

Referências bibliográficas

- [1] AMERICAN PETROLEUM INSTITUTE. **API STANDARD 520 Sizing, Selection and Installation of Pressure-relieving Devices in Refineries.** Eighth Edition, 2008.
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- [4] FRANCIS, J.; BETTS, P.L. **Backpressure in a High-Lift Compensated Pressure Relief Valve subject to single phase compressible flow.** Journal of Loss Prevention in the Process Industries, vol. 11, 1998, p. 55-66.
- [5] BOCCARDI G.; BUBBICO R.; CELATA G. P.; MAZZAROTTA B. **Two-phase flow through pressure safety valves. Experimental investigation and model prediction.** Chemical Engineering Science, vol. 60, 2005, p. 5284-5293.
- [6] ORTEGA A. J.; AZEVEDO B. N.; PIRES L. F. G.; NIECKELE A. O. **Analysis of the Discharge of a Spring Loaded Pressure Relief Valves During its Dynamic Behavior.** Anais do Congresso Brasileiro de Engenharia Mecânica, COB09-2155, 2009.
- [7] ORTEGA A. J.; AZEVEDO B. N.; PIRES L. F. G.; NIECKELE A. O.; AZEVEDO L. F. A. **A Numeral Model About the Dynamic Behavior of a Pressure Relief Valve.** Anais do Congresso Brasileiro de Engenharia e Ciências Térmicas, 2008.
- [8] ORTEGA A. J.; PIRES L. F. G.; NIECKELE A. O. **Simulação Numérica de Escoamento Incompressível ao Longo de uma Válvula de Alívio de Pressão.** Anais do Congresso Nacional de Engenharia Mecânica, COM 08-0711, 2008.

- [9] MELIANDE P.; NASCIMENTO E. A.; LACERDA R. F. **Transient Evaluation for LPG and oil pipelines.** Anais do Internacional Pipeline Conference, IPC 31323, 2010.
- [10] WYLIE, E. BENJAMIN; L. STREETER. **Fluid Transients in Systems.** Prentice Hall, NJ 07458, 1993.
- [11] STONER PIPELINE SIMULATOR. **Stoner Pipeline Simulator (SPS) 9.6, Help and Reference.** Advantica, Inc. 2007.

Anexos

1. Folha de Dados da Bomba

Série CAM

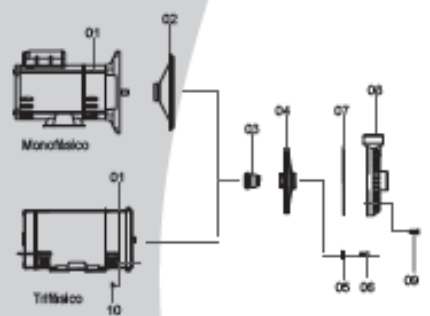
CAM-W6C



Centrífuga de Aplicações Múltiplas

DANCOR
BOMBA E FILTRO

Componentes



Componente	Descrição
01	Motor elétrico
02	Intermediária interna IP-0
03	Selo mecânico
04	Rotor
05	Atuador
06	Parafuso oculto
07	O-ring
08	Carcasa
08 A	Parafuso Alar
09 B	Parafuso oculto
10	Porca oculta

Matérias Empregados

- Carcasa - em aço espessal de alumínio-silício, de alta resistência à pressão e soldagem com o bocal de descarga na linha centro / vertical, para seu perfeito escoamento.
- Rotor - do tipo fechado, injetado em termoplástico de engenharia, Noryl®6, de alta resistência, reforçado com fibra de vidro, rosca diretamente na ponta do eixo.
- Vedação do eixo - por selo mecânico - Ø 5/8" - tipo "B" - conjunto de precisão, construído com borneria metálica, mola de aço inox e faces de vedação em grafite e cerâmica. Temperatura de trabalho do líquido até 80°C.

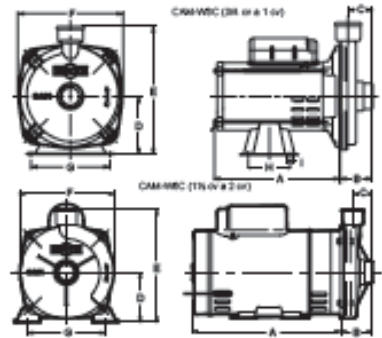
Motor Elétrico

- Características:
 - Norma - Carcassa Nema 42, potência 3/4cv e 1cv monofásico; Carcassa Nema 56 nos demais modelos, todos com ponta de eixo "Jet Pump".
 - Eixo: em aço carbono Ø 5/8"
 - Rotação: 2 polos - 3.450 rpm - 60 Hz
 - Monofásico: 110 ou 220V até 1 cv Demais: 110/220V Trifásico: 220/380V
 - Grau de Proteção: IP 21
 - Isolamento: Classe "B"

Opcionais

- Carcasa, intermediária e rotor: Ferro fundido. Outros materiais sob consulta.
- Selo mecânico: Para bombeamento de água com temperaturas superiores à 80°C recomenda-se a utilização das borneras em Viton. Nos casos em que haja a presença de abrasivos recomenda-se o uso do selo de carvão de sílica.
- Motor elétrico:
 - 50Hz
 - Alto rendimento
 - Outras tensões
 - IP55, 56, 65, 66
 - Isolamento classe F ou H
 - Eixo em aço inox
 - Outros opcionais sob consulta
- Bombas mancalizadas.

Dados Dimensionais (mm)



Modelo	W	Tubo		A	B	C	D	E	F	G	H	I	Peso (kg)
		Ext. (mm)	Int. (mm)										
CAM-W6C	3/4M			260		10	130	230			68	T	19.3
	1M			365									19.4
	1 1/2M			360		38	68	200	181	138			17.2
	2M	1"	1"	360	68	38	68	200	181	138			19.7
CAM-W6	1.5T			365		37	130	230					19.9
	1.5T			239		38	68	200					15.2
	2.0T			269									18.7

CAM-W6C

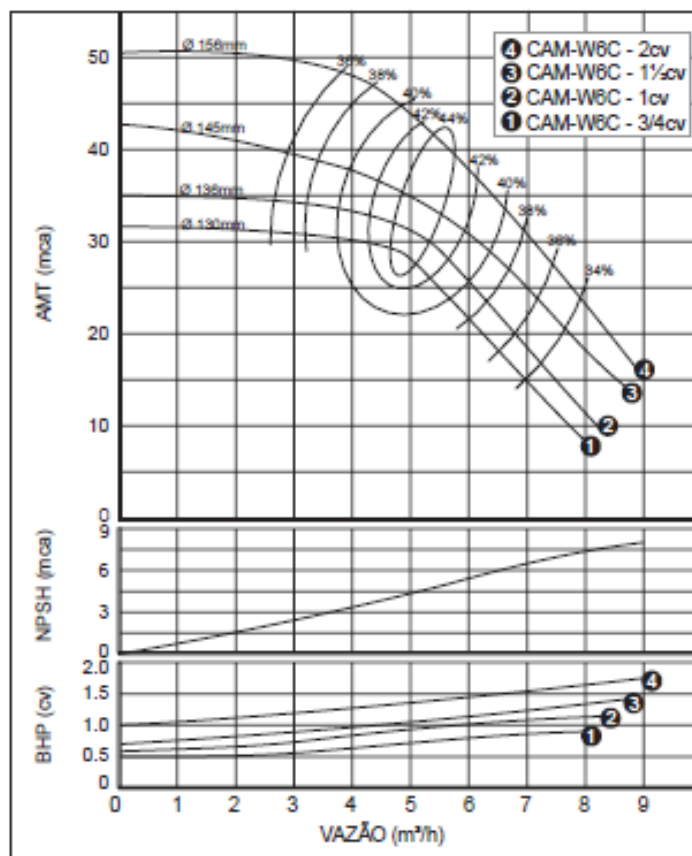
Centrífuga de Aplicações Múltiplas



Curvas de Performance



2 Polos - 3.450 rpm - 60 Hz



Série CAM

Tabela de Seleção

Modelo	Tubo (mm)	Pot. (cv)	Tubo (mm)	Vazão (m³/h)	AMT (mca)	Altura Manométrica Total em metros de Coluna de Água (mca) - Não utilize leituras de pontos por ponto															
						8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38
CAM-W6C	CAM-W6	3/4	1"	1"	32	6.5	7.7	7.5	7.5	6.5	6.5	6.5	5.8	5.5	5.5	5.0	4.5				
		1			35		6.5	6.5	7.4	7.0	6.7	6.5	6.2	6.0	5.8	5.5	4.8	4.2			
		1 1/2			43				6.7	6.4	6.1	7.7	7.4	7.1	6.8	6.5	6.1	5.7	5.4	3.8	3.0
		2			51					6.9	6.6	6.3	7.8	7.6	7.3	7.0	6.6	6.5	6.2	5.9	5.7

IMPORTANTE: Não utilizar as bombas em alturas inferiores àsquelas limitadas pela linha demarcação, sob o risco de sobrecarga no motor elétrico, ocasionando a perda de GARANTIA.



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CATÁLOGO DE PRODUTOS

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2. Memória de Cálculo da Válvula de Alívio

SIZING FOR LIQUID RELIEF: PRESSURE RELIEF VALVES REQUIRING CAPACITY CERTIFICATION

Dados de Entrada	Valor	Unidade
Vazão no Duto	3	m³/h
Quantidade de PSV	1	Válvulas
Vazão em cada PSV	3	m³/h
Pressão de Ajuste ou de Abertura (Pa)	2	Kgf/cm²
Contrapressão Máxima (Cp Max)	0.2	Kgf/cm²
Contrapressão Mínima (Cp min)	0.1	Kgf/cm²
Viscosidade a temperatura do fluido	1	cSt
Sobre-pressão (Sp)	10%	
Densidade (G)	1	
Coefficiente de descarga (Kd)	0.65	
Fator de Correção de contrapressão (Kw)	1	
Fator do disco de ruptura (Kc)	1	
Fator de Correção de Viscosidade (Kv)	0.99795	
Kv calculado	0.99795	

Será Utilizado o Fole	Não
Será Utilizado internos especiais para liq.?	Não

O uso do fole só é necessário quando a contra-pressão é variável no caso de válvulas de segurança para líquidos. Ao preencher os valores acima, por favor se certificar que, no caso de contra-pressão constante, Cp max = Cp min.

API STANDARD 520
EIGHTH EDITION, DECEMBER 2008

Área calculada do Orifício da válvula de Alívio/Segurança (in²)	0.100
Orifício a ser utilizado segundo norma	D
Válvula necessita de Fole?	SIM
Reynolds Calculado (Re)	113447

Orifício	API 520
D	0.110
E	0.196
F	0.307
G	0.503
H	0.785
J	1.287
K	1.838
L	2.853
M	3.600
N	4.340
P	6.380
Q	11.050
R	16.000
T	26.000

In USC units:

where

$$A = \frac{Q}{38 \times K_d K_w K_c K_v} \sqrt{\frac{G_1}{P_1 - P_2}}$$

In SI units:

$$A = \frac{11.78 \times Q}{K_d K_w K_c K_v} \sqrt{\frac{G_1}{P_1 - P_2}}$$

A is the required effective discharge area, in ² (mm²);

Q is the flow rate, U.S. gal/min (L/min);

K_d is the rated coefficient of discharge that should be obtained from the valve manufacturer; for preliminary sizing, an effective discharge coefficient can be used as follows:

- 0.55, when a PRV is installed with or without a rupture disk in combination,
- 0.52, when a PRV is not installed and sizing is for a rupture disk in accordance with 5.11.1.2.1.

K_w is the correction factor due to backpressure; if the backpressure is atmospheric, use a value for K_w of 1.0. Balanced bellows valves in backpressure service will require the correction factor determined from Figure 31. Conventional and pilot-operated valves require no special correction (see 5.3);

K_c is the combination correction factor for installations with a rupture disk upstream of the PRV (see 5.11.2); use the following values for the combination correction factor:

- 1.0, when a rupture disk is not installed,
- 0.9, when a rupture disk is installed in combination with a PRV and the combination does not have a certified value.

K_v is the correction factor due to viscosity, as determined from Figure 37 or from Equation (30);

$$K_v = \left(0.9935 + \frac{2.878}{Re^{0.12}} + \frac{342.75}{Re^{1.1}} \right)^{-1.6} \quad (30)$$

where

G_1 is the specific gravity of the liquid at the flowing temperature referred to water at standard conditions;

P_1 is the upstream relieving pressure, psig (kPag); this is the set pressure plus allowable overpressure.

P_2 is the total backpressure, psig (kPag).

3. Folha de Dados da Válvula de Alívio

Crosby Size - Specification Sheet

Page# 1

Date: 23/06/2009

Revision: 0

Customer: CTDUT

Reference: E.MAIL DE 28/09/09

Quote/Tag: YJK-5521/9-1

Prepared By: Any Name

AG Crosby Valve

1-508-384-3121

GENERAL	01. Tag Number	
	02. Service	
	03. Line/Vessel No	
	04. Full/Semi Nozzle	Full
	05. Safety/Relief	Relief
	06. Conv/Bellows/Pilot Op	Bellows
	07. Bonnet Type	Closed
CONNECTIONS	08. Size: Inlet/Orifice/Outlet	1 D 2
	09. Flange Rating or Screwed	150 X 150
	10. Flange Faces	RF x RF
MATERIALS	*11. Body and Bonnet	Carbon Steel
	*12. Seat and Disc	316 S.S.
	*13. Resilient Seat Seal	[None]
	*14. Guide	Corrosion Resistant S.S.
	*15. Rings	316 S.S.
	*16. Spring	Carbon Steel
	*17. Bellows	Inconel 625
OPTIONS	18. Cap	Extended Cap
	19.	
	20.	
	21. code spring	X-6006 (25 - 30kgf/cm ² -g)
	23.	
BASIS	24. Code	Section VIII
	25. Fire per API-520	No
	26. Rupture Disc	No
	27. Sizing Basis	
INPUT DATA	28. Fluid and State	AGUA
	29. Required Capacity	63,00 l/min
	30. Specific Gravity	1,00
	31. Set Pressure	2,00 kg/cm ² -g
	32. Relieving Temperature	25 degC
	33. None	0,00 kg/cm ² -g
	34. -	
	35. - Total	0,00 kg/cm ² -g
	36. Allowable Overpressure	3,00 psi
	37. Overpressure Factor	
	38. Compressibility Factor	1,000
	39. Latent Heat of Vaporization	
CALCULATED VALUES	40.	
	41. Operating Viscosity	0,5 cP
	42.	
	43.	
	44. Opr. Pressure / Opr. Temp.	
	45. Calc. Area	0,105 sq in
	46. Selected Area	0,110 sq in
	47. Orifice Designation	D
	48. Manufacturer	Crosby Valve
	49. Model No.	JLT-JBS-E-15-J
COMMENTS	50. Calculated Flow	65,70 l/min
	51. Pintura	R-02
	52.	
	53.	
	54.	

CERTIFICADO
RENATA DUCA
27/10/09

* For mat'l other than Crosby std., consult factory for press/temp limit.

** Denotes "Non-Stock" Selection

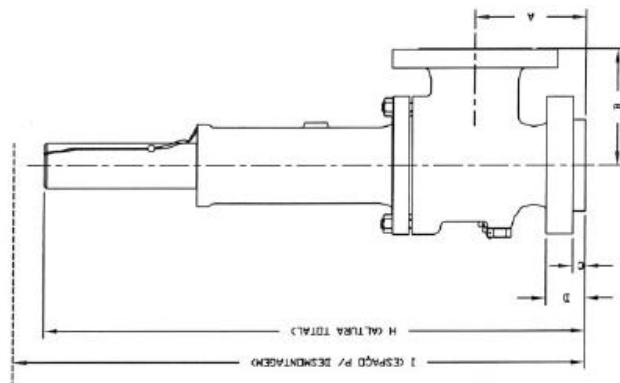
Comments: - C/ PINTURA PADRAO PPS-002.

- C/ PLAQ. DE IDENTIF. EM A. INOX.

Rena ta 27/10/09

40196	Rica	18.7.00	40657	Rica	20.11.00	19.06.09
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605061



MATERIAIS CONFORME FOLHA DE ESPECIFICAÇÕES ANEXA

VALVULA		CLASSE DA VALVULA (Pressão X Temperatura)					DIMENSIONES APPROX. EM MM				
ENTRADA	SALIDA	A	B	C	D	H	I				
1	D	2	15 16 25 26	35 36 37	45 46 47	105	114	40	502	642	16
1	E	2	15 16 25 26	35 36 37	45 46 47	121	128				22
1 1/2	F	2	15 16 25 26	35 36 37	45 46 47	158	158				23
1 1/2	G	2 1/2	15 16 25 26	35 36 37	45 46 47	121	121	44	591	731	23
1 1/2	G	3	15 16 25 26	35 36 37	45 46 47	158	158	17			24
1 1/2	H	3	15 16 25 26	35 36 37	45 46 47	130	124	43	597	737	25
2	H	3	15 16 25 26	35 36 37	45 46 47	158	158	46	679	819	26
2	J	3	15 16 25 26	35 36 37	45 46 47	137	143	43	603	743	30
2 1/2	J	4	15 16 25 26	35 36 37	45 46 47	156	171	52	673	819	40
3	J	4	15 16 25 26	35 36 37	45 46 47	184	181	54	749	914	52
3	K	4	15 16 25 26	35 36 37	45 46 47	156	162	54	727	867	52
3	L	4	15 16 25 26	35 36 37	45 46 47	184	181	54	779	944	55
4	L	6	15 16 25 26	35 36 37	45 46 47	179	203	61	864	1029	63
4	M	6	15 16 25 26	35 36 37	45 46 47	178	194	64	895	1060	103
4	N	6	15 16 25 26	35 36 37	45 46 47	178	194	64	895	1060	103
4	P	6	15 16 25 26	35 36 37	45 46 47	225	254	99	1213	1423	221
4	Q	8	15 16 25 26	35 36 37	45 46 47	241	240	99	1213	1423	221
6	R	8	15 16 25 26	35 36 37	45 46 47	267	267	99	1353	1563	273
6	R	10	15 16 25 26	35 36 37	45 46 47	276	276	101	1423	1633	289
6	T	10	15 16 25 26	35 36 37	45 46 47	276	276	101	1423	1633	289

DADOS DE REFERENCIA

CLIENTE	CTOUT	MODELO	AL-T-JRS-E-15-J	NZ/REF. US 5538709 - ITEM UNICO
PEDIDO	AF-110/CTOUT/2009	CLASSE	ENTRADA 1" 150HRF SAIDA 2" 150HRF	DES. ARQ.
REF.	-	Nº SERIE	375939	APR. CLOUD
	-	QTD. BA.MILA	X=6006	ESCALA
TAG.	-	FLUIDO	60ua	VALVULA DE ALIVIO E SEGURANCA
			TEMPERATURA 25 degC	DES. N°
				MODELO JRS/JRS-E/JRS-E-BAZ TIPO J
				220-0567-3

HITER CROSBY

VÁLVULAS CROSBY IND. COM. LTDA

Rua Cap. Francisco Teixeira Nogueira, 233

CEP 05037-030 - Água Branca - São Paulo - Brasil

Fone: 55 11 3879-6300 - Fax 55 11 3879-6301/02/03/04

vendas@hiter.com.br - www.hiter.com.br

CERTIFICADO DE TESTES E MATERIAIS		CERT Nº 0411/10	
CLIENTE: CTDUT		DATA: 24/02/10	
REFER. CLIENTE: AF 110/CTDUT/2009		ORDEM DE SERVIÇO: 5538/09	
DESCRIÇÃO: JLT-JOS-E-15-J		DIÂMETRO: 1" D 2" / 150# X 150#	
SÉRIE: 37939	QTDE: 1	ITEM: 01	FOLHA: 1/1
DESCRIÇÃO DOS TESTES EXECUTADOS E NORMAS			

TESTE	PRESSÃO (psig)	DURAÇÃO DO TESTE (seg)	NORMA
HIDROSTÁTICO	2225	15	ASME VIII - 2008

Pintura: R-02

TESTE	PRESSÃO (psig)	DURAÇÃO DO TESTE (min)	NORMA
INTEGRIDADE	90 a 100	3	ASME VIII - 2008

TESTE DE ABERTURA ASME VIII - 2008	
PRESSÃO DE AJUSTE:	2.07 Kg/cm ²

TESTE VEDAÇÃO	PRESSÃO	VAZAMENTO PERMISSÍVEL	ENCONTRADO
NORMA API-527	18 Kg/cm ²	10 cm ³ /hr	0 p/ teste realizado c/ líquido

RASTREABILIDADE DOS MATERIAIS				
COMPONENTE	MATERIAL	CORRIDA, CIMP, COD.	Nº CERTIFICADO/ OP	FORNECEDOR
CORPO	ASME SA 216-07 GR. WCB	24511 S6	12798	MARRUCCI
CASTELO	ASME SA 216-07 GR. WCB	25256 S22	14890	MARRUCCI
BOCAL	ASME SA 351-07 GR. CF8M	80145	305109	QUALISTEEL
DISCO	ASME SA 276-07 TP. 316	79415	6806/08	ARINOX
GUIA	ASME SA 297-07 GR. HE	93227	1096108	QUALISTEEL
HASTE	ASTM A 582-05 TP. 415	80517	220614	ARINOX
MOLA	ARAME DIN 17223-64 CLB	35265	23814	VIBRAMOL
FOLE	INCONEL	803103	75000-4	SENIOR

MANÔMETROS UTILIZADOS Nº 416	VALIDADE CALIBRAÇÃO: 07/10
ENSAIOS / REQUISITOS ADICIONAIS	
☐ Relat. Testes por Pontas:	☐ Relatório de LP:
☐ Certif. Trat. Térmico:	☐ Relatório de Revestimento:
☐ Relatório Raio X:	☐ Relat. Acomp. Soldagem:
☐ Relatório Dimensional:	☐ Outros:
☐ RNC:	

TERMO DE GARANTIA

Nossos produtos são garantidos pelo prazo de 12 (doze) meses, a contar da data de emissão da nota fiscal respectiva, contra defeitos de fabricação e/ou mão de obra, os quais serão reparados em nossa fábrica. Sempre que for constatada qualquer irregularidade, o cliente deverá nos remeter, no prazo de garantia, relatório detalhado da ocorrência, ficando o produto sujeito à inspeção por nossos técnicos. A garantia abrange somente produtos que tenham sido aplicados, manuseados e operados dentro de suas características próprias e de acordo com nossas instruções. Contate nosso departamento de Assistência Técnica à clientes, caso necessite de apoio. Nosso Depto de Engenharia também está à disposição dos clientes para sobre os produtos de nossa fabricação.


 GUSTAVO COSTA
 GARANTIA DA QUALIDADE

INDUSTRIAS MARRUCCI LTDA

Data / Date : 21/07/09

[Controle de Qualidade - Divisão Fundição / Control of Quality - Foundry Division]

CERTIFICADO DE QUALIDADE / QUALITY CERTIFICATE N. 0012958

[CLIENTE] NITER IND.COM.C.TERMO S. LTD

[DESCRIÇÃO DE PEÇAS / DESCRIPTION OF PIECES]

10 PCW FEP14808-1 MCB CORPO P-14808-1A22B22 MCB OC:247348 OT: RMB:01 A 10

[REF. N. DE V. / BILL OF SALE]
00006116[DATA EMISSÃO / ISSUE DATE]
21/07/2009[CORRIDA N. / RUN NR.]
024611 -[DATA DA CORRIDA / DATE OF RUN]
14/07/2009[MATERIAL]
AÇO CARBONO FUNDIDO / ALLOY CASTINGS[NORMA / STANDARD SPECIFICATIONS]
ASME-SA-216/SA-216-M-2004-GR.WCB

[COMPOSIÇÃO QUÍMICA / CHEMICAL COMPOSITION (%)]

	C	Si	Mn	Cr	Ni	Mo	V	Cu	P	S	Mg	Al	Zr	Ti
max	0,000	0,030	0,000	0,000	0,000	0,000	0,000	0,000	0,003	0,000	0,000	0,030	0,000	0,000
min	0,220	0,480	0,910	0,030	0,010	0,001	0,010	0,020	0,020	0,010	0,001	0,050	0,001	0,050
max	0,300	0,600	1,280	0,500	0,500	0,200	0,030	0,300	0,040	0,050	0,000	0,080	0,000	0,000

[TRATAMENTO TÉRMICO / HEAT TREATMENT]

NORMALIZADO - AQUECIMENTO 920°C +/- 10°C, DETANAR 1h/POU,
RESFRIAMENTO AR.FORÇADO.

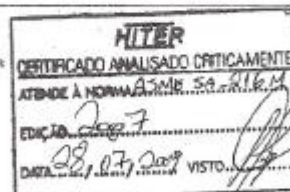
[PROPRIEDADES FÍSICO-MECÂNICAS / MECHANICAL PROPERTIES]

LN (mpa)	LE (mpa)	AL (%)	RA (%)	Impacto (J)	Dureza (HB)
531,25	343,62	27,40	47,32	9,00	157

[OBSERVAÇÕES / REMARKS]

CP.CONFORME ASTM.A.370.2008 (LO=4.00)
INSPEÇÃO VISUAL CONFORME MSS-SP 95 EDICAO 2001

LE.DETERMINADO A 0,2%

[Jose Benedito Rabello]
Supervisor Qualidade / Quality Manager

-> Certificado emitido eletronicamente dispensando assinatura <-

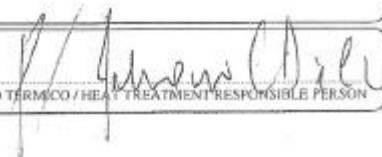
End / Address: Rodovia Piracicaba - Tietê, Km 3 - Piracicaba - SP - Brasil

Email: jrabello@marrucci.com.br

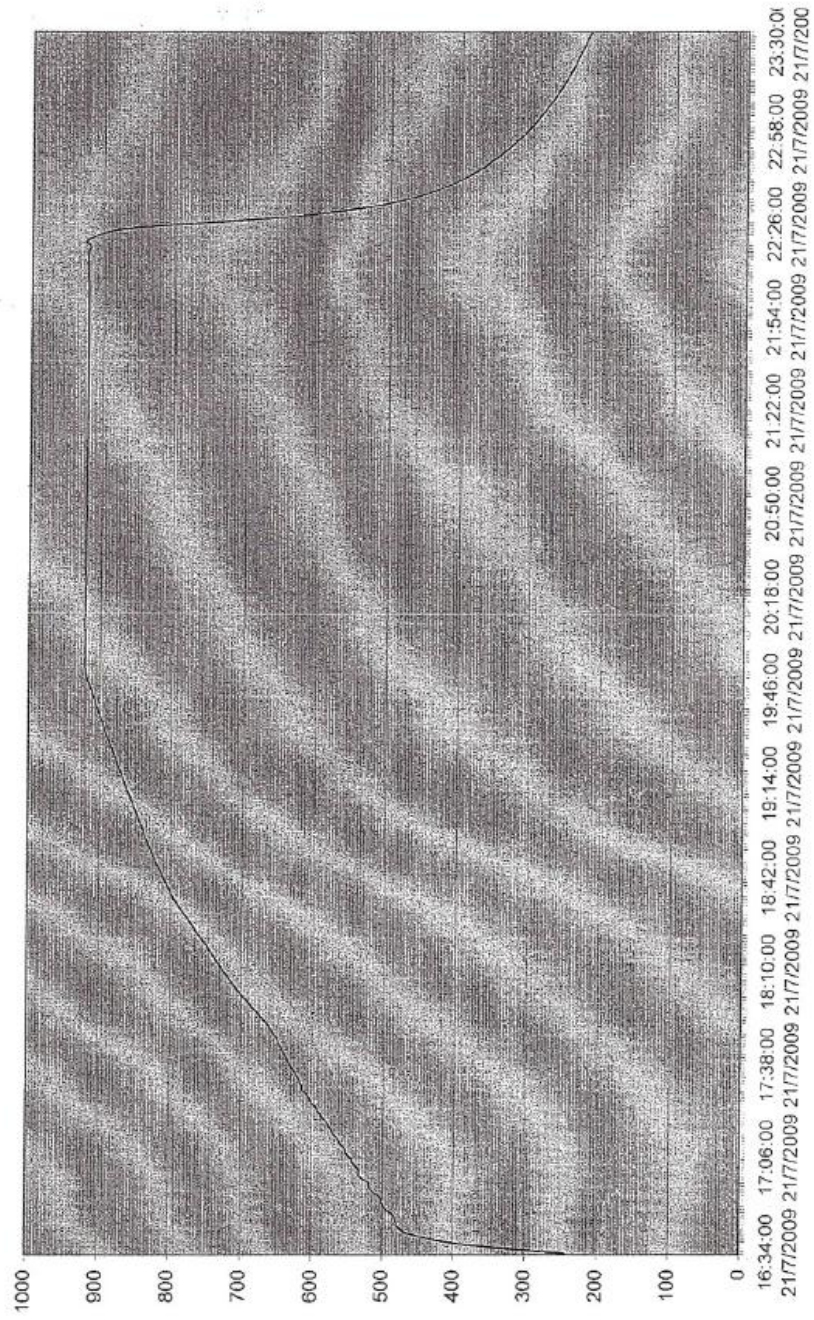
CNP / RFP Code: 13401-020

Fone/Phone: 55 (19) 2105-4714

Fax: 55 (19) 2105-4701



NO1658



INDUSTRIAS MARRUCCI LTDA

Data / Date.: 18/12/09

[Controle de Qualidade - Divisão Fundição / Control of Quality - Foundry Division]

CERTIFICADO DE QUALIDADE / QUALITY CERTIFICATE N. 0014890

[CLIENTE] EITER IND.COM.C.TERMO H. LTD

[DESCRIÇÃO DE PEÇAS / DESCRIPTION OF PIECES]

03 PCs PBPC14880 WCB CASTELO PC14880 WCB OC:248928 OT: Rest:36-37-38

[BNF. N. DE V. / BILL OF SALE]
001047377[DATA EMISSÃO / ISSUE DATE]
18/12/2009[CORRIDA N. / RUN NR.]
015256 -[DATA DA CORRIDA / DATE OF RUN]
15/12/2009[MATERIAL]
AÇO CARBONO FUNDIDO[NORMA / STANDARD SPECIFICATIONS]
ASME-SA-216/SA-216-M-2004 GR. WCB

[COMPOSIÇÃO QUÍMICA / CHEMICAL COMPOSITION (%)]

	C	Si	Mn	Cr	Si	Mo	V	Cu	P	S	Hg	Al	Zr	Ta
Min:	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000	0,000
Obt:	0,190	0,530	0,900	0,050	0,010	0,010	0,010	0,010	0,027	0,011	0,002	0,052	0,030	0,001
Max:	0,300	0,500	1,200	0,500	0,500	0,200	0,030	0,300	0,040	0,050	0,060	0,080	0,100	0,100

[TRATAMENTO TÉRMICO / HEAT TREATMENT]

NORMALIZADO = AQUEC.ATE 920°C +/- 30°C,PATMAR 1H/POG,
RESFRIAMENTO.AN.FORÇADO.

[PROPRIEDADES FÍSICO-MECÂNICAS / MECHANICAL PROPERTIES]

	LE (Mpa)	LE (Mpa)	AL (%)	EA (%)	Impacto (J)	Dureza (HB)
	525,19	295,45	30,50	44,23	0,00	000

[OBSERVAÇÕES / REMARKS]

INSPEÇÃO VISUAL CONFORME MSS SP-55 EDIÇÃO 2001

[Jose Benedito Rabello]
Supervisor Qualidade / Quality Manager

-> Certificado emitido eletronicamente dispensando assinatura <-

End / Address: Rodovia Piracicaba - Tieta, Km 1 - Piracicaba - SP - Brasil

Email: jrabello@marrucci.com.br

CEP / ZIP Code: 13401-620

Fone/Phone: 55 (19) 2105-4714

Fax: 55 (19) 2105-4701

Qualisteel **Qualisteel Fundação de Precisão Ltda**
 Av.: Imperatriz Leopoldina: 250 - CEP: 95320-000 - Nova Prata - RS
 Tel.: (54) 3242 1667 - Fax: (54) 3242 1973 - RS - Central: (54) 3242 7057
 E-mail: laboratorio@qualisteel.com.br / qualidade@qualisteel.com.br
 Site: www.qualisteel.com.br

CERTIFICADO DE QUALIDADE N°.: 305/09

Cliente: HITER IND. COM CONTROLES TERMO-HID. LTDA.

Material: ASME SA 351/A 351M 2007 CF8M SECTION II.A. **Nota Fiscal:** 21693

Corrida	DESCRIÇÃO	Quant.	OS. N°
8D145	BOCAL E-106201 M106201025	4	814013
8C76	BOCAL E-106201 M106201025	3	808048
8D144	BOCAL E-106201 M106201025	1	814013
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

COMPOSIÇÃO QUÍMICA

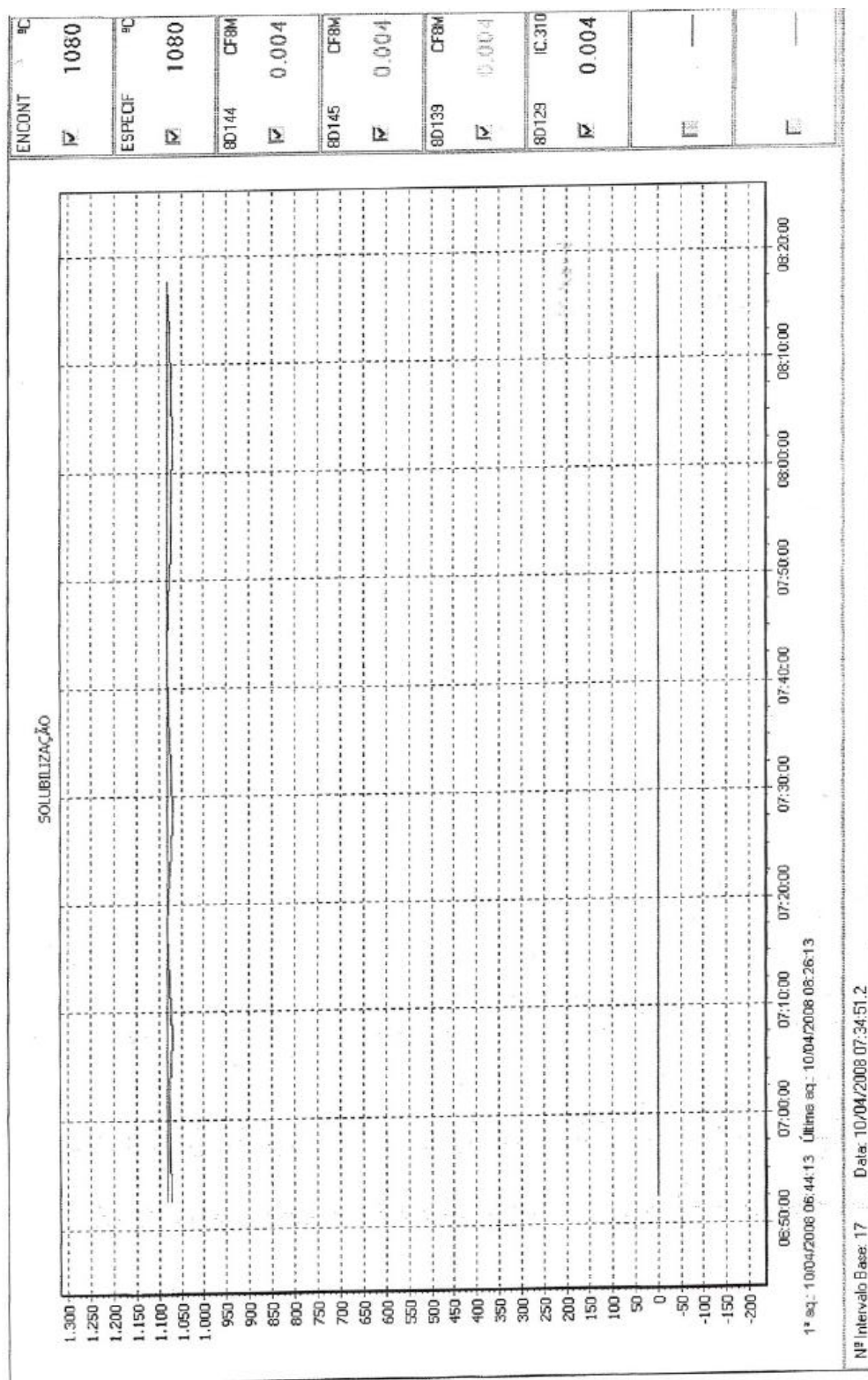
Corrida	C	Si	Mn	P	S	Cr	Mo	Ni	Cu	W
8D145	0,036	0,636	1,140	0,013	0,0004	18,080	2,270	10,880	-	-
8C76	0,046	1,040	0,895	0,020	0,0004	18,200	2,070	9,350	-	-
8D144	0,041	0,635	1,170	0,010	0,0004	18,090	2,230	10,930	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-	-	-	-
Mínimo						18,000	2,000	9,000	-	-
Máximo	0,080	1,500	1,500	0,040	0,040	21,000	3,000	12,000	-	-

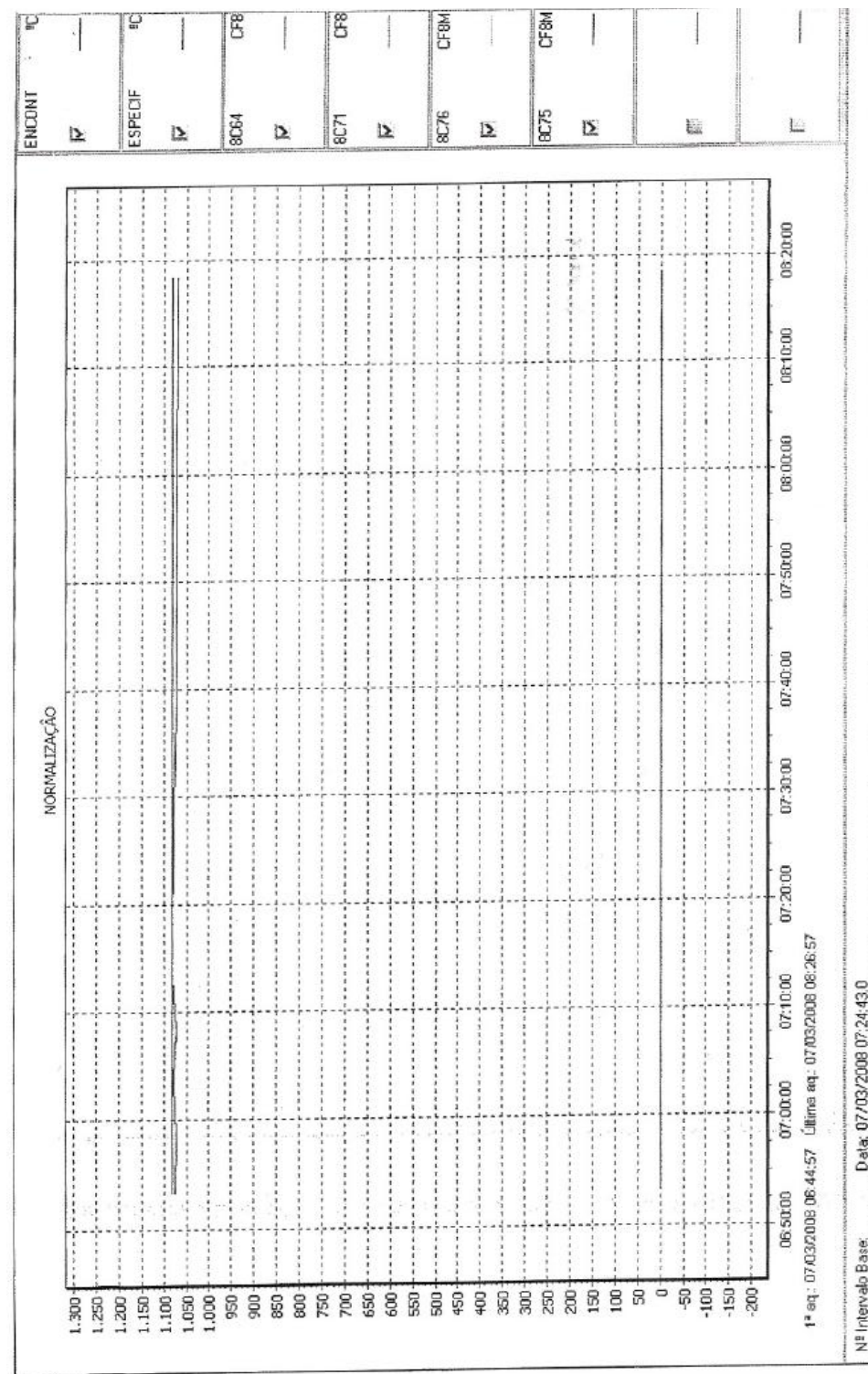
PROPRIEDADES MECÂNICAS						OBSERVAÇÕES	
Corrida	L. RES (MPa)	L. ESC. (MPa)	Along. (%)	Estricção	Dureza HB		
8D145	563	248	40	-	-	Tratamento Térmico: Solubilização Peso Líquido: 5,96 kg. HITER CERTIFICADO ANALISADO CRITICAMENTE ATENDE A NORMA ASME SA-351-CF8M EDIÇÃO 2007 DATA 10/03/09 VISTO: <i>[Assinatura]</i>	
8C76	580	330	37	-	-		
8D144	593	327	37	-	-		
-	-	-	-	-	-		
-	-	-	-	-	-		
-	-	-	-	-	-		
-	-	-	-	-	-		
Mínimo	485	205	30	-	-		
Máximo							

NORMA DE INSPEÇÃO:
 N° Sequencial: ASTM A 985/A 985 M - 08 a;
 ASTM A 997 - 08.

R.P.A.
Analista Lab. Metalúrgico
 Rodrigo P. Almeida

Nova Prata, 4 de março de 2009.





VIRAJ PROFILES LIMITED

10 IMPERIAL CHAMBERS, 1ST FLOOR,
WILSON ROAD, BALLARD ESTATE,
MUMBAI - 400038 INDIA

TEST CERTIFICATE**CUSTOMER :**

ARINOX COMERCIAL LTDA.
R. VISCONDE DE PARNAIBA, 1464
CEP 03164-300, MOOCA SAO PAULO BRAZIL
CNPJ 03.025.815/0001-13
TEL 11 27978000

ORDER NO. :

6896/08

PACKING LIST NO. :

IMP/101045

INSPECTION NO :

IMP/101045/1

DATE :

14/10/2008

BUNDLE NO. :

2026221

GRADE :
SS 316

DESCRIPTION :

STAINLESS STEEL BRIGHT BARS NCM N. 72221100

COLD DRAWN GROUND & POLISHED

SIZE (INC)	SHAPE	TOLERANCE	LENGTH (MTR)	PIECES	WEIGHT (MTS)
3/4	ROUND	h9	4.00-6.00	54	0.492

CHEMICAL ANALYSIS

HEAT NO.	C	Mn	Si	S	P	Ni	Cr	Mo	Cu	N	Co
14548	0.046	1.17	0.41	0.023	0.034	10.03	16.37	0.11	0.49	0.058	0.15

TEST RESULT

.2% YIELD STRENGTH MPA	TENSILE STRENGTH MPA	ELONGATION %	REDUCTION OF AREA %	HARDNESS BHN
645	743	36	91	220

Specification :

MATERIAL CONFORMS TO ASTM A276-26, COND. A. IGC TEST SATISFACTORY AS PER ASTM A 262-02a, PRAC E. CERTIFIED AS PER EN 10204-3.1.

Remarks :

MATERIAL IS FREE FROM MERCURY CONTAMINATION. FREE FROM WELD OR WELD REPAIRS. MANUFACTURED AND PROCESSED IN INDIA.

We hereby certify that the material described above has been tested and complies with the terms of order/contract.

ARINOX COMERCIAL LTDA.

AUTENTICAMOS A PRESENTE COM
ESTE CERTIFICADO CUJO ORIGEM
ENCONTRA-SE EM NOSSO ARQUIVO
CONTROLE DE QUALIDADE.

SUELI A. BRITO
Controladora de Qualidade

ARINOX COMERCIAL LTDA.

CNPJ 799.115
DATA: 10/06/09
CO VISTO: 12

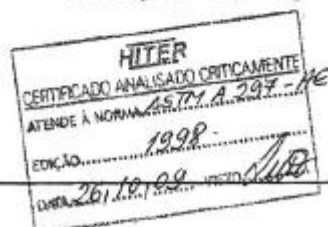
WORKS INSPECTOR

HITER
CERTIFICADO ANALISADO CRITICAMENTE
ATENDE A NORMA ASTM A276-26
EDICAO 2007
DATA 17.05.09 VISTO: 12

		Qualisteel Fundição de Precisão Ltda Av.: Imperatriz Leopoldina: 250 - CEP: 95320-000 - Nova Prata - RS Tel.: (54) 3242 1667 - Fax: (54) 3242 1973 - RS - Central: (54) 3242 7057 E-mail: laboratorio@qualisteel.com.br / qualidade@qualisteel.com.br Site: www.qualisteel.com.br									
		CERTIFICADO DE QUALIDADE Nº.: 1096/09									
Cliente: HITER IND. COM CONTROLES TERMO HID. LTDA.											
Material: ASTM A 297/297 - 08 a GR HE										Nota Fiscal: 902	
Corrida	DESCRIÇÃO									Quant.	OS. Nº
9G227	GUIA E-103366 M103366316									12	934002
-	-									-	-
-	-									-	-
-	-									-	-
-	-									-	-
-	-									-	-
-	-									-	-
COMPOSIÇÃO QUÍMICA											
Corrida	C	SI	Mn	P	S	Cr	Mo	Ni	Cu	V	
9G227	0,207	1,200	0,980	0,019	0,0046	26,050	0,208	9,910	-	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	-	
Mínimo	0,200	-	-	-	-	26,000	-	8,000	-	-	
Máximo	0,500	2,000	2,000	0,040	0,040	30,000	0,500	11,000	-	-	
PROPRIEDADES MECÂNICAS											
Corrida	L. RES (MPa)	L. ESC. (MPa)	Along. (%)	Estricção	Dureza HB						
9G227	683	308	23	-	-						
-	-	-	-	-	-						
-	-	-	-	-	-						
-	-	-	-	-	-						
-	-	-	-	-	-						
-	-	-	-	-	-						
Mínimo	585	275	9	-	-						
Máximo	-	-	-	-	-						
Nº Seqüencial: NORMA DE INSPEÇÃO: ASTM A 985/A 985M - 08 a; ASTM A 997 - 08.											
Nova Prata, 21 de agosto de 2009.											
 Analista Lab. Metalúrgico Rodrigo P. Almeida											

Tratamento Térmico: BRUTO DE FUSÃO

Peso Líquido: 19,50 kg.



GERDAU
AÇOS FINOS PIRATINI

NOTA FISCAL INVOICE Nº 009534 PEROWEIGHT (KG) 1.520,00

CLIENTE/CUSTOMER ARINOX COMERCIAL LTDA

PROD. CLIENTE/CUSTOMER ORDER 4100/04-JU

ISO/TS 16949: 2002

Qualidade Nacional 38388

Qualidade Nacional 453465 - 86685297

PRODUT/PRODUCT BARRA LAMINADA REDONDA

ESFEROIDIZADO

DESCASCADO POLIDO

NORMA/SPECIFICATION PADRAO

LOT/BATCH 20174070

CORRIDA/REAT 12.296.490

CERTIFICADO DE QUALIDADE
QUALITY CERTIFICATE
MILL'S TEST CERTIFICATE
CERTIFICADO DE CALIDAD

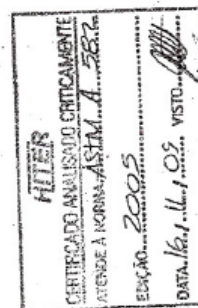
RAZÃO SOCIAL: GERDAU AÇOMINAS S/A
CNPJ: 17.227.422/0001-16
Nº 20614

QUALIDADE/GRADE		TOLERÂNCIA		TENSÃO		TENSÃO		TENSÃO		TENSÃO	
AI	SI	AI	SI	AI	SI	AI	SI	AI	SI	AI	SI
0,14	0,20	1,02	0,039	0,190	12,90	0,50	0,06	0,10	0,0196		
ENSaios MECÂNICOS/MECHANICAL PROP.											
DUREZA											
HB 191											
GRAU ESFEROID. % 98											
ENSaios METALOGRAFICOS/METALLOGRAPHIC TESTS											
OBSERVAÇÕES/OBSERVATIONS											

DEPARTAMENTO DA QUALIDADE/QUALITY DEPARTMENT
CHARQUEADAS, 22.05.2004
Sidnei de J. Oliveira
CREA 27043

ARINOX COMERCIAL LTDA

CLAMP 885-109
DATA 24.08.09
CQ VISTO



ARINOX COMERCIAL LTDA
AUTENTICAMOS A PRESENTE
ESTE CERTIFICADO CUIDO CRICAMENTE
ENCONTRA-SE EM NOSSO ARQUIVO
CONTROLE DE QUALIDADE

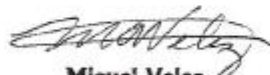
SUELI A. BRITO
Controladora de Qualidade

SEYMOUR-SHERIDAN, INCORPORATED
15 COMMERCE DRIVE, MONROE, CT 06468

CERTIFICATE OF CONFORMANCE

DATE: August 10, 2009
SEYMOUR – SHERIDAN P/N: 75000-4
HITER IND. COM DE CONTROLES P/N: S91740
HITER IND. COM DE CONTROLES P.O.# 685658
QUANTITY SHIPPED: 10

**WE CERTIFY THAT THESE PARTS HAVE BEEN TESTED AND WELDED PER
DRAWING SAE89850 Rev. B WE HAVE PHYSICAL AND CHEMICAL
TEST RESULTS OF THE MATERIAL USED.**


Miguel Velez
Plant Manager



01691063
 Order # 54706mer Part #
 Heat # 3179
 Customer PO #
 Customer Name
 EAST BAY MANUFACTURERS INCORPORATED 5686
 ALUMINUM METALS - WOBURN, MA

VISUAL AND DIMENSIONAL EXAMINATION SATISFACTORY.
MATERIAL, WHEN SHIPPED, IS FREE FROM CONTAMINATION BY MERCURY, RADIUM, ALPHA SOURCE, & LOW MELTING ELEMENTS.


Vibramol Indústria e Comércio de Molas Ltda

Rua Spencer Vampré, 680/688 - CEP - 02860-030 - São Paulo - SP

Tel/Fax: 11-3859-0607 / e-mail: vibramol@vibramol.com.br

 ISO 9001
Certificado
Nº 348953QH

Relatório de Liberação Final Nº 23814

Sistema de Gestão da Qualidade Certificado

Dados do Cliente

Empresa/Cliente	Produto:	NF:	Ordem de Compra:	Data:
HITER	X-6006		700236	3/11/2009

Dados do Material

Material	Identidade	Fornecedor
ARAME ATC DIN 17223-64 CL B	1691	JPL COM. DE ARAMES LTDA
Corrida	Nº do Certif. Fornecedor	Bitola
3130300	30.094/09	2,20
NF Fornecedor	30533	

Composição Química

Carbono C	Manganês Mn	Silício Si	Fósforo P	Enxofre S	Cromo Cr	Níquel Ni	Ferro Fe	Níobio Nb
0.665	0.816	0.200	0.013	0.011				
Molibdeno Mo	Alumínio Al	Cobre Cu	Boro B	Titânio Ti	Tungstênio W	Vanádio V	Tântalo Ta	Nitrogênio N
	0.001							

Resistência à Tração: 1.981Mpa

Dureza:

Dados da Produção

O.P.	Qtde. Produzida	Qtde Inspeccionada
35265	1	1

Ensaios Dimensionais

Dados Técnicos	Especificado			Encontrado
	Sugerido	Máximo	Tolerância	
Altura Livre - mm	76,20		+0,76	76,20
Diâmetro Externo - mm	25,27	41,15		27,20
Diâmetro Interno - mm	21,00			22,50
Diâmetro Médio - mm				
Espiras Ativas - unid.	13,55			12,60
Espiras Totais - unid.	15,55			14,60
Diâmetro do Material - mm	2,15			2,20
Dureza - HRC				
Constante Elástica - KGF	0,12		+10% -0%	0,125
Perpendicularismo - Grau	Máximo 1 Grau			0,30
Paralelismo - Grau	Máximo 1,5 Grau			1,40
Carga Sólida - KGF	ASME VIII Div. 1			ok
Abaulamento - mm	Máximo Permissível 1/100 mm			ok

Ensaios Funcionais

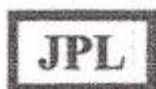
Teste por Altura - Especificado			Teste por Deflexão - Especificado			
Em mm	Em kgf	Encontrado kgf	Em mm	Em kgf	Encontrado kgf	
L1:	P1:		D1:	10,01	F1:	1,25
L2:	P2:		D2:	27,10	F2:	3,40
L3:	P3:		D3:		F3:	
L4:	P4:		D4:		F4:	
L5:	P5:		D5:		F5:	

 Responsável Técnico: *Sandro R. Basilio*

 Resultado: **Aprovado**

FOR-061 - Rev. 03 - Data Revisão 03/02/2009 - Aprovado eletronicamente via sistema.

Emissão: 1/12/2009 10:09:25



COMERCIO DE
ARAMES LTDA.

Comércio de Aços e Arames em Geral

30.094/09

I-1691

CERTIFICADO DE QUALIDADE

Cliente: VIBRAMOL IND. COM. DE MOLAS LTDA

Endereço: RUA SPENCER VAMPRE, 688

Produto: ARAME ATC DIN 17223-64 CL B

Pedido No.

Bitola: 2.20 mm

PESO: 79,0KG

Nota Fiscal: 30533

COMPOSIÇÃO QUÍMICA

C	Mn	P	Si	S	Al	Cr	Cu	Ni	Mo
0.665	0.816	0.013	0.200	0.011	0.001				

Corrida: 3130300

Ordem: 369427-30

ESPECIFICAÇÃO

	Bitola (mm)	LR (Mpa)	Torção	Flexão	C.Zinco	Estricção	A eng.
Mínima	2,17	1.697	22			40	
Máxima	2,23	1.981					

VALORES DO LOTE

Mínima

Média

Máxima

2,19

1.883

43

47

GARANTIMOS OS VALORES DE TEOR DE COBRE ABAIXO DE 0,12%
MATERIAL ORIGINAL BELGO BEKAERT.



SÃO PAULO, 11 DE MARÇO DE 2009.

[Assinatura]
José Carlos Tanshellini
CREA 4 Reg. 114735-D
-Eng. Metalúrgico

Rua Dr. Vidal Roa, 101 - CEP: 02181-000 - Parque Novo Mundo - São Paulo/SP
Fones: 3346-0444 / 3346-0445 / 3346-0446 / 3346-0447 / 3346-0448 / 3346-0449
E-mail: arame@arame.com.br

Consulta Item: FNO703 2.00.00.012 1 - HITER IND.COM.CONTROL. TERMO HIDR

Arquivo Ajuda

Item: X-6006

Descrição: MOLDE DE COMPRESSÃO EM AÇO CARBONO

Basic Completo Narrativa Características Textos Referência Desenho

TERMINAIS RECOSTADOS E RETIFICADOS, FACE DE APETO >= 170 GRAUS, PERP. DENTRO DE 1 GRAU, PARAL. DENTRO DE 1,5 GRAUS, ALT. LEVRE 76,2 mm, DEPLEXAO 0.12 ECF/mm, DIAM. EXT. MAX. 41.15 mm, ARAME SUGERIDO 2.15 mm, DIAM. EXT. SUGERIDO 25.27 mm, ESP. ATIVAS SUG. 13.55, COMP. BARRA P/DIM.SUG. 1129 mm, FAIXA DE TRABALHO 10.01 a 27.1 mm, MAX. ALTURA SOLDADA PERMITIDA 43.32 mm, FAIXA MAX. A 80% DO CURSO: COM CERTIFICADO DE MATERIAL CONFORME NORMA, ANALISE QUÍMICA E PROPRIEDADES MECÂNICAS, E RELATÓRIOS DE INSPEÇÃO DIMENSIONAL E TESTES

Vá para

062
-60

10,02 8,54 17,09

3,25

CEL.

ESCALA

III

IV

17,07 - 19,80

8,53 - 14,50

10,02 - 9,30

K = 0.12L

4.

Folha de Dados do Medidor de Vazão Tipo Turbina

MEDIDOR DE VAZÃO TIPO TURBINA SÉRIE - SVT / L-9
controla de vazão e fluxo

- Acoplado diretamente à tubulação do processo.
- Conexões sanitárias, rosca ou flange.
- Invólucro à prova de tempo e explosões grau de proteção
- BR-Ex d IB T4 IP66
- Versões para líquido ou gás.
- Sinal de saída em pulso ou 4 a 20 mA

APLICAÇÕES E CARACTERÍSTICAS

Os medidores de vazão tipo turbina são acoplados diretamente à tubulação do processo através de conexões sanitárias, rosca ou flanges. Com diâmetros de até 10", estes medidores são utilizados na medição de vazão em líquidos e gases, podendo ser fabricados em diferentes materiais para atender a uma extensa gama de tipos de fluidos.

PRINCÍPIO DE FUNCIONAMENTO

O fluido que se desloca no interior da tubulação aciona um rotor montado axialmente dentro do medidor. A velocidade deste rotor é proporcional à velocidade de deslocamento do fluido no processo. Um sensor (pick-up magnético) acoplado ao corpo do medidor, tem seu campo magnético alterado a cada passagem de uma das pás do rotor, gerando um pulso elétrico que é amplificado e processado na forma de frequência ou corrente. Um indicador digital, pré-determinado e totalizador fornecido pela CONTECH, interpreta este sinal, propiciando a visualização de vazão instantânea, bem como a sua totalização no tempo.

INSTALAÇÃO

A fim de eliminar os efeitos da turbulência na medição de vazão, deve haver um trecho reto anterior ao medidor (montante) e outro em sua saída (jusante). O valor típico de trechos retos recomendados é de dez vezes o diâmetro da tubulação à montante, e de cinco vezes o diâmetro da tubulação à jusante:

D = Diâmetro do Medidor

TABELA DE VAZÕES NOMINAIS

LÍQUIDOS			GASES		
Modelo	Diâmetro nominal IN	Faixa de Vazão M³/h	Modelo	Diâmetro nominal IN	Faixa de Vazão M³/h
L9	3/8	0.10 - 1.5	G9	3/8	0.85 - 8.5
L12	1/2	0.32 - 2.34	G12	1/2	1.7 - 17
L18	3/4	0.67 - 6.8	G18	3/4	3.4 - 34
L25	1	0.9 - 13.8	G25	1	8.50 - 85
L31	1.1/4	1.48 - 21.5	G37	1.1/2	20.4 - 204
L37	1.1/2	1.9 - 29.5	G50	2	34 - 340
L50	2	3.5 - 52	G52	2.1/2	85 - 850
L62	2.1/2	6.2 - 91.8	G75	3	110 - 1100
L75	3	9 - 143.8	G100	4	187 - 1870
L100	4	18.3 - 282.8	G125	5	305 - 3050
L125	5	32.4 - 455.2	G150	6	510 - 5100
L150	6	46.8 - 648.8	G200	8	820 - 8200
L200	8	76.5 - 1082.6	G250	10	1270 - 12700
L250	10	149.3 - 1815.7	G300	12	2040 - 20400
L300	12	250 - 2500			

Contech. Contech Indústria e Comércio de Equipamentos Eletrônicos LTDA
Rua Pinheiro das Águas, 484 • Vila Alexandra • São Paulo • SP • 04635-022
fones.: 5035.0920 • www.contechind.com.br • contech@contechind.com.br

01

[illegible]

5.

Certificado do Medidor de Vazão Tipo Turbina

Contech.

CERTIFICADO DE AFERIÇÃO Nº 09120652				O.S: 2009/3034	
CLIENTE: CENTRO DE TECNOLOGIA EM DUTOS -CTDUT					
1. IDENTIFICAÇÃO DO MEDIDOR					
SENSOR	TURBINA			MÓDULO ELETRÔNICO	
FABRICANTE	CONTECH			FABRICANTE CONTECH	
N. SÉRIE	09120652			N.SÉRIE 09120653	
MODELO	SVTL - 2" INT 3/4"			MODELO CTH2265	
2.CONDIÇÕES DE AFERIÇÃO					
FLUÍDO DE AFERIÇÃO: ÁGUA TEMPERATURA MÉDIA DO FLUÍDO: 22°C MASSA ESPECÍFICA MÉDIA DO FLUÍDO: 0,996 Kg/cm ³ PROCEDIMENTO DE ENSAIO: BASEADO NA ISO 4185/1960 DE ACORDO COM A NORMA INTERNACIONAL DA ISA-RP DE 31/01/1977 SÃO NECESSÁRIOS NO MÍNIMO TRÊS MEDIÇÕES PARA LEVANTAR A CALIBRAÇÃO DO INSTRUMENTO.					
3.PADRÃO DE REFERÊNCIA					
Padrão: Balança eletrônica com 3 células de carga Fabricante: Alpha Identificação: 13777 Faixa Nominal: 1000Kg Valor de uma divisão: 0,1Kg Certificado Nº 56631 - Data: 19/02/09 - RBC Nº Calibração: 0222					
4.RESULTADOS					
Frequecia (Hz)	V.I.I.T. (LPM)	V.I.I.P. (LPM)	Erro (%)	Vazão(m³/h)	SAIDA 4 a 20mA
634	113,3	113,1	-0,18	6,8	4,00mA=0,0 m³/h
397	71,0	70,6	-0,57	4,3	20,00mA=4,0m³/h
281	50,1	49,8	-0,60	3,0	FREQ: 373Hz
169	30,1	29,9	-0,67	1,8	
61	11,1	11,0	-0,91	0,7	
V.I.I.P = Valor Indicado pelo Instrumento Padrão V.I.I.T. = Valor Indicado pelo Instrumento de Trabalho Incerteza dos Resultados = +/-0,2 Litros					
5. GRÁFICO					
Curva de Erro				Responsável: RENE SOUZA DE MELO Depto. Técnico Data: 02/02/10	

CONTECH Indústria e Comércio de Equipamentos Eletrônicos Ltda
 Av. Dr. Lino de Moraes Leme, 1094 - Vila Paulista - São Paulo / SP - CEP 04360-000
 Fone / Fax: (11) 5031-0920 / 5035-0929
 E-mail: contech@contechind.com.br / Site: www.contechind.com.br

.6. Folha de Dados do Aquisitor de Dados

QUANTUM^X MX840

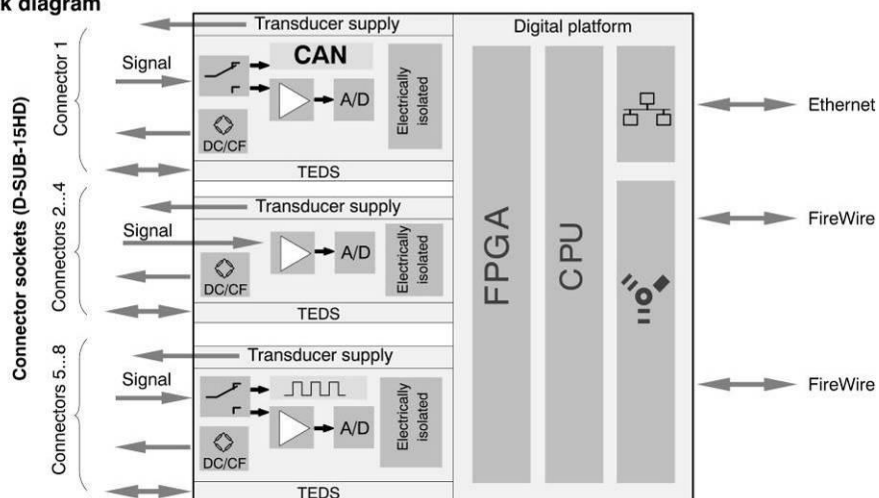
Universal amplifier



Special features

- 8 individually configurable inputs (electrically isolated)
- Connection of more than 10 transducers technologies
- Data rate: up to 19,200 values/s
- 24-bit A/D converter per channel for synchronous, parallel measurements
- Active low pass filter
- TEDS support
- Supply voltage (DC): 10 V ... 30 V
- Supply voltage for active transducers (DC): 5 V ... 24 V

Block diagram



Specifications

General specifications		
Inputs	Number	8, electrically isolated from each other
Transducer technologies		Strain gage full bridge, inductive full and half bridge, piezoresistive full bridge, Potentiometric transducers, three voltage ranges, current; resistance thermometers; thermocouples (K, N, E, T, S, ...) with cold junction in the plug (1-THERMO-MXBOARD) Frequency, pulse counting, SSI, incremental rotary encoder (connectors 5-8 only) CAN (ISO 11898; connector 1 only)
Data rate	Values/s	0.1 ... 19200, adjustable for each channel
A/D converter		24 Bit Delta Sigma converter
Active low-pass filter (Bessel/Butterworth)	Hz	0.01 ... 3200 (-3 dB)
Transducer identification (TEDS, IEEE 1451.4) max. distance of the TEDS module	m	100
Transducer connection		D-SUB-15HD
Supply voltage range (DC)	V	10 ... 30, 24 V nominal (rated) voltage
Supply voltage interruption		max. 5 ms at 24 V
Power consumption without adjustable transducer excitation with adjustable transducer excitation	W W	< 10 < 13
Transducer Excitation (active transducers) Adjustable supply voltage (DC) Maximum output power	V W	5 ... 24; adjustable for each channel 0.7 each channel / a total of 2
Ethernet (data link) Protocol/addressing Connection Max. cable length to module	- - m	10Base-T / 100Base-TX TCP/IP (direct IP address or DHCP) 8P8C plug (RJ-45) with twisted pair cable (CAT-5) 100
FireWire (module synchronization, data link, optional supply voltage) Baud rate Max. current from module to module Max. cable length between the nodes Max. number of modules connected in series (daisy chain) Max. number of modules in a FireWire system (including hubs ¹⁾ , backplane) Max. chain of hops ²⁾	Mbaud A m - - -	IEEE 1394b (HBM modules only) 400 (approx. 50 MByte/s) 1.5 5 12 (~11 Hops) 24 14
Nominal (rated) temperature range	°C [°F]	-20 ... +60 [-4 ... +140]
Operating temperature range (no dewing allowed/module not dew-point proof)	°C [°F]	-20 ... +65 [-4 ... +149]
Storage temperature range	°C [°F]	-40 ... +75 [-40 ... +167]
Rel. humidity at 31 °C	%	80 (non condensing) lin. reduction to 50 % at 40 °C
Protection class (up to 2000 m height, degree of contamination 2)		III
Degree of protection		IP20 per EN 60529
Mechanical tests³⁾ Vibration (30 min) Shock (6 ms)	m/s ² m/s ²	50 350
EMC requirements		per EN 61326
Maximum input voltage at transducer socket to ground (PIN 6) PIN 1, 2, 3, 4, 5, 7, 8, 10, 13 PIN 14	V V	5.5 (no transients) 60 (no transients)/typ. 500
Dimensions, horizontal (W x H x D)	mm	52.5 x 200 x 122 (with case protection) 44 x 174 x 119 (without case protection)
Weight, approx.	g	980

¹⁾ Hub: FireWire node or distributor

²⁾ Hop: Transition from module to module/signal conditioning

³⁾ Mechanical stress is tested according to European Standard EN60068-2-6 for vibrations and EN60068-2-27 for shock. The equipment is subjected to an acceleration of 25 m/s² in a frequency range of 5 ... 65 Hz in all 3 axes. Duration of this vibration test: 30min per axis. The shock test is performed with a nominal acceleration of 200 m/s² for 11 ms, half sine pulse shape, with 3 shocks in each of the 6 possible directions.

HBM

2

B2358-2.0 en

Specifications (Continued)

5 mV/V CF strain gage full bridge with 1 V or 2.5 V excitation (effective)		
Accuracy class		0.05
Carrier frequency (sine)	Hz	4800 ± 0.6
Bridge excitation voltage (effective)	V	1 and 2.5 (± 5 %)
Transducers that can be connected		strain gage full bridges
Permissible cable length between MX840 and transducer	m	100
Measuring ranges at 2.5 V excitation at 1 V excitation	mV/V mV/V	± 5 ± 10
Measurement frequency range (–3 dB)	kHz	0 ... 1.6
Transducer impedance at 2.5 V excitation at 1 V excitation	Ω Ω	300 ... 1000 80 ... 1000
Noise at 25 °C and 2.5 V excitation (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 0.2 < 0.5 < 1 < 4
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	0.02 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.05 of measurement value

100 mV/V (DC) piezoresistive strain gage full bridge with 2.5 V (DC) excitation		
Accuracy class		0.05
Excitation voltage (DC)	V	2.5
Transducers that can be connected		piezoresistive strain gage full bridges
Permissible cable length between MX840 and transducer	m	100
Measuring range	mV/V	± 100
Measurement frequency range (–3 dB)	kHz	0 ... 3.2
Transducer impedance Carrier frequency DC supply	Ω Ω	300 ... 1000 300 ... 5000
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 4 < 6 < 15 < 80
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	< 0.02 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.05 of measurement value

1000 mV/V (DC) piezoresistive strain gage full bridge with 2.5 V (DC) excitation		
Accuracy class		0.05
Bridge excitation voltage (DC)	V	2.5
Transducers that can be connected		piezoresistive strain gage full bridges
Permissible cable length between MX840 and transducer	m	100
Measuring range	mV/V	± 1000
Measurement frequency range (–3 dB)	kHz	0 ... 3.2
Transducer impedance	Ω	300 ... 1000
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 40 < 100 < 200 < 700
Linearity error	%	< 0.02 of full scale
Zero drift (1 V excitation)	% / 10 K	< 0.02 of full scale
Full-scale drift (1 V excitation)	% / 10 K	< 0.1 of measurement value

Specifications (Continued)

100 mV/V CF Inductive full bridge with 1 V or 2.5 V excitation (effective)		
Accuracy class		0.05
Carrier frequency (sine)	Hz	4800 ± 0.6
Bridge excitation voltage (effective)	V	1 and 2.5 (± 5 %)
Transducers that can be connected		inductive full bridges
Permissible cable length between MX840 and transducer	m	100
Measuring ranges		
at 2.5 V excitation	mV/V	± 100
at 1 V excitation	mV/V	± 300
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance		
at 2.5 V excitation	Ω	300 ... 1000
at 1 V excitation	Ω	80 ... 1000
Noise at 25 °C and 2.5 V excitation (peak to peak)		
with filter 1 Hz Bessel	μV/V	< 3
with filter 10 Hz Bessel	μV/V	< 5
with filter 100 Hz Bessel	μV/V	< 15
with filter 1 kHz Bessel	μV/V	< 50
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	< 0.02 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.05 of measurement value

1000 mV/V CF Inductive full bridge with 1 V excitation (effective)		
Accuracy class		0.05
Carrier frequency (sine)	Hz	4800 ± 0.6
Bridge excitation voltage (effective)	V	1 (± 5 %)
Transducers that can be connected		inductive full bridges
Permissible cable length between MX840 and transducer	m	100
Measuring range	mV/V	± 1000
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance	Ω	80 ... 1000
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	μV/V	< 40
with filter 10 Hz Bessel	μV/V	< 100
with filter 100 Hz Bessel	μV/V	< 500
with filter 1 kHz Bessel	μV/V	< 1200
Linearity error	%	< 0.02 of full scale
Zero drift (1 V excitation)	% / 10 K	< 0.02 of full scale
Full-scale drift (1 V excitation)	% / 10 K	< 0.1 of measurement value

Specifications (Continued)

100 mV/V CF inductive half bridge with 1 V or 2.5 V excitation (effective)		
Accuracy class		0.1
Carrier frequency (sine)	Hz	4800 ± 0.6
Bridge excitation voltage (effective)	V	1 and 2.5 (± 5 %)
Transducers that can be connected		inductive half bridges
Permissible cable length between MX840 and transducer	m	100
Measuring ranges		
at 2.5 V excitation	mV/V	± 100
at 1 V excitation	mV/V	± 300
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance		
at 2.5 V excitation	Ω	300 ... 1000
at 1 V excitation	Ω	80 ... 1000
Noise at 25 °C and 2.5 V excitation (peak to peak)		
with filter 1 Hz Bessel	μV/V	< 3
with filter 10 Hz Bessel	μV/V	< 5
with filter 100 Hz Bessel	μV/V	< 15
with filter 1 kHz Bessel	μV/V	< 50
Linearity error	%	< 0.02 of full scale
Zero drift (2.5 V excitation)	% / 10 K	< 0.1 of full scale
Full-scale drift (2.5 V excitation)	% / 10 K	< 0.1 of measurement value

LVDT		
Accuracy class		0.1
Carrier frequency (sine)	Hz	4800 ± 0.6
Bridge excitation voltage (effective)	V	1 (± 5 %)
Transducers that can be connected		LVDT
Permissible cable length between MX840 and transducer	m	100
Measuring range	mV/V	± 3000
Measurement frequency range (-3 dB)	kHz	0 ... 1.6
Transducer impedance	mH	4 ... 33
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	μV/V	< 40
with filter 10 Hz Bessel	μV/V	< 100
with filter 100 Hz Bessel	μV/V	< 500
with filter 1 kHz Bessel	μV/V	< 1200
Linearity error	%	< 0.02 of full scale
Zero drift (1 V excitation; effective)	% / 10 K	< 0.1 of full scale
Full-scale drift (1 V excitation; effective)	% / 10 K	< 0.1 of measurement value

Specifications (Continued)

Potentiometric transducer		
Accuracy class		0.1
Excitation voltage (DC)	V	2.5
Transducers that can be connected		potentiometric transducers
Permissible cable length between MX840 and transducer	m	100
Measuring range	mV/V	± 1000
Measurement frequency range (–3 dB)	kHz	0 ... 3.2
Transducer impedance	Ω	300 ... 5000
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV/V μV/V μV/V μV/V	< 40 < 100 < 200 < 700
Linearity error	%	< 0.02 of full scale
Zero drift (1 V excitation)	% / 10 K	< 0.1 of full scale
Full-scale drift (1 V excitation)	% / 10 K	< 0.1 of measurement value

10 V DC voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator ± 10 V
Permissible cable length between MX840 and transducer	m	100
Measuring range	V	± 10
Measurement frequency range (–3 dB)	kHz	0 ... 3.2
Internal resistance of the voltage source	Ω	< 500
Internal impedance	MΩ	typ. 1
Noise at 25 °C (peak to peak) with filter 1 Hz Bessel with filter 10 Hz Bessel with filter 100 Hz Bessel with filter 1 kHz Bessel	μV μV μV μV	< 150 < 300 < 600 < 3000
Linearity error	%	< 0.02 of full scale
Common-mode rejection with DC common mode with 50 Hz common mode	dB dB	> 100 typ. 75
Maximum common-mode voltage (to housing and supply ground)	V	± 60
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value

Specifications (Continued)

60 V DC voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator ± 60 V
Permissible cable length between MX840 and transducer	m	100
Measuring range	V	± 60
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Internal resistance of the voltage source	Ω	< 500
Input impedance	M Ω	typ. 1
Noise at 25 °C (peak to peak)		
with filter 1Hz Bessel	μ V	< 150
with filter 10Hz Bessel	μ V	< 300
with filter 100Hz Bessel	μ V	< 600
with filter 1kHz Bessel	μ V	< 3000
Linearity error	%	< 0.02 of full scale
Common-mode rejection		
with DC common mode	dB	> 100
with 50 Hz common mode	dB	typ. 75
Maximum common-mode voltage (to housing and supply ground)	V	± 60
Zero drift	% / 10 K	< 0.02 of full scale
Full-scale drift	% / 10 K	< 0.05 of measurement value

100 mV DC voltage		
Accuracy class		0.05
Transducers that can be connected		voltage generator
Permissible cable length between MX840 and transducer	m	100
Measuring range	mV	± 300
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Input impedance	M Ω	> 20
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	μ V	< 5
with filter 10 Hz Bessel	μ V	< 100
with filter 100 Hz Bessel	μ V	< 1000
with filter 1 kHz Bessel	μ V	< 1500
Linearity error	%	< 0.03 of full scale
Common-mode rejection		
with DC common mode	dB	> 90
with 50 Hz common mode	dB	typ. 75
Maximum common-mode voltage (to housing and supply ground)	V	± 30
Zero drift	% / 10 K	< 0.1 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value

Specifications (Continued)

20 mA DC current		
Accuracy class		0.05
Transducers that can be connected		transducers with 4 ... 20 mA current output
Permissible cable length between MX840 and transducer	m	100
Measuring range	mA	±30
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Measurement resistance value	Ω	typ. 10
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	μA	< 1
with filter 10 Hz Bessel	μA	< 1.5
with filter 100 Hz Bessel	μA	< 15
with filter 1 kHz Bessel	μA	< 40
Linearity error	%	< 0.02 of full scale
Common-mode rejection		
with DC common mode	dB	> 100
with 50 Hz common mode	dB	typ. 75
Maximum common-mode voltage (to housing and supply ground)	V	±30
Zero drift	% / 10 K	< 0.05 of full scale
Full-scale drift	% / 10 K	< 0.1 of measurement value

Resistance thermometer		
Transducers that can be connected		resistance thermometers
Permissible cable length between MX840 and transducer	m	100
Measuring ranges		PT100 PT1000
Linearization range	°C [°F]	-200 ... +848 [-328 ... +1558.4]
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Noise at 25 °C (peak to peak)		
with filter 1 Hz Bessel	K	< 0.1
with filter 10 Hz Bessel	K	< 0.2
with filter 100 Hz Bessel	K	< 0.5
with filter 1 kHz Bessel	K	< 1.5
Linearity error	K	< ±0.3
Zero drift		
with PT100	K / 10 K	<0.2
with PT1000	K / 10 K	<0.1
Full-scale drift		
with PT100	K / 10 K	<0.5
with PT1000	K / 10 K	<1

Specifications (Continued)

Thermocouples ⁴⁾		
Transducers that can be connected		Thermocouples
Permissible cable length between MX840 and transducer	m	100
Measuring range	mV	± 100
Linearization ranges Type B (Pt-30 % Rh and Pt-6 % Rh) Type E (Ni-Cr and Cu-Ni) Type J (Fe and Cu-Ni) Type K (Ni-Cr and Ni-Al) Type N (Ni-14,2 % Cr and Ni-4,4 % Si-0,1 % Mg) Type R (Pt-13 % Rh and Pt) Type S (Pt-10 % Rh and Pt) Type T (Cu and Cu-Ni)	°C [°F] °C [°F] °C [°F] °C [°F] °C [°F] °C [°F] °C [°F] °C [°F]	+100 ... +1820 [+212 ... +3308] -200 ... +900 [-328 ... +1652] -210 ... +1200 [-346 ... +2192] -270 ... +1372 [-454 ... +2501.6] -270 ... +1300 [-454 ... +2372] -50 ... +1768 [-58 ... +3214.4] -50 ... +1768 [-58 ... +3214.4] -270 ... +400 [-454 ... +752]
Measurement frequency range (-3 dB)	kHz	0 ... 3.2
Noise at 25 °C and Type K (peak to peak) with Filter 1 Hz Bessel with Filter 10 Hz Bessel with Filter 100 Hz Bessel with Filter 1 kHz Bessel	K K K K	0.05 0.1 0.5 1
Zero error Type E, J, K, T Type N, R, S Type B	K K K	< ± 0.3 < ± 3 < ± 30
Linearity error Type E, J, K, T Type N, R, S Type B	K K K	< ± 0.3 < ± 3 < ± 30
Max. error of the cold junction	K	< ± 0.5
Total error limit Type E, J, K, T Type N, R, S Type B	K K K	± 1 ± 6.5 ± 60
Cold junction 1-THERMO-MXBOARD Nominal (rated) temperature range Operating temperature range Storage temperature range	°C [°F] °C [°F] °C [°F]	-20 ... +60 [-4 ... +140] -20 ... +65 [-4 ... +149] -40 ... +75 [-40 ... +167]

⁴⁾ The external cold junction is required for connecting thermocouples to the MX840 (Order no.: 1-THERMO-MXBOARD).

Specifications (Continued)

Frequency or pulse counting (connections 5 ... 8)		
Accuracy class		0.01
Transducers that can be connected		Torque transducers, Frequency signal sources (square and sine), incremental encoder
Permissible cable length between MX840 and transducer	m	50
Signals $f_1 (\pm)$ $f_2 (\pm)$ Zero index ($\pm$)		Frequency or pulse signal Direction of rotation signal shifted by $\pm 90^\circ$ to f_1 Zero position signal
Input level with differential operation Low level High level		Differential inputs (RS422): Signal (+) < Signal (-) -200 mV Differential inputs (RS422): Signal (+) > Signal (-) +200 mV
Input level with unipolar operation Low level High level	V V	<1.5 >3.5
Maximum input voltage at transducer socket to ground	V	5.5 (no transients)
Measuring ranges Frequency Pulse counting	pulses/s	0.1 Hz ... 1000 kHz 0 ... 1000000
Input impedance	kΩ	typ. 10
SSI mode (differentially) Shift clock Word length Code Input level Low level High level Signals Data Shift clock	kHz Bit - Data Clk+, Clk-, RS-422	100, 200, 500, 1000 12-31 dual or gray Differential inputs (RS422): Signal (+) < Signal (-) -200 mV Differential inputs (RS422): Signal (+) > Signal (-) +200 mV Data+, Data-, RS-422 Clk+, Clk-, RS-422

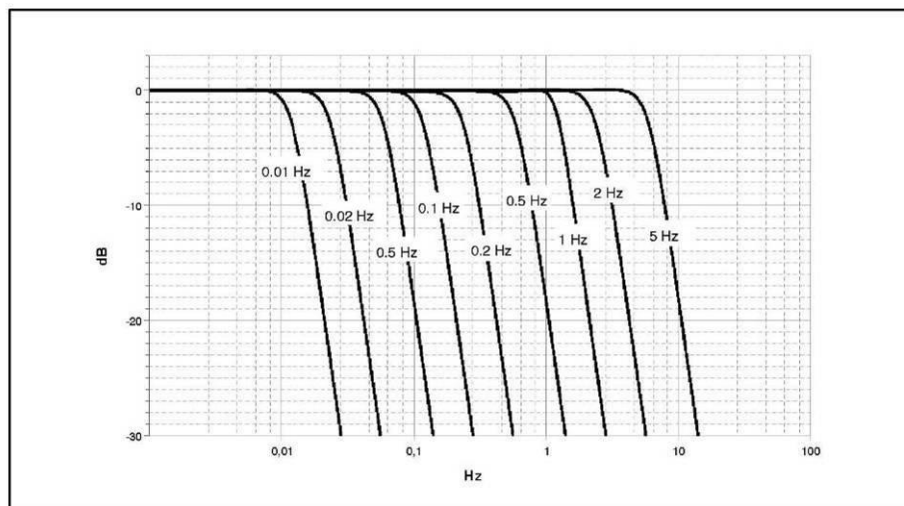
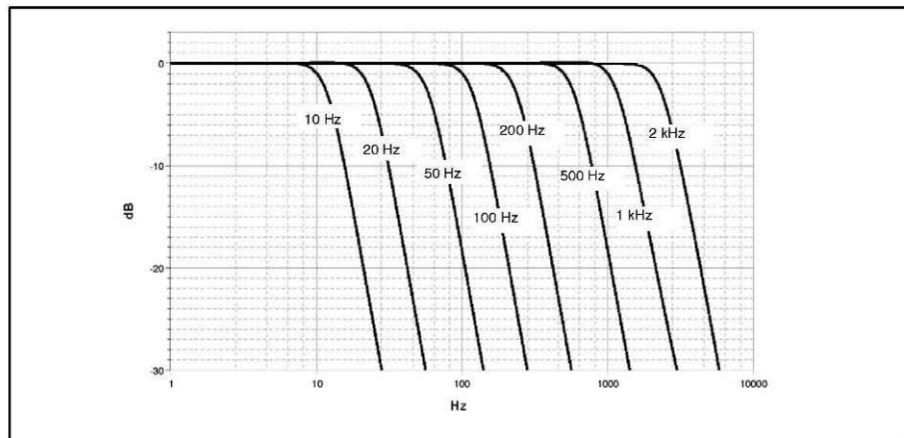
CAN (connection 1)						
Supported protocols		CAN 2.0A, CAN 2.0B				
Number of CAN-ports		1 (connection 1)				
Bus link		two w/ire, according to ISO11898				
Baud rates and permissible cable lengths	kB/t/s m	1000, 25,	500, 100,	250, 250,	125, 500,	100 600
Sampling rate	signals/s	max. 10000				
CAN channels		≤128				
CAN signal types		standard, mode-dependent, mode-signal				

Amplitude responses of the adjustable filters

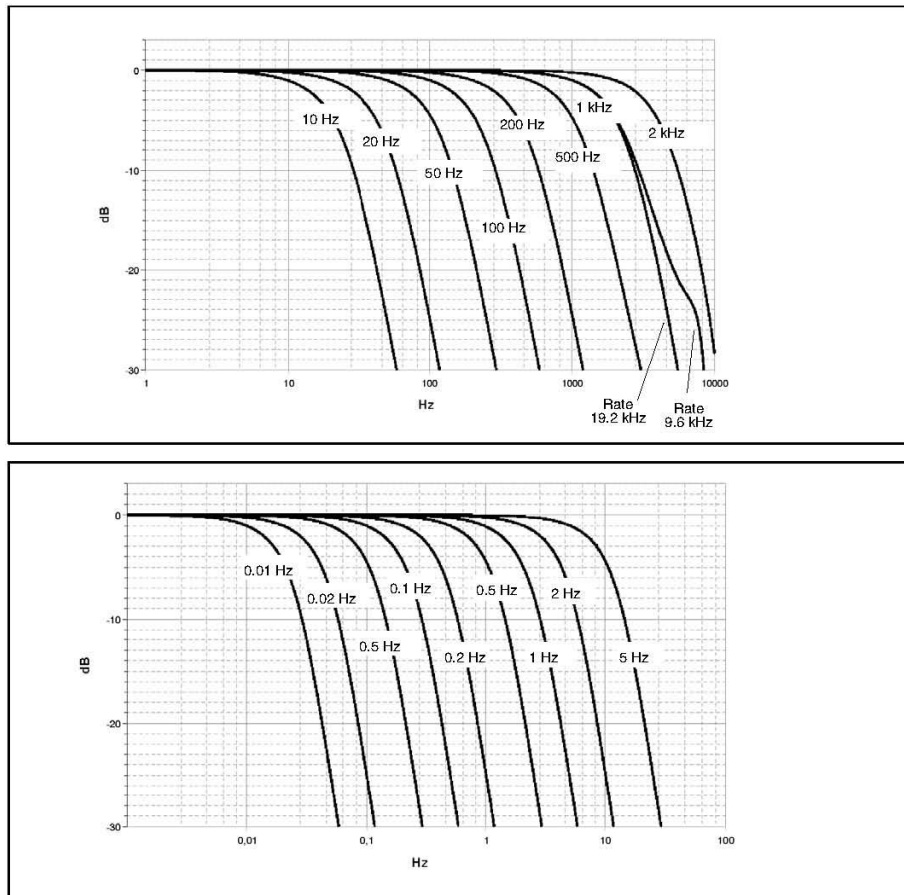
MX840 active low-pass filter data (4th order Bessel/Butterworth)

Type	-1dB (Hz)	-3dB (Hz)	-20dB (Hz)	Phase delay (ms)	Rise time (ms)	Overshoot (%)	Data rate (values/s)
Bessel	2000	3210	8100	0.15	0.1	1.5	19200
	1000	1630	4050	0.24	0.2	1.4	19200
	1000	1640	5150	0.21	0.2	0.7	9600
	500	820	2120	0.4	0.43	1.4	9600
	200	335	860	1	1.04	1	9600
	100	167	430	2	2.1	0.8	9600
	50	83	215	4	4.28	0.8	9600
	20	33.7	85	10	10.6	0.8	9600
	10	16.5	42	20	21.3	0.8	9600
	5	8.4	21	40	41.6	0.8	2400
	2	3.4	8.5	99	104	0.8	2400
	1	1.6	4.2	200	214	0.8	2400
	0.5	0.83	2.1	400	420	0.8	300
	0.2	0.34	0.85	1000	1060	0.8	300
	0.1	0.17	0.43	2000	2130	0.8	300
	0.05	0.084	0.21	3940	4200	0.8	20
	0.02	0.033	0.085	10000	10600	0.8	20
	0.01	0.017	0.042	20100	21300	0.8	20
Butterworth	2000	2360	4331	0.2	0.15	11	19200
	1000	1178	2100	0.38	0.3	11	19200
	1000	1168	2140	0.32	0.32	11	9600
	500	586	1050	0.66	0.66	11	9600
	200	235	420	1.7	1.6	11	9600
	100	118	210	3.46	3.2	11	9600
	50	49	105	6.98	6.6	11	9600
	20	24	42	17.3	16	11	9600
	10	12	21	34.9	32	11	9600
	5	5.95	10.5	69	66	11	2400
	2	2.37	4.24	173	160	11	2400
	1	1.26	2.1	347	320	11	2400
	0.5	0.59	1.05	701	660	11	300
	0.2	0.236	0.421	1760	1600	11	300
	0.1	0.118	0.21	3510	3200	11	300
	0.05	0.059	0.105	6950	6600	11	20
	0.02	0.0235	0.042	17500	16000	11	20
	0.01	0.012	0.021	34600	32000	11	20

Amplitude response of MX840 Butterworth filter



Amplitude response of MX840 Bessel filter

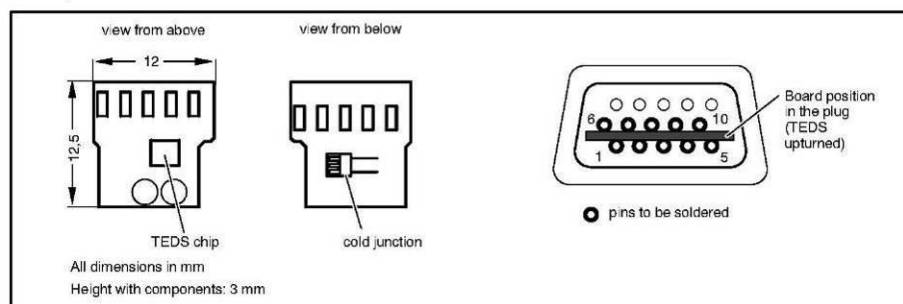


Specifications Power pack NTX001

NTX001		
Nominal input voltage (AC)	V	100 ... 240 ($\pm 10\%$)
Stand-by power consumption at 230 V	W	0.5
Nominal load		
U_A	V	24
I_A	A	1.25
Static output characteristics		
U_A	V	$24 \pm 4\%$
I_A	A	$0 - 1.25$
U_{Br} (Output voltage ripple; peak to peak)	mV	≤ 120
Current limiting, typically from	A	1.6
Primary - secondary separation		galvanically, by optocoupler and converter
Creep distance and clearance	mm	≥ 8
High-voltage test	kV	≥ 4
Ambient temperature range	$^{\circ}\text{C}$ [$^{\circ}\text{F}$]	$0 \dots +40$ [$+32 \dots +104$]
Storage temperature	$^{\circ}\text{C}$ [$^{\circ}\text{F}$]	$-40 \dots +70$ [$-40 \dots +158$]

Accessories, to be ordered separately

Accessories MX840		
Article	Description	Order No.
Cold junction for thermocouples on MX840	Electronics for temperature compensation for measurements with thermocouples on MX840 including: - PT1000 cold junction - incl. TEDS chip for transducer identification Note: Installation in DSubHD 15-pole transducer plug.	1-THERMO-MXBOARD
DSubHD 15 pole-to-DSub 15 pole adapter	DSubHD 15 pole-to-DSub 15 pole adapter for connection of transducers with pre-wired DSub plug to MX840 (length approx. 0.3 m); Note: Pre-wired for full bridge (6-wire).	1-KAB416
DSubHD15-to-DSub9 (CAN) adapter	Adapter for connection of CAN instruments to MX840. DSubHD 15-pole (plug) to DSub 9-pole (socket); Length: approx. 0.3 m.	1-KAB418
General accessories		
Article	Description	Order No.
DSubHD 15-pole connector kit with TEDS chip	DSubHD 15-pole connector kit (male) with TEDS chip for storage of a sensor data sheet; Housing: Metallised plastic with knurled screws. Note: The TEDS chip comes blank.	1-SUBHD15-MALE
AC-DC power supply / 24 V	Input : 100 ... 240 V AC ($\pm 10\%$), 1.5 m cable Output: 24 V DC, max. 1.25 A, 2 m cable with ODU connector	1-NTX001
3m cable – QuantumX supply	3 m cable for voltage supply of QuantumX modules; Suitable plug (ODU Medi-Snap S11M08-P04MJGO-5280) on one side and open strands on the other end.	1-KAB271-3
3 m FireWire cable PC-to-module	Firewire connection cable from the PC to the first module for data transfer from QuantumX modules to the PC; With matching plugs on both sides; Length: 3 m.	1-KAB275-3
0.2 m FireWire cable (module-to-module)	FireWire connection cable for QuantumX modules; with matching plugs on both sides; Length: 0.2 m Note: The cable enables QuantumX modules to be supplied with voltage (max. 1.5 A, from the source to the last drain).	1-KAB269-0.2
2 m Firewire cable (module-to-module)	FireWire connection cable for QuantumX modules (Length: 2 m); With matching plugs on both sides; Note: The cable enables QuantumX modules to be supplied with voltage (max. 1.5 A, from the source to the last drain).	1-KAB269-2
Connecting elements for QuantumX modules	Connecting elements (clips) for QuantumX modules; Set comprising 2 case clips including mounting material for fast connection of 2 modules.	1-CASECLIP

Cold junction 1-THERMO-MXBOARD

Modifications reserved.
All details describe our products in general form only. They
are not to be understood as express warranty and do not
constitute any liability whatsoever.

B2358-2.0 en

Hottinger Baldwin Messtechnik GmbH

Im Tiefen See 45, D-64293 Darmstadt, Germany
Tel.: +49 6151 803-0 Fax: +49 6151 803 9100
Email: support@hbm.com Internet: www.hbm.com



measurement with confidence

7.

Folha de Dados do Transdutor de Pressão

Data Sheet

P8AP

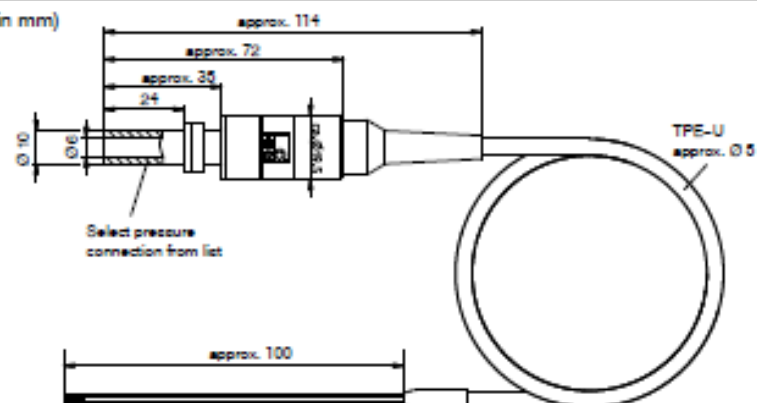
Absolute pressure transducer



Special features

- 2 mV/V strain gage sensor
- No sealing between pressure connection and strain gage sensor; no liquid filler
- Fast and economical installation
- Diverse pressure connection options
- Corrosion-resistant
- Mounting position as desired
- For static and dynamic pressures

Dimensions (in mm)



Pin assignment:
Excitation voltage
Excitation voltage
Output voltage

(+) blue
(-) black
(+) white

Output voltage
Sense lead
Sense lead
Cable shield

(-) red
(+) green
(-) gray
blank

B0021-3.2 en



Specifications

Type	PBAP						
Accuracy class	0.3						
Mechanical input quantities							
Measuring span	bar	10	20	50	100	200	500
Lower range value (abc.)	bar	0					
Natural frequency of the diaphragm	kHz	12	16	29	50	88	134
Attenuation of the diaphragm	1	0.01					
Operating range at 23 °C	%	0...150					
Overload limit at 23 °C	%	175					
Test pressure	%	175					
Destructive range	%	> 200					
During dynamic loading maximum pressure	%	100					
permissible vibration bandwidth (as per DIN 50 100)	%	70	70	85	95	95	50
Material for parts which come into contact with the measurement medium: inner surface pressure connection Material(s) for parts which come into contact with the environment		stainless steel 1.4542 stainless steel 1.4301 stainless steel 1.4301, polyethylene					
Dead volume with tube ¹⁾ without pressure connection	mm ³ mm ³	1110 (410)	1100 (400)	1090 (390)	1060 (360)	1100 (400)	1020 (320)
Control volume	mm ³	2			1.5	0.5	0.3
Output characteristics							
Nominal (rated) sensitivity	mV/V	2 ± 2%					
Input resistance at 23 °C	Ω	420 (+180/-120)					370 (+130/-70)
Output resistance at 23 °C	Ω	330 (+90/-30)					
Nominal (rated) range of the excitation voltage (rms value)	V	0.5...5		0.5...12			
Characteristic curve deviation (starting point setting)	%	0.3					
Repeatability as per DIN 1319	%	± 0.1					
Temperature effect on the zero signal relative to the measuring span, per 10 K, in the nominal (rated) temperature range	%	± 0.3			< ± 0.2		
Temperature effect on the sensitivity relative to the actual value, per 10 K, in the nominal (rated) temp. range	%	± 0.3					
Ambient conditions		Option A5			Option T2	Option T9	Option TH
Nominal (rated) temperature range	°C	-10...+70			-10...+70		
Operating temperature range	°C	-40...+80			-40...+140		
Storage temperature range	°C	-50...+85			-50...+140		
Impact resistance (type-tested to DIN IEC 68)	m/s ²	500					
Degree of protection (as per DIN 40050, IEC 68)		IP 67					
Connection cable length, free and ²⁾	m	5					
Weight, approx. (incl. cable)	g	250					

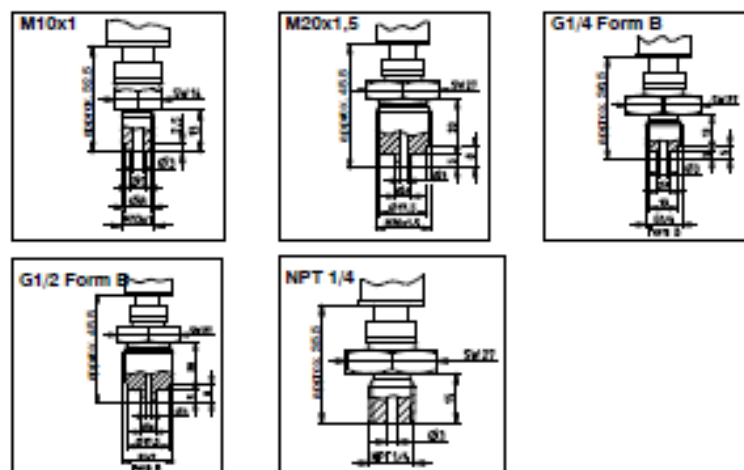
¹⁾ For the other pressure connections, see options: take the dead volume and the material from the "Connector elements" section on page 3.

²⁾ For Option 3, Code T2: 1.5 m

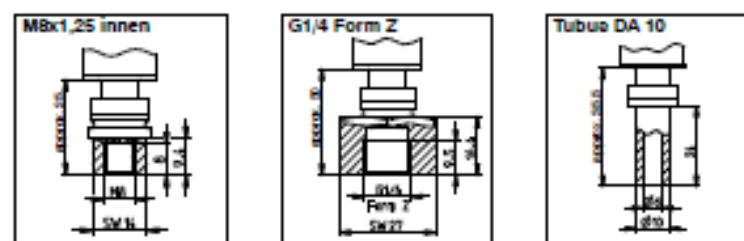
Economical standard versions with a tube (DA10) for pipe unions (see Options) can be supplied from stock at short notice.

Standard version	10 bar	20 bar	50 bar	100 bar	200 bar	500 bar
Order number	1-PBAP/10S-001	1-PBAP/20S-001	1-PBAP/50S-001	1-PBAP/100S-001	1-PBAP/200S-001	1-PBAP/500S-001

Connector elements with external thread



Connector elements with internal thread and miscellaneous

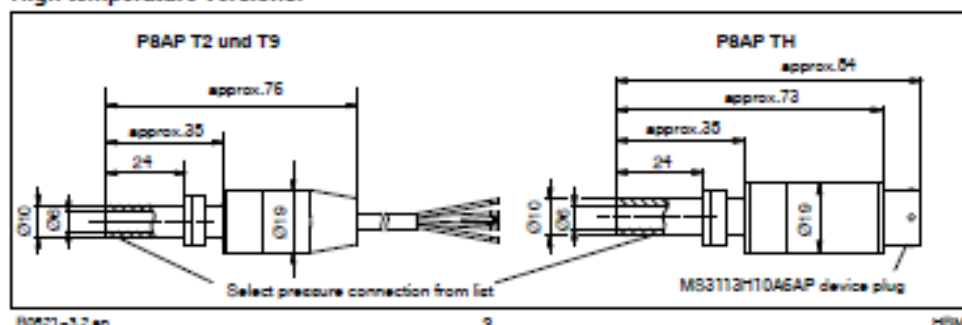


		External thread					Internal thread		
		M10x1	M20x1.5	G1/4 Form B	G1/2 Form B	NPT 1/4	M8x1.25	G 1/4 Form Z	Tube DA 10
Dead volume ¹⁾	mm ³	170	260	190	260	190	180	100	700
Full scale value	bar	500	1600 ²⁾	1000	1600 ²⁾	1000	500	1000 ²⁾	500
Material		1.4542					1.4542		1.4571

¹⁾ Add the dead volume of the connector element to the dead volume of the transducer

²⁾ Data as per DIN 15288

High temperature versions:



B0521-3.2 en

3

HBM

Order code for options

Code	Option 1: Measuring range selection 0 bar...
218	10 bar
221	20 bar
228	50 bar
228	100 bar
231	200 bar
238	500 bar

Code	Option 2: Pressure connection selection	
10	M10x1	External thread
13	M20x1.5	
14	G1/4 Form B	
15	G1/2 Form B	
17	NPT 1/4	
51	G1/4 Form Z	Internal thread
50	M5x1.25	
71	DA10 screwed connection with cutting or clamping ring	

Code	Option 3: Version
A5	Standard version
T2	High temperature version (max. +140°C), with cable, 1.5 m. free ends
T9	High temperature version (max. +140°C), with cable, 20 m. free ends
TH	High temperature version (max. +140°C), with H58P connector *)

Code	Option 4: Special features
1	no
2	With pressure peak damping

Ordering example

K-P8AP- 2 1 8 . 1 0 T 2 -0-K- 2

*) corresponds to PT06E-10-SS, from Bendix / UPT06J, from Cannon

Devices with can be supplied in the standard version from stock at short notice. These devices include all the accompanying options.

In addition, the following pressure connections are possible on request:

External thread: M12x1.5; M14x1.5; NPT1/8; NPT1/2; UNF 7/16-20; UNF 9/16-18; G1/2 Form D; G3/4 Form D

Internal thread: NPT1/4; NPT1/2; G1/2 Form B

Modifications reserved.
All details describe our products in general form only. They are not to be understood as explicit warranty and do not constitute any liability whatsoever.

30521-3.2 en

Hottinger Baldwin Messtechnik GmbH

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measurement with confidence

.8.

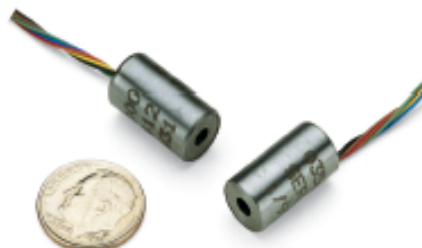
Folha de Dados do Transdutor Linear de Posição

MHR-Series

Miniature LVDT

DESCRIPTION

The **MHR Series** of LVDTs is ideal for applications where excessive core weight could influence the motion of sensitive mechanisms. The lightweight core also helps minimize stresses and preserves the structural integrity of the core actuation assembly. High sensitivity results from close electrical coupling between coil and core. A magnetic stainless steel housing provides electromagnetic and electrostatic shielding.



FEATURES

- ✦ For Applications Where Installation Space or Weight Is Limited
- ✦ Lightweight Core
- ✦ Calibration Certificate Supplied with All Models
- ✦ Compatible with All Schaevitz® Signal Conditioners
- ✦ High Temperature (220°C) and High Pressure (vented case) Available – Consult Factory

APPLICATIONS

- ✦ Sensitive, Lightweight Devices

OPTIONS

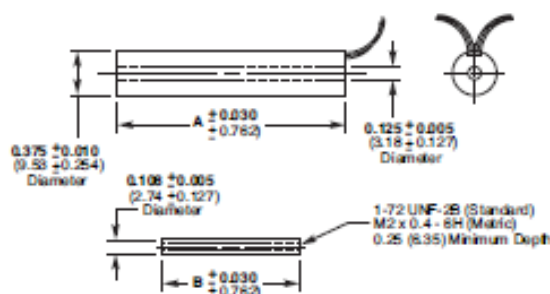
- ✦ Alternative 5.0 and 10.0 kHz Excitation Frequency Testing*
- ✦ Metric Thread Core

* Performance and electrical specifications for alternative frequencies will differ from the standard specifications listed below which are based on a 10 kHz excitation frequency. Consult factory for further information.

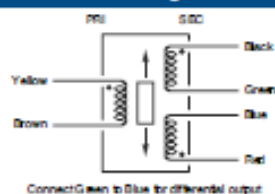
specifications

Input Voltage	3 V rms (nominal)
Frequency Range	2 kHz to 20 kHz
Operating Temperature	-65°F to 300°F
Range	(-55°C to 150°C)
Null Voltage	<0.5% full scale output
Shock Survival	1,000 g for 11 msec
Vibration Tolerance	20 g up to 2 kHz
Coil Form Material	High density, glass-filled polymer
Housing Material	AISI 400 series stainless steel
Lead Wires	32 AWG, stranded copper, Teflon-insulated, 12 inches (300 mm) long (nominal)

dimensions



wiring



www.meas-spec.com
Rev: 0/17/06

Measurement Specialties, Inc. • 1000 Lucas Way • Hampton, VA 23066 USA • www.meas-spec.com • 757-764-1100 • 800-765-8008 • Fax 757-764-6187



MHR-Series

performance and electrical specifications @ 10 kHz¹ (recommended)

MHR Series	Nominal		Linearity (±% full range)				Sensitivity		Impedance		Phase
Model	Linear Range						mV out/V In Per		Ohms		Shift
Number	Inches	mm	50	100	125	150	0.001 in	mm	Pri	Sec	Degrees
005 MHR	±0.005	±0.13	0.20	0.25	0.30	0.40	8.70	342	84	302	+38
010 MHR	±0.010	±0.25	0.10	0.25	0.35	0.35	6.05	238	165	300	+20
025 MHR	±0.025	±0.64	0.15	0.25	0.25	0.30	8.10	319	238	485	+15
050 MHR	±0.050	±1.27	0.15	0.25	0.35	0.50	3.15	124	419	154	+8
100 MHR	±0.100	±2.54	0.15	0.25	0.25	0.30	2.80	110	400	200	+5
250 MHR	±0.250	±6.35	0.15	0.25	0.35	0.50	2.07	86	345	420	+7
500 MHR	±0.500	±12.70	0.15	0.25	0.30	0.75	1.96	77	264	810	+4
1000 MHR	±1.000	±25.40	0.20	0.25	0.50	—	0.77	30	155	450	-1

performance and electrical specifications @ 2.5 kHz¹

MHR Series	Nominal		Linearity (±% full range)				Sensitivity		Impedance		Phase
Model	Linear Range						mV out/V In Per		Ohms		Shift
Number	Inches	mm	50	100	125	150	0.001 in	mm	Pri	Sec	Degrees
005 MHR	±0.005	±0.13	0.20	0.25	0.30	0.40	3.14	124	59	260	+73
010 MHR	±0.010	±0.25	0.10	0.25	0.35	0.35	3.29	129	78	192	+39
025 MHR	±0.025	±0.64	0.15	0.25	0.25	0.30	4.36	172	116	286	+38
050 MHR	±0.050	±1.27	0.15	0.25	0.35	0.50	2.55	100	141	90	+36
100 MHR	±0.100	±2.54	0.15	0.25	0.25	0.30	2.40	94	135	125	+30
250 MHR	±0.250	±6.35	0.15	0.25	0.35	0.50	1.73	68	147	268	+29
500 MHR	±0.500	±12.70	0.15	0.25	0.30	0.75	1.60	67	145	445	+19
1000 MHR	±1.000	±25.40	0.20	0.25	0.50	—	0.70	27	100	370	+6

mechanical specifications

MHR Series	Weight				Dimensions			
Model	Body		Core		A (Body)		B (Core)	
Number	oz	gm	oz	gm	in	mm	in	mm
005 MHR	0.07	2	0.004	0.1	0.38	9.7	0.18	4.6
010 MHR	0.11	3	0.007	0.2	0.54	13.7	0.23	5.8
025 MHR	0.18	5	0.016	0.4	0.66	16.8	0.40	10.2
050 MHR	0.21	6	0.016	0.4	0.80	20.3	0.50	12.7
100 MHR	0.21	6	0.025	0.5	1.00	25.4	0.62	15.7
250 MHR	0.32	9	0.032	0.9	1.85	47.0	1.12	28.4
500 MHR	0.60	17	0.056	1.6	3.30	83.8	2.00	50.8
1000 MHR	0.92	26	0.088	2.5	5.60	142.2	3.00	76.2

ordering information

Specify the MHR Model followed by the desired option number(s) added together.

Ordering Example:

Model Number 050 MHR-009 is an MHR Series LVDT with a ±0.05" range (050 MHR), with the 10 kHz testing option (003), Metric thread core (006).

MHR model

005 MHR
010 MHR
025 MHR
050 MHR
100 MHR
250 MHR
500 MHR
1000 MHR

options

Number	Description
002	5.0 kHz Linearity Test
003	10 kHz Linearity Test
006	Metric Thread Core

Distribuidor

Brasil e América do Sul

CONTATO

Endereço

Rua Sete de Setembro, 2671 - Centro
13560-181 - São Carlos - SP - Brasil

Telefone

+55 (16) 3371-0112

Fax

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Internet

www.metrolog.net
metrolog@metrolog.net



9. Certificado do Transdutor Linear de Posição

 +55 (16) 3371-0112 metrolog@metrolog.net www.metrolog.net Metrolog Controle de Medição																												
Schaevitz Linear Variable Differential Transducers																												
Test and Inspection Data																												
Type: <u>MHR 500</u>	Serial No. <u>J 39338</u> Range $\pm$ <u>0.5"</u>																											
PLEASE READ BEFORE USING THIS TRANSDUCER This measurement device is manufactured to high precision standards. Our factory tests prior to shipment assure its performance. To obtain the optimum performance in your application, handle and install with care. Do not machine, grind or tap permanent magnet core and coil assembly. Permanent magnet core and coils are matched sets; for best performance do not interchange cores.																												
TEST CONDITIONS Primary connections Secondary Connections Secondary Midpoints Case Connections Primary Excitation Secondary Load	<table border="0"> <tr> <td><u>yellow</u></td> <td>and</td> <td><u>brown</u></td> </tr> <tr> <td>☒ grounded</td> <td></td> <td>☐ not grounded</td> </tr> <tr> <td><u>black</u></td> <td>and</td> <td><u>red</u></td> </tr> <tr> <td>☒ grounded</td> <td></td> <td>☐ not grounded</td> </tr> <tr> <td>(a) <u>green</u></td> <td></td> <td>(b) <u>blue</u></td> </tr> <tr> <td>☒ (a) tied to (b)</td> <td></td> <td>☐ (a) not tied to (b)</td> </tr> <tr> <td>☐ grounded</td> <td></td> <td>☒ not grounded</td> </tr> <tr> <td colspan="3"><u>3</u> volts at <u>2500</u> Hz</td> </tr> <tr> <td colspan="3"><u>0.5</u> Meg ohms (in parallel with _____ mfd)</td> </tr> </table>	<u>yellow</u>	and	<u>brown</u>	☒ grounded		☐ not grounded	<u>black</u>	and	<u>red</u>	☒ grounded		☐ not grounded	(a) <u>green</u>		(b) <u>blue</u>	☒ (a) tied to (b)		☐ (a) not tied to (b)	☐ grounded		☒ not grounded	<u>3</u> volts at <u>2500</u> Hz			<u>0.5</u> Meg ohms (in parallel with _____ mfd)		
<u>yellow</u>	and	<u>brown</u>																										
☒ grounded		☐ not grounded																										
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☐ grounded		☒ not grounded																										
<u>3</u> volts at <u>2500</u> Hz																												
<u>0.5</u> Meg ohms (in parallel with _____ mfd)																												
TEST DATA Displacement Output Linearity Null (Combined Quadrature and Harmonics) Output-to-Input Phase Angle Special Tests	<table border="0"> <tr> <td>$\pm$ _____</td> <td>inches</td> </tr> <tr> <td>_____</td> <td>volts</td> </tr> <tr> <td>_____</td> <td>volts/input volts</td> </tr> <tr> <td>$\pm$ _____</td> <td>% of full range output</td> </tr> <tr> <td>_____</td> <td>mv (rms)</td> </tr> <tr> <td>_____</td> <td>degrees ☐ leading (+)</td> </tr> <tr> <td></td> <td>☐ lagging (-)</td> </tr> <tr> <td colspan="2">_____</td> </tr> <tr> <td colspan="2">_____</td> </tr> </table>	$\pm$ _____	inches	_____	volts	_____	volts/input volts	$\pm$ _____	% of full range output	_____	mv (rms)	_____	degrees ☐ leading (+)		☐ lagging (-)	_____		_____										
$\pm$ _____	inches																											
_____	volts																											
_____	volts/input volts																											
$\pm$ _____	% of full range output																											
_____	mv (rms)																											
_____	degrees ☐ leading (+)																											
	☐ lagging (-)																											

INSPECTION	☒ Workmanship ☒ High Voltage Test ☒ Completeness of assembly																											
REMARKS	 																											
ACCEPTANCE	Tested by _____ Date _____ Inspected by _____ Date _____ Military Inspection _____ Date _____ (When Required)																											
																												

Schaevitz

Linear Variable Differential Transducers

WARRANTY

Schaevitz instruments are warranted during a period of one year from date of shipment to original purchaser to be free from defects in material and workmanship. The liability of Seller under this warranty is limited to replacing or repairing any instrument or component thereof which is returned by Buyer, at his expense, during such period and which has not been subjected to misuse, neglect, improper installation, repair, alteration, or accident. Seller shall have the right to final determination as to the existence and cause of a defect. In no event shall Seller be liable for collateral or consequential damages. This warranty is in lieu of any other warranty, expressed, implied or statutory; and no agreement extending or modifying it will be binding upon Seller unless in writing and signed by a duly authorized officer.

RECEIVING INSPECTION

Every Schaevitz instrument is carefully inspected and is in perfect working order at the time of shipment. Each instrument should be checked as soon as received. If the unit is damaged in any way, or fails to operate, a claim should immediately be filed with the transportation company.

All units being returned to the factory for any reason require a Return Material Authorization (RMA) number before they will be accepted. This number may be obtained by calling the Repair Department at (800) 745-8008 with the following information:

- Model Number • Quantity • Serial Numbers
- Symptoms of the problem with the unit if being returned for service
- Original P.O. number of Schaevitz sales number, if under warranty

If a Schaevitz instrument requires service, first contact the nearest Schaevitz representative. They may be able to solve the problem without returning the unit to the factory. If it is determined that factory service is required, call the Repair Department for an RMA number before return.

INQUIRIES

Address all inquiries on operation or applications to your nearest Sales Representative; or to Sales Manager, Schaevitz, 1000 Lucas Way, Hampton, Virginia

North American Operations
Schaevitz Sensors
1000 Lucas Way
Hampton, Virginia 23666
800/745-8008
FAX: 800/745-8004

European Operations
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Slough, Berks SL1 4EG
United Kingdom
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9290038-000

SCHAEVITZ
SENSORS



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metrolog@metrolog.net
www.metrolog.net

Metrolog Control de Medição



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Rua São de Setembro, 2671 - Centro
15092-101 - São Carlos - SP - Brasil
Tel: +55 (16) 3371-0112 - Fax: +55 (16) 3372-1993
web: www.metrolog.net - e-mail: metrolog@metrolog.net

Schaevitz Sensors
HAMPTON, VIRGINIA

FINAL TEST LVDT MHR 500 ASSY

02560411-000

RANGE +/- .5 Inches

S/N J39338

INDEPENDENT LINEARITY DATA

LEAST SQUARES LINE

2009-12-7

MEASURED Inches	MEASURED Volts RMS	CALC. Volts RMS	CALC. DEVIATION
-0.5000	-2.4099	-2.4098	-0.0001
-0.4000	-1.9303	-1.9280	-0.0023
-0.3000	-1.4457	-1.4462	+0.0005
-0.2000	-0.9635	-0.9644	+0.0009
-0.1000	-0.4825	-0.4826	+0.0000
+0.1000	+0.4825	+0.4810	+0.0015
+0.2000	+0.9639	+0.9628	+0.0011
+0.3000	+1.4450	+1.4446	+0.0004
+0.4000	+1.9280	+1.9264	+0.0016
+0.5000	+2.4046	+2.4082	-0.0036

Linearity = 0.08%

Sensitivity = 1.6061 mv/Volts RMS/.001 Inches

NULL (actual) = 0.0027 Volts RMS

Tested by Chaogang Bai

Inspected by 

10. Catálogo da Válvula de Bloqueio da MIPEL



Linha 9103

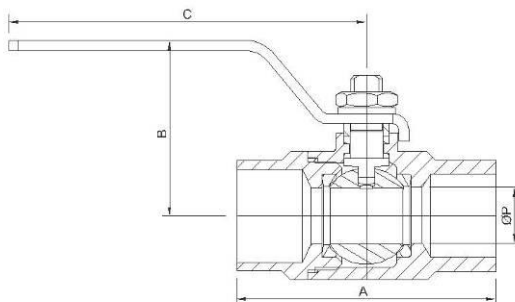
Válvulas de Esfera Monobloco em Latão Niquelado PN 30 435 psi (WOG)

Line 9103

Threaded Split Body Ball Valve in
Nickel-Plated Brass PN 30 435 psi (WOG)

Línea 9103

Válvulas Esféricas Monobloque en
Latón Niquelado PN30 435 psi (WOG)



Bitola Size Medida		Dimensões mm/(polegadas) Dimensions mm/(inches) • Dimensiones mm/(pulgada)			
DN	NPS	A	B	C	OP
6	1/4"	43/(1,69)	42/(1,65)	97,5/(3,83)	10/(0,39)
10	3/8"	43/(1,69)	42/(1,65)	97,5/(3,83)	10/(0,39)
15	1/2"	47/(1,85)	46,5/(1,83)	97,5/(3,83)	14/(0,55)
20	3/4"	54,5/(2,14)	51/(2)	97,5/(3,83)	18,5/(0,72)
25	1"	64/(2,51)	51,5/(2,02)	110/(4,33)	23/(0,90)
32	1.1/4"	72,5/(2,85)	66,5/(2,61)	139/(5,47)	29/(1,14)
40	1.1/2"	81/(3,18)	71/(2,79)	139/(5,47)	36/(1,41)
50	2"	95,5/(3,75)	80/(3,14)	165/(6,49)	46/(1,77)
65	2.1/2"	125/(4,92)	110/(4,33)	218/(8,58)	62/(2,44)
80	3"	148/(5,82)	118/(4,64)	218/(8,58)	75/(2,95)
100	4"	173/(6,81)	130/(5,11)	218/(8,58)	97/(3,81)

-PMT: PN 30 435 psi (WOG)

-MWT: PN 30 435 psi (WOG)

-PMT: PN 30 435 psi (WOG)

-Temperatura de Trabalho: -10° a 90°C

-Working Temperature: -10° a 90°C

-Temperatura de Trabajo: -10° a 90°C

Como Especificar - 9103 How to Specify - 9103 • Como Determinar - 9103

Tipo de Válvula/Classe de Pressão Type of Valve/Pressure Rating Modelo/Clase de Presión	Material do Corpo Body Material Material Cuerpo	Esfera + Haste Ball + Stem Esfera + Vástago	Passagem Port Pasaje	Vedações Seals Sellos	Tipo de Acoplamento Ends Extremos	Diâmetro Size Medida
9103 Válvulas de Esfera Monobloco em Latão Niquelado PN 30 435 psi 9103 Threaded Split Body Ball Valve in Nickel-Plated Brass PN 30 435 psi 9103 Válvulas Esféricas Monobloque en Latón Niquelado PN 30 435 psi	1 - Latão Niquelado 1 - Nickel-Plated Brass 1 - Latón Niquelado	1 - Latão Niquelado 1 - Nickel-Plated Brass 1 - Latón Niquelado	2 - PP 2 - PB 2 - PT	0 - PTFE	1 - BSP	01 - 1/4" 03 - 3/8" 05 - 1/2" 08 - 3/4" 10 - 1" 13 - 1.1/4" 15 - 1.1/2" 20 - 2" 25 - 2.1/2" 30 - 3" 40 - 4"

Exemplo: 9.10.31.12.01.10 - Válvula de Esfera Monobloco em Latão Niquelado PN 30 435 psi, Linha 9103, Corpo em Latão Niquelado, Esfera e Haste em Latão Niquelado, PP, Vedação em PTFE, Acoplamento NPT, 1"

Example: 9.10.31.12.01.10 - Threaded Split Body Ball Valve in Nickel-Plated Brass PN 30 435 psi, Line 9103, Body in Nickel-Plated Brass, Ball and Stem in Nickel-Plated Brass, PP, Seals in PTFE, Ends NPT, 1"

Ejemplo: 9.10.31.12.01.10 - Válvulas Esféricas Monobloque en Latón Niquelado PN 30 435 psi, Línea 9103, Cuerpo en Latón Niquelado, Esfera y Vástago en Latón Niquelado, PP, Sellos en PTFE, Acoplado NPT, 1"