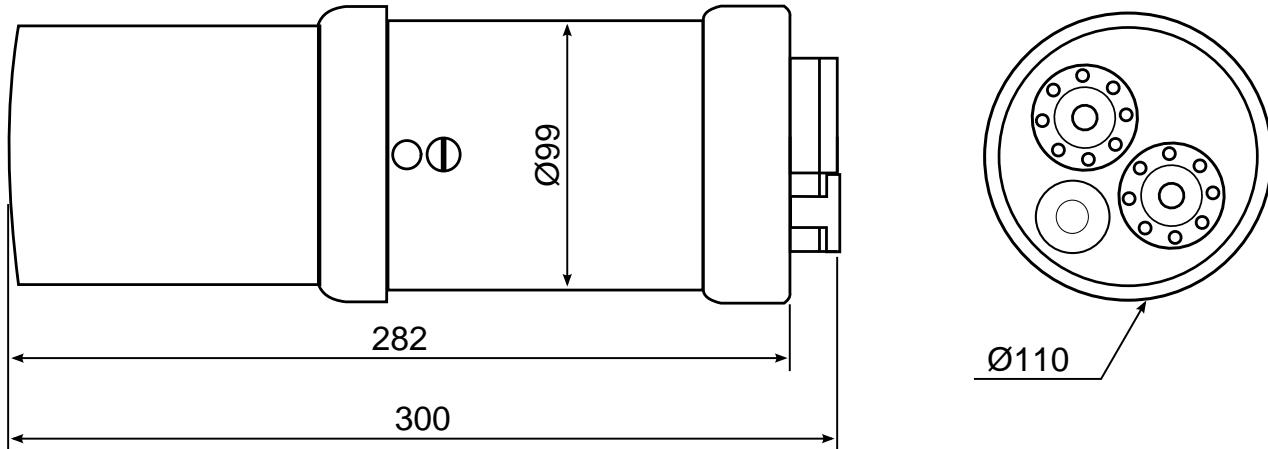
### Features

- Dual frequency transducer
- Hard boot for protection
- Connector options available
- 4000m depth rating
- Fast scan rates
- ARCNET or RS232

### Applications

- Pipeline and trench profiling
- Precision positioning of mattresses
- Storage tank survey
- Underwater surveying of bridge supports

# Specification



Not to scale, dimensions in mm.

Acoustic	High frequency	Low frequency
Operating frequency	1.1MHz	600kHz
Beamwidth	1° conical	2° conical
Maximum range	40m	80m
Pulse length	20 - 200µs	
Minimum range	0.3m	
Scan resolutions	0.45°, 0.9°, 1.35° 1.8°	
Source level	210dB re 1µPa at 1m	
Scanned sector	Up to 360°	
Continuous 360° scan?	Yes	
Sector offset mode?	Yes	
Timing resolution	1mm	

Physical		Electrical and Communications	
Weight in air	3.5kg (aluminium)	Power requirement	20 to 36V DC at 1A
Weight in water	1.7kg (aluminium)	Communication protocols	ARCNET, RS232
Materials	Boot: Acetal copolymer Body tube: Anodised aluminium alloy (6Al4V Titanium optional)	Communication rate	ARCNET: 156kbit·s <sup>-1</sup> , 78kbit·s <sup>-1</sup> RS232: 115.2kbit·s <sup>-1</sup>
Depth rating	4000m	ARCNET line driver	1500m at 156kbit·s <sup>-1</sup> 2500m at 78kbit·s <sup>-1</sup>
Temperatures	Operating: -10 to 35°C Storage: -20 to 50°C	Connector options	Tritech 6-pin (standard) Others available on request

Specifications subject to change according to a policy of continual development.

Document: 0374-SOM-00007, Issue: 01

Marketed by:

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**Tritech**  
トリチック

## A Anexo II - Sensor Indutivo



## Designação para encomenda

NBB20-L2-E2-V1

## Características

- Cabeça do sensor pode ser substituída e rodada
- 20 mm nívelado
- DC de 3 fios
- Fecho de montagem rápida
- LED de 4 indicações

## Acessório

V1-G

V1-W

V1-G-2M-PUR

V1-W-2M-PUR

MHW 01

MH 02-L

Auxiliar de montagem

## Dados técnicos

### Dados gerais

Função do elemento de comutação	s <sub>n</sub>	PNPContacto de trabalho
Intervalo de comutação		20 mm
Montagem		nivelado
Polaridade de saída		DC
Intervalo seguro de comutação	s <sub>a</sub>	0 ... 16,2 mm
Factor de redução r <sub>AI</sub>		0,33
Factor de redução r <sub>Cu</sub>		0,31
Factor de redução r <sub>1.4301</sub>		0,74
Factor de redução r <sub>Ms</sub>		0,41

### Dados característicos

Tensão de funcionamento	U <sub>B</sub>	10 ... 30 V DC
Frequência de comutação	f	0 ... 150 Hz
Histerese	H	tipo 5 %
Protecção contra as inversões da polaridade		protecção contra polaridade inversa
Protecção contra curto-círcuito		cíclico
Queda de tensão	U <sub>d</sub>	≤ 2 V
Corrente de funcionamento	I <sub>L</sub>	0 ... 200 mA
Corrente residual	I <sub>r</sub>	0 ... 0,5 mA
Corrente reactiva	I <sub>0</sub>	≤ 20 mA
Retardamento de prontidão	t <sub>v</sub>	80 ms
Indicação da tensão de funcionamento		LED, verde
Indicação do estado de comutação		LED, amarelo

### Características da segurança funcional

MTTF <sub>d</sub>	1460 a
Vida útil (T <sub>M</sub> )	20 a
Grau de cobertura do diagnóstico (GCD)	0 %

### Condições ambientais

Temperatura ambiente	-25 ... 85 °C (-13 ... 185 °F)
Temperatura de armazenamento	-40 ... 85 °C (-40 ... 185 °F)

### Dados mecânicos

Tipo de saída	Conector do aparelho M12 x 1, 4 pinos
Material da caixa	PA
Superfície frontal	PA
Tipo de protecção	IP69K
Massa	130 g

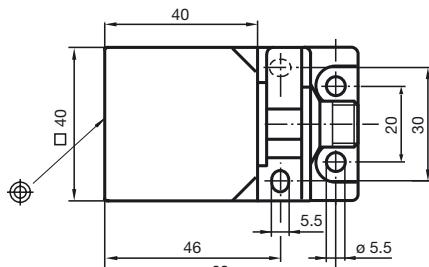
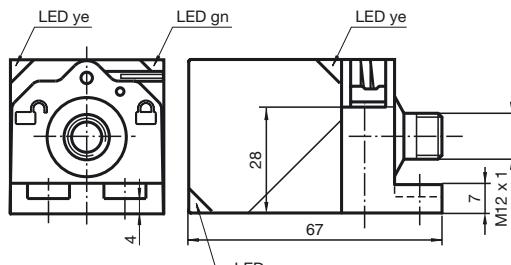
### Conformidade de directivas e normas

Conformidade com as normas	
Normas	EN 60947-5-2:2007 IEC 60947-5-2:2007

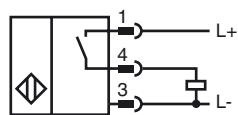
### Autorizações certificadas

Classe de protecção	II
Tensão de isolamento de medição U <sub>i</sub>	253 V
Resistência de tensão transitória de medição U <sub>imp</sub>	4000 V
Autorização UL	cULus Listed, General Purpose
Autorização CSA	ccSAus Listed, General Purpose
Autorização CCC	Produtos com tensão de operação máxima de ≤36 não necessitam de aprovação, por este motivo não apresentam identificação CCC.

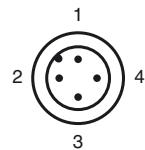
## Dimensões



## Conexão eléctrica



## Pinout



Fios cores de acordo com a EN 60947-5-2

1	BN
2	WH
3	BU
4	BK

## A Anexo III - Encoder



CANopen

### Model Number

CVS42H

Heavy duty encoder

### Features

- **Sturdy construction**
- **Highly shock / vibration and soiling resistant**
- **Increased shaft load capacity**
- **Stainless steel housing**
- **IP69K**
- **Very small housing**

### Description

This absolute rotary encoder with magnetic sampling provides a position value corresponding to the shaft position on its integrated CAN bus interface. The very sturdy design of this encoder has been dimensioned for use in harsh environmental conditions and high mechanical stress.

The integrated CAN-bus interface supports all CANopen functions. Thus the following modes can be programmed to either enabled or disabled:

- Polled Mode
- Cyclic Mode
- Sync Mode

### Technical data

#### General specifications

Detection type	magnetic sampling
----------------	-------------------

#### Indicators/operating means

LED ERR	dual-LED, red
LED RUN	dual-LED, green

#### Electrical specifications

Operating voltage $U_B$	10 ... 30 V DC
Power consumption $P_0$	$\leq 1.5 \text{ W}$
Output code	binary code
Code course (counting direction)	adjustable

#### Interface

Interface type	CANopen
Resolution	
Single turn	12 Bit
Overall resolution	12 Bit
Transfer rate	max. 1 MBit/s
Cycle time	500 $\mu\text{s}$
Standard conformity	ISO 11898

#### Connection

Connector	M12 connector, 5 pin
Cable	2 m fixed cable, 5-wire, screened

#### Standard conformity

Protection degree	IEC/EN 60529
Climatic testing	DIN EN 60068-2-3, 95 %, no moisture condensation
Emitted interference	EN 61000-6-4:2007
Noise immunity	EN 61000-6-2:2005
Shock resistance	DIN EN 60068-2-27, 300 g, 6 ms
Vibration resistance	DIN EN 60068-2-6, 30 g, 55 ... 2000 Hz

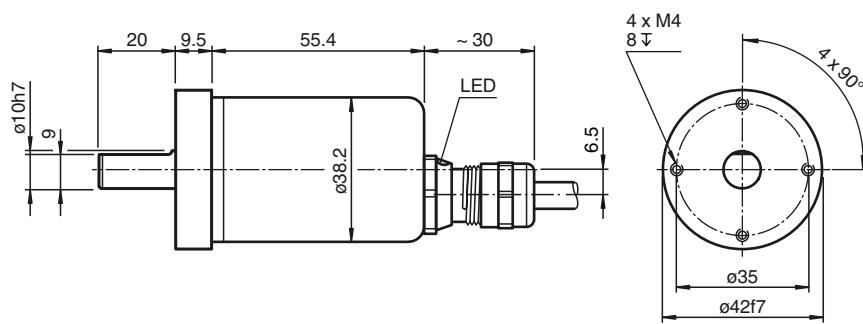
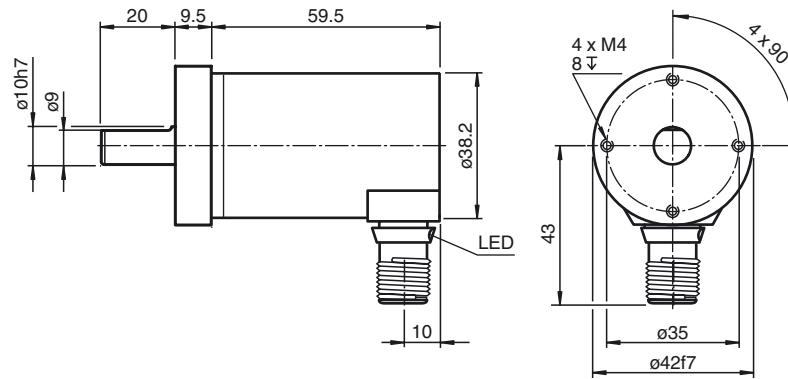
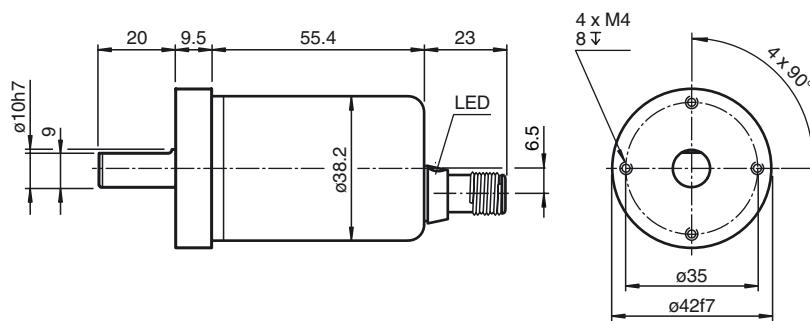
#### Ambient conditions

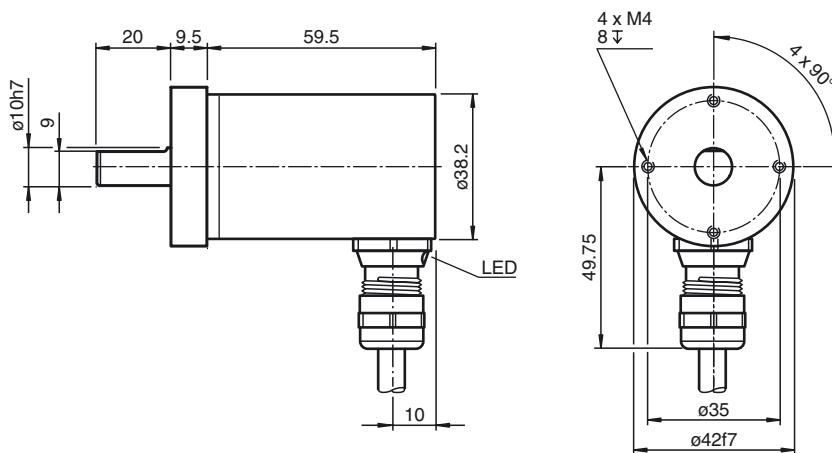
Operating temperature	-40 ... 85 °C (-40 ... 185 °F)
Storage temperature	-40 ... 85 °C (-40 ... 185 °F)
Relative humidity	98 %, no moisture condensation

#### Mechanical specifications

Flange	servo flange 42 mm with 4 x Threading M4
Shaft dimensions Ø x l	10 mm x 20 mm
Protection degree	IP65 / IP67 / IP68 / IP69k
Material	
Housing	Stainless steel 1.4404 / AISI 316L
Flange	Stainless steel 1.4404 / AISI 316L
Shaft	Stainless steel 1.4412 / AISI 440B
Mass	approx. 350 g
Rotational speed	max. 6000 min <sup>-1</sup>
Moment of inertia	30 gcm <sup>2</sup>
Starting torque	< 5 Ncm
Shaft load	
Axial	270 N
Radial	270 N

## Dimensions





### Electrical connection

Signal	Connector	Cable
CAN GND	1	green
V <sub>S</sub> (10 ... 30 V DC)	2	red
GND	3	yellow
CAN-High	4	white
CAN-Low	5	brown
Shielding	Housing	screen
Pinout		

## Programmable CAN operating modes

Mode	Explanation
Polled mode	The connected host requests the current actual position value via a remote transmission request telegram. The absolute encoder reads in the current position, calculates all parameters that have been set and sends back the process actual value through the same CAN identifier.
Cyclic mode	The absolute encoder sends the current actual process value cyclically, without being prompted by the host. The cycle time can be programmed in milliseconds for values between 1 ms and 65536 ms.
Sync mode	After the sync telegram has been received by the host, the absolute encoder sends the current actual process value. If multiple nodes should respond to the sync telegram, the individual nodes report one after the other according to their CAN identifier. There is no programming of an offset time. The sync counter can be programmed so that the rotary encoder does not transmit until after a defined number of sync telegrams.

## Programmable rotary encoder parameters

Parameter	Explanation
Operating parameter	The direction of rotation (complement) can be specified by parameter as the operating parameter. This parameter determines the direction of rotation in which the output code will ascend or descend.
Resolution per revolution	The "Resolution" parameter is used to program the rotary encoder so that a desired number of steps can be implemented in reference to one revolution.
Preset value	The preset value is the desired position value that must be achieved for a specific physical setting of the axis. The preset value parameter is used to set the actual position value to the desired actual process value.
Min. and max. limit switch	A total of two positions can be programmed. The absolute encoder sets one bit to high state in the 32 Bit actual process value if a value falls outside the range between these two positions.
Cam	8 freely programmable cams can be set within the overall resolution. This produces the functionality of a mechanical cam shifting mechanism.

## Status LED

The rotary encoder is equipped with a two-color status LED. The LED lights up both red and green, and displays the physical bus status and the status of the CANopen state machine. The following statuses are defined:

- LED on
- LED off
- Led flickers (rapid flashing at approx. 10 Hz)
- Led flashes (slow flashing at approx. 2.5 Hz)
- Single flash (LED flashes once briefly, followed by a pause of approx. 1 s)
- Double flash (LED flashes twice briefly, followed by a pause of approx. 1 s)
- Triple flash (LED flashes three times briefly, followed by a pause of approx. 1 s)
- Quadruple flash (LED flashes four times briefly, followed by a pause of approx. 1 s)

If there is any conflict as to whether the red or the green LED should be activated, only the red LED is activated. In all other instances, the two-color LED will combine the behavior of the CAN Error LED (red) and the CAN Run LED (green).

### Description of the CANopen Error LED (red)

Error LED (red)	CANopen status	Description
LED off	No error	Normal operating mode.
LED flickers	Auto bit rate/LSS	Automatic bit rate detection or LSS service in operation (alternating with Run LED).
LED flashes	Faulty configuration	General configuration error.
Single flash	Warning limit has been reached	At least one of the CAN controller error counters has reached or exceeded the warning limit (too many error frames).
Double flash	Error event	A guard event (NMT slave or NMT master) or a heartbeat event (heartbeat consumer) has occurred.
Triple flash	Sync error	The sync message was not received within the configured communication time-out. See object 1006h.
Quadruple flash	Event timer error	An anticipated PDO (process data object) was not received before the event timer expired.
On	No bus signal	The CAN controller has no connection to the bus.

### Description of the CANopen Run LED (green)

Run LED (green)	CANopen status	Description
LED flickers	Auto bit rate/LSS	Automatic bit rate detection or LSS service in operation (alternating with Error LED).
LED flashes	PREOPERATIONAL	The device is in PREOPERATIONAL status.
Single flash	STOPPED	The device is in STOPPED status.
Double flash	-	Reserved
Triple flash	Program/firmware upload	Software is being uploaded to the device.
On	OPERATIONAL	The device is in OPERATIONAL status.

Date of issue: 2012-10-09 t48778\_eng.xml

Release date: 2012-10-09 06:32

## Order code

C	V	S	4	2	H	-	0	1	R			1	B	N	-	0	0	1	2
---	---	---	---	---	---	---	---	---	---	--	--	---	---	---	---	---	---	---	---

Number of bits singletturn  
12 4096 (standard)

Option 2

N Normal

Output code

B Binary

Option 1

1 with Status-LED

Exit position

A Axial

R Radial

Connection type

BD Device connector M12 x 1, 5 pin

K2 2 m cable

Shaft dimension/flange version

01R Shaft Ø10 mm x 21 mm with 42 mm servo flange

Housing material

H Heavy Duty

Principle of operation

S Singletturn

Shaft version

V Solid shaft

Data format

C CAN bus

## A Anexo IV - Pan e Tilt

## Multi-purpose pan &amp; tilt



- Extremely durable and compact design
- Harmonic gearing
- Digital or analogue control

The new OE10-102 is an electric multi-purpose pan and tilt unit offering exceptional torque, positioning performance and durability for the toughest subsea tasks. Its compact robust design, high shock & vibration tolerance and other environmental and electrical protection features ensure continuous performance in the harshest environments.

The OE10-102 is either controlled directly by application of hard-wired controls interfaced to manually operated switches or to existing ROV outputs (24VDC or optional 110VAC) or by use of a digital command via RS485 half duplex or RS232 serial data link.

Graphic User Interface (GUI) software and 9 BIT serial feedback is provided as standard and control protocol can be supplied on request. Use of the GUI allows full pan and tilt control, including: speed, "go to" functions and tilt travel limits.

The OE10-102 uses innovative Harmonic Drive gear systems enabling a high torque output (up to 35Nm from a 24V power input), minimal backlash and high positional accuracy and repeatability.

The pressure housing is manufactured from stainless steel as standard and incorporates a pressure compensation unit for reliable deep water operation to 6000m.

Electrical end stops limit both pan and tilt excursion. These can be set up via the GUI or by use of a non-penetrating magnetic switch. RS232 or RS485 can also be selected using this magnetic switch. Mechanical over travel stops can be fitted externally in 30 degree steps.

## Standard Features

## Electrical

Input Voltage	12 to 24 VDC (110VAC optional)
Maximum Current	2.8 amps per axis
Maximum Output Torque P&T	30 to 35 Nm (depending on voltage and control type)
Nominal Output Speed	13 to 30 Deg/second
Limit Switches	External adjustable magnetic stop positions
Position Feedback	Electrically adjustable by digital control 9 bit resolution accuracy serial output (approx 0.7°)
Control	Switched - Direct application of ±12 to 24VDC Digital - RS485 Half Duplex (multidrop) or RS232. GUI is inclusive. Control protocol available
Protection	Over-voltage protection on digital inputs and outputs
Electro-Magnetic Compatibility	BS EN 61000-6-3 2007 Emission BS EN 61000-6-1 2007 Immunity

## Environmental

Operating Depth	Up to 6000 metres
Temperature Range	Operating -5°C to +40°C Storage -20°C to +60°C
Shock	30g peak, 25 ms half sine pulse
Vibration (non-operating)	10g, 20Hz to 150Hz in all three axes

## Mechanical

Gearbox	Harmonic Drive
Maximum Payload	25kg (55lbs) in air
Backlash	±0.08°
Dimensions	169mm (H) x 150mm (L) x 152mm (D)
Housing Material	Stainless Steel as standard
Weight	9.5kg in air, 7.6kg in water
Pressure Compensator	Integral Pressure Compensation
Connector	Burton 5506-2008 as standard (Other options available, including Subconn BH 8M)

## Optional

Payload Mounting Brackets (Right Angle or direct drive)



KONGSBERG

# SS109 PAN & TILT

## Underwater Pan and Tilt Assembly

**BOWTECH**  
PRODUCTS  
LIMITED

underwater **vision** specialists

## Features

- Modular Configuration
- High Quality Ball Bearings
- Low Backlash Gear Drives and Motors
- Operating Depth of 10,000ft



## Description

The SS109 underwater pan and tilt assembly is designed in a modular configuration and uses high quality precision ball bearings, low backlash gear drives and motors. The high output brushless, synchronous electric motors can operate reliably even after thousands of cycles. These units can operate at a depth of 10,000 feet and are capable of generating impressive amounts of torque on each axis.

The SS109 can operate in any type of harsh environment due to its corrosion resistant, single piece design which prevents rusting and water ingestion. Communication is supported through RS232, RS422 and RS485 protocols. Users can choose from a range of input connectors.



# Specification – SS109 PAN & TILT

## MECHANICAL

Gears:	Precision Strain Wave Gearing
Backlash:	36 arc Minutes (approx. 0.5°)
Dimensions:	8.45in x 6.64in x 3.68in (215mm x 169mm x 94mm)
Weight in Air:	9.3lbs (4.2kg)
Weight in Water:	5.9lbs (2.7kg)
Pressure Compensator:	Internal Diaphragm
Position Limits:	(optional) +/-175° Pan, +/-90° Tilt

## ENVIRONMENTAL

Operating Depth:	Up to 10,000ft (3,000m) with Internal Compensation Up to 20,000ft (6,000m) with External Compensation
Temperature Range:	-20°C to 50°C (-4°F to 122°F) Operating -30°C to +60°C (-22°F to +140°F) Storage
Housing Material:	Anodized 6061-T6 Aluminium
O-ring Material:	Buna
Fastener Material:	316 Stainless Steel

## ELECTRICAL

Input Voltage:	24Vdc, 24 Vac or 115 Vac
Maximum Drive Current:	100mA to 900mA Per Axis (24 Vdc serial, speed dependant) 250mA Per Axis (24 Vdc analog) 750mA Per Axis (115 Vac) 150mA Per Axis (115 Vac)
Maximum Static Current:	100mA – 1.2A Per Axis (24 Vdc serial, customer selectable) 650mA Per Axis (24 Vdc analog) 350mA Per Axis (24 Vac) 100mA Per Axis (115 Vac)
Maximum Output Torque:	10 ft-lb (14nm) (24 Vdc) 13 ft-lb (18nm) (24 Vac & 115 Vac) 50lbs (23kg)
Maximum Payload:	RS485 Version 9 Steps 1.5 to 7.5 deg/s
Output Speed:	12 Bit Resolution (approx. 0.1°)
Position Feedback:	Analog, RS485, RS422 or RS232
Communication:	Large Selection of Connectors Available
Connector:	



# PT-10-FB RS-485 COMPUTER CONTROLLED PAN & TILT UNIT



**RS-485 / RS-232 computer controlled for advanced features and control options**

**Real-time position feedback, variable rotation speed, variable braking, and networkability of multiple pan and tilts**

**10 lb-ft (13.56 N-m) of output torque on each axis and accommodates payloads up to 25 lbs (11.3 kg)**

**Rugged pan and tilt unit with RS-485 / RS-232 computer control to remotely orient camera systems, acoustic equipment, antennas, and other instrumentation.**

The PT-10-FB RS-485 pan and tilt provides 10 lb-ft (13.56 N-m) of output torque on each axis. Heavy-duty ball bearings supporting the output shaft allow it to accommodate payloads up to 25 lbs (11.3 kg). Each axis includes a DC brushless stepper motor coupled to low backlash gearing. It is designed to allow stalling of the output shafts without damage to the gears, the motors, or control electronics.

The RS-485 / RS-232 control enables the pan and tilts to be highly configurable and precision controllable. By using either the ROS positioner GUI (graphical user interface) or the ROS communication protocol for custom software integration you can control unique features such as: variable rotation speed, real-time position feedback, variable braking, programmable software limits, and networkability of multiple ROS pan and tilts sharing the same cable. A total of only four wires (two for power; two for communication) are needed to operate the RS-485 / RS-232 pan and tilt units.

Using RS-485 control provides several advantages over RS-232. RS-485 allows communication over longer lengths of cable (1000 feet) and enables the ability for networking multiple nodes. A typical computer has the capability of RS-232 communication through its serial COM ports. Inexpensive devices are readily available for converting RS-232 to RS-485, USB to RS-485, or Ethernet to RS-485. This unit may also be controlled by an external joystick.

The PT-10-FB RS-485 pan and tilt is available in two versions: air-filled or oil-filled. Oil-filled units are used for deep water applications up to 3,000 meters depth. Air-filled units are used for shallow water applications up to 30 meters depth. In addition, air-filled units are suitable for above water applications where rain, humidity, and dust are issues.



# PT-10-FB RS-485 Computer Controlled Pan & Tilt Unit

## PERFORMANCE

### Power:

Operating Range:

24 - 28 VDC, 1.5 amps (max) per axis @ 24 VDC

Braking Mode:

24 VDC, adjustable, 0 mA to 750 mA per axis

At Rest (not braking):

< 100 mA per axis

### Torque:

10 lb-ft (13.56 N-m) per axis, 0.5 to 15 degrees/second (0.08 to 2.5 RPM)

8 lb-ft (10.85 N-m) per axis, 15 to 20 degrees/second (2.5 to 3.3 RPM)

Rotation Speed (88:1 gears):

Variable, 0.5 to 20 degrees/second (0.08 to 3.3 RPM)

Gear backlash (88:1 gears):

0.6 degrees (36 arc minutes)

Scan Range (both axes):

0 to 360 degrees when used with no external hard stops

Scan Range w/ stop collar & optional yoke bracket

12 to 348 degrees pan axis, +/- 90 degrees tilt axis

Feedback Potentiometer:

Absolute position (1000 ohm wire-wound), 10 bit A/D

Resolution:

+/- 0.5 degrees (30 arc minutes)

Control protocol:

RS-485, 2-wire half duplex, 8 data bits, 1 stop bit, no parity, no hardware flow control

Command Protocol:

ROS Document 21-30022

Supported Baud Rates:

Factory set to 9.6 KBaud, 19.2 KBaud, or 57.6 KBaud

Networkability:

Up to 32 ROS RS-485 nodes sharing the same cable for power and communication

## MECHANICAL

Housing Material:

	Anodized 6061-T6 Aluminum	Electropolished 316 Stainless Steel
Height:	236 mm (9.30 in)	236 mm (9.30 in)
Width:		
Air-filled:	179 mm (7.05 in)	179 mm (7.05 in)
Oil-filled with bellofram:	219 mm (8.64 in)	219 mm (8.64 in)
Length without connector:	94.0 mm (3.70 in)	94.0 mm (3.70 in)
Main Body Diameter:	74.9 mm (2.95 in)	74.9 mm (2.95 in)
Output Shaft Diameter:	25.4 mm (1.00 in)	25.4 mm (1.00 in)
Weight in Air:		*
Air-filled:	3.6 kg (8.0 lbs)	4.0 kg (8.8 lbs)
Oil-filled:	4.2 kg (9.3 lbs)	4.6 kg (10.0 lbs)
Weight in Water:		
Air-filled:	2.1 kg (4.7 lbs)	2.3 kg (5.2 lbs)
Oil-filled:	2.6 kg (5.8 lbs)	2.9 kg (6.3 lbs)
Standard Connector:	LPMBH-4-MP	
Housing Mounting:	Two 1/4-20 threaded holes in output pan shaft	
Equipment Mounting:	Two 1/4-20 threaded holes in output tilt shaft	
Mounts:	ROS mounting plate and optional yoke bracket	
External Mechanical Limits:	ROS stop collar	
Compensator (oil-filled units only)	Bellofram	(*) weights with mounting plate & stop collar

## ENVIRONMENTAL

Operating Depth Rating:

Air-filled:

30 m (100 ft)

Oil-filled:

3,000 m (10,000 ft)

Operating Temperature:

up to +50°C (122°F)

Storage Temperature:

-20°C to +60°C (-4°F to 140°F) in air

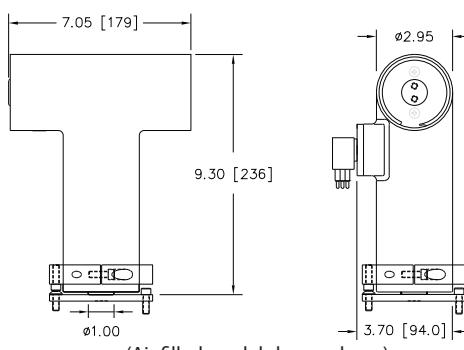
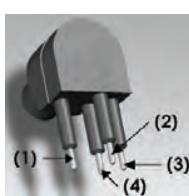
## ROS STANDARD PIN-OUT

1 - DC COMMON

2 - +24 VDC

3 - RS-485 A

4 - RS-485 B



Specifications subject to change without notice



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