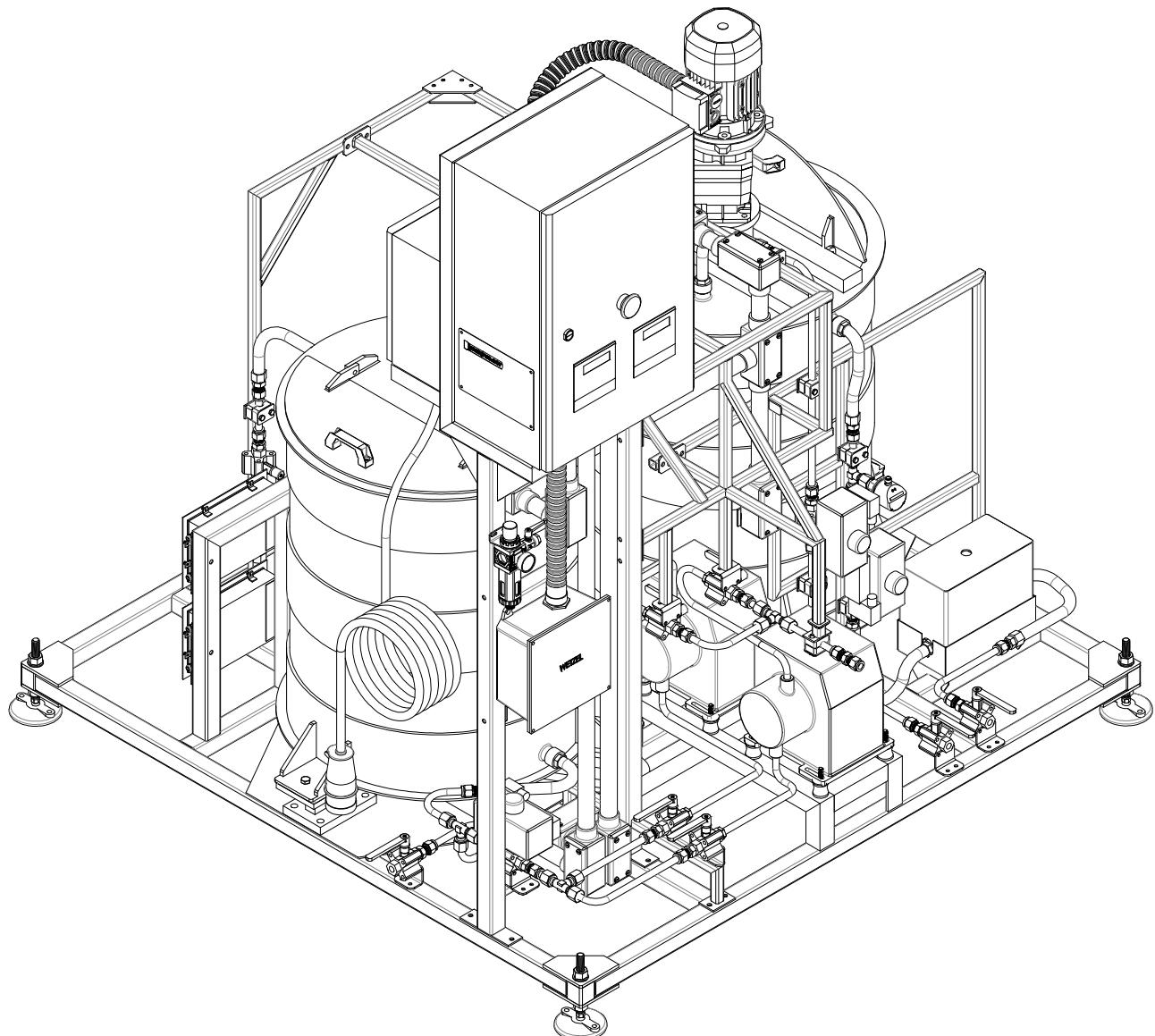




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# Sistema p/ preparação e dosagem de NaOH

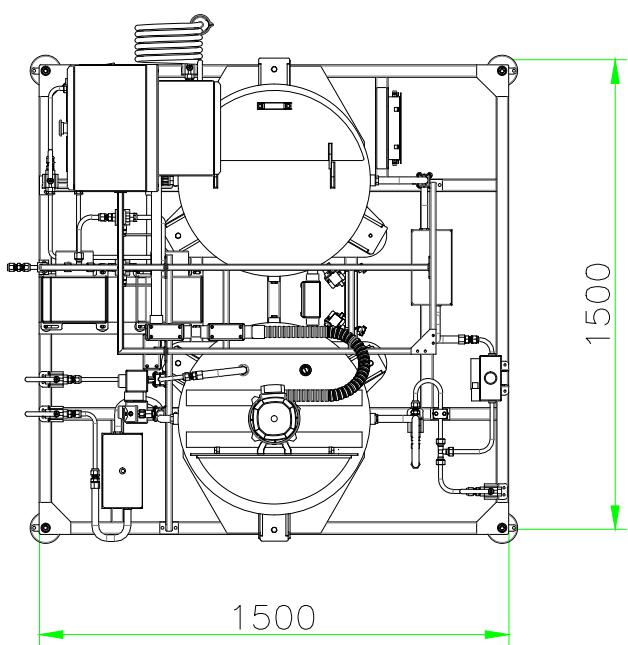
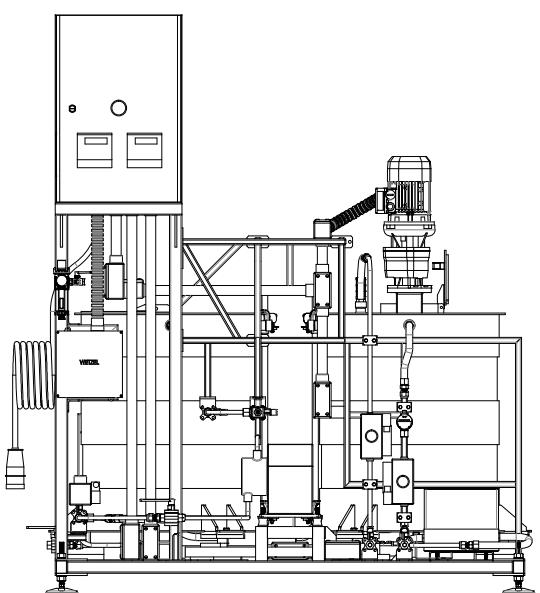
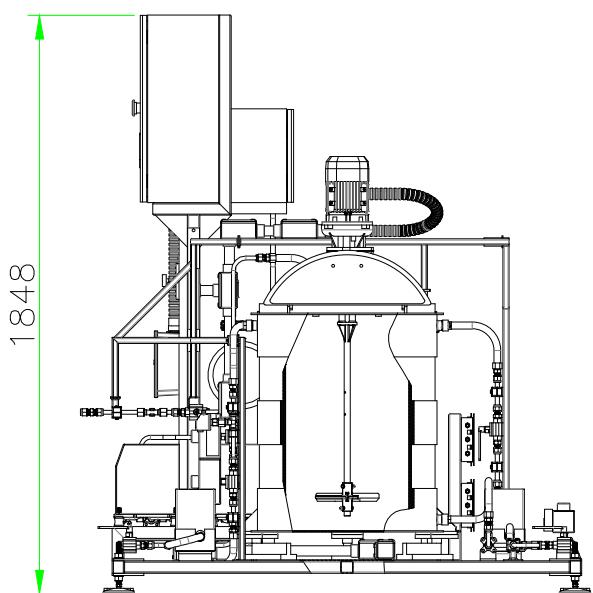
2	Modificações no SKID e Databook	Alexander.B	21/05/14				
1	Proposta atualizada e Modificações no SKID	Alexander.B	19/05/14				
0	Emissão inicial(proposta)	Alexander.B	16/01/14	Erich.G	16/01/14	GRACE	0059
REV	ALTERAÇÕES FEITAS:	EXECUTADO	DATA	APROVADO	DATA	CLIENTE	Projeto



# Bombas e Projetos Industriais

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Datasheet-Toledo	25(38 paginas)
Datasheet-Esquema elétrico das células de carga	26(06 paginas)
Datasheet-Bombas pneumáticas Gracco	27(26 paginas)

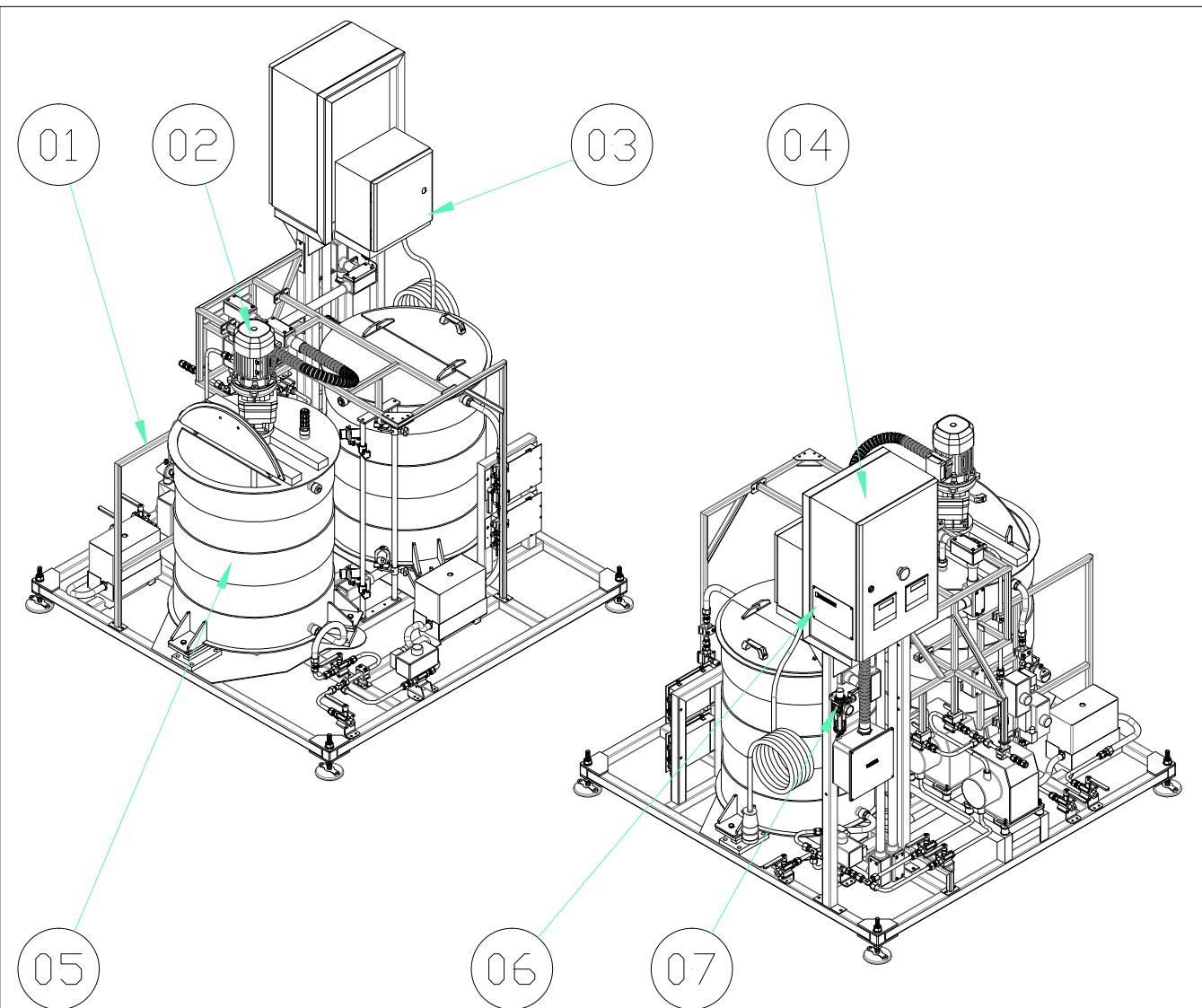


Item	Qtd	Denominação, Material, Dimensão, etc										Código/ref./fabricante
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância												Desenhista/Projetista Alexander.B
Comprimento	acima		6	30	120	315	1000	2000	4000			Conferido por :
	até	6	30	120	315	1000	2000	4000	8000			Aprovado por :
Tolerância	acima	$\pm 0,1$	$\pm 0,2$	$\pm 0,3$	$\pm 0,5$	$\pm 0,8$	$\pm 1,2$	$\pm 2$	$\pm 3$			Escala S/E Formato A3
	até											
	Tolerância											
Cliente/Número de projeto: <b>GRACE/0059</b>												Data 28/03/14
Denominação : <b>SKID GRACE 0059</b>												
Código de fornecimento ServProject: <b>SK   1000021-A</b>												Revisão 06 Folhas 1/1
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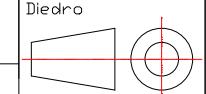


07	01	FILTRÔ REG.SYNTESI 1/4- 5610F100	-
06	01	Plaqueta do SKID Grace 0059	PQ - 1000003
05	01	Conjunto hidráulico	SK 1000047
04	01	Sistema de eletrodutos	SK 1000043
03	01	Conjunto de alimentação do SKID	SK 1000051
02	01	Conjunto misturador	SK 1000042
01	01	Conjunto mecânico estrutural	SK 1000044
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante

Variação admissível conf.DIN 7168 p/dimensões s/  
indicação de Tolerância

Comprimento	acima		6	30	120	315	1000	2000	4000	A r g u l o	acima		10°	50°	Diedro Alexander.B
	até	6	30	120	315	1000	2000	4000	8000		até	10°	50°	120°	
	Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		Tolerância	±1°	±30'	±20'	

Desenhista/Projetista  
Alexander.B



Conferido por :

Escala

S/E A3

Aprovado por :

Data

28/03/14



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GRACE/0059

Denominação :

SKID GRACE 0059

Código de fornecimento ServProject:

SK | 1000021-B

Revisão

06 1/1

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120



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## Projeto: Sistema p/ preparação e dosagem de NaOH

Cliente: GRACE Ano: 2014

Nº de série: SK 47123 0001 Fluido: NaOH

Vazão: 30 l/h Pressão max: 7 Kg/cm<sup>2</sup>

Temp.Max: 60°C Materiais: PP/AISI 304

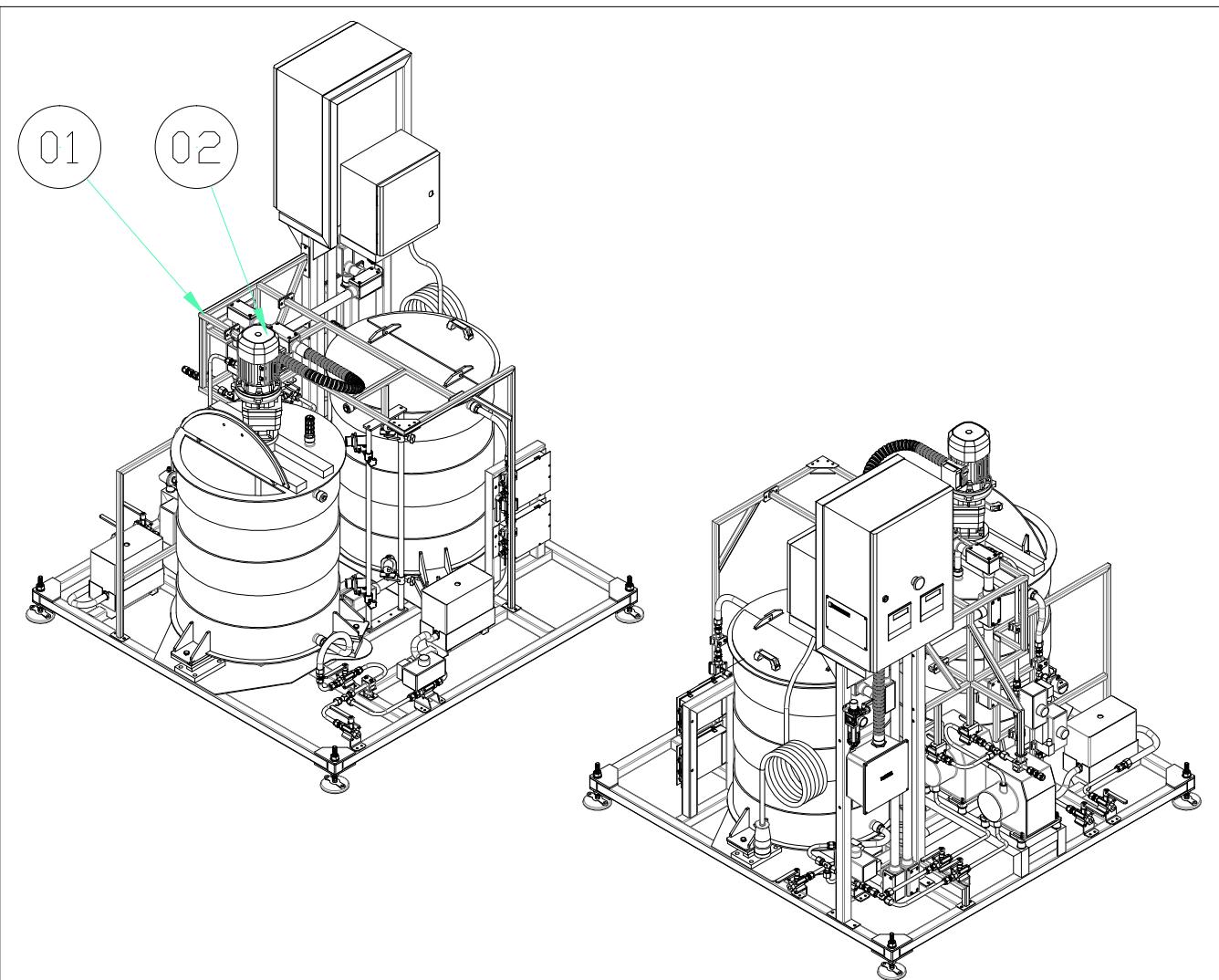
1	01	#0,6 x 140 x 200mm em Aço Inox AISI 304	ServProject												
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante												
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância			Desenhista/Projetista Alexander.B												
Comprimento	acima	6	30	120	315	1000	2000	4000	até	acima		10°	50°	Conferido por :	
	até	6	30	120	315	1000	2000	4000	8000	até	10°	50°	120°	Aprovado por :	
Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		Tolerância	±1°	±30'	±20'	Escala S/E Formato A4	
												Cliente/Número de projeto: GRACE/0059		Data 28/04/14	
												Denominação : Plaqueta do SKID Grace 0059			
												Código de fornecimento ServProject:	Revisão	Folhas	
												PQ   1000003	02	1/1	
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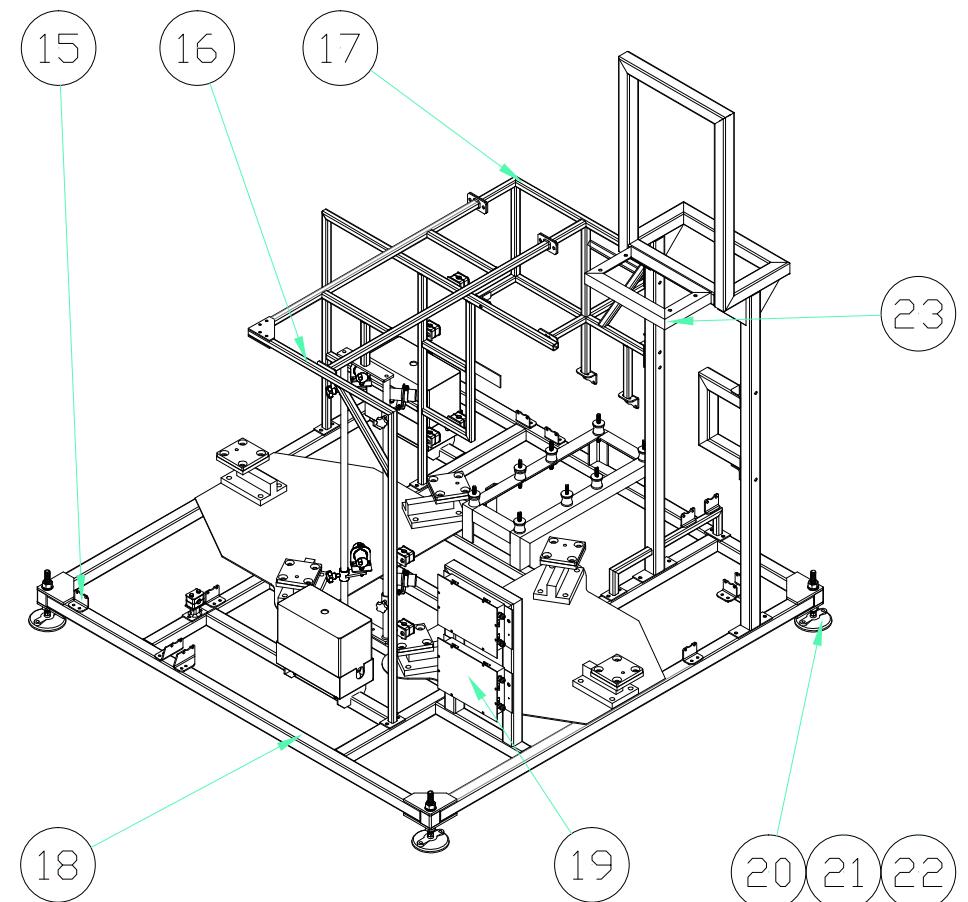
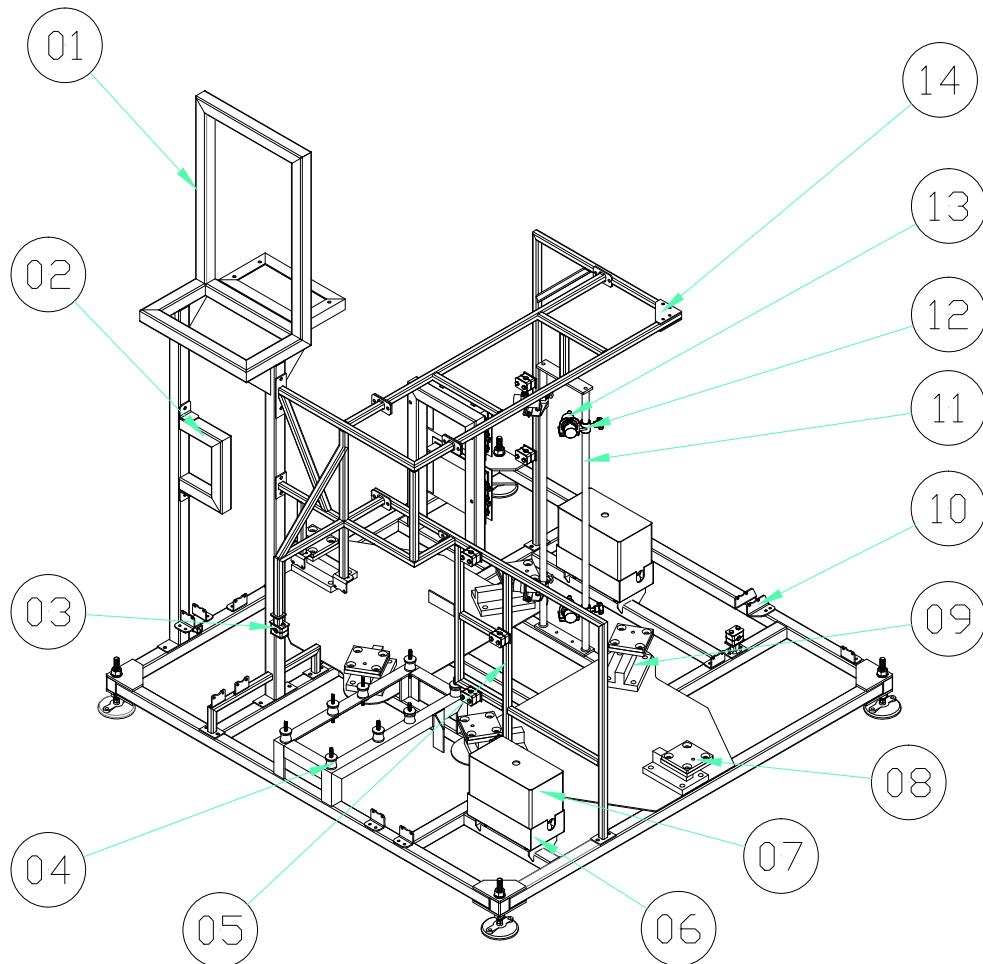


02	01	Conjunto misturador do tanque										SK 1000042				
01	01	Conjunto mecânico estrutural										SK 1000044				
Item	Qtd	Denominação, Material, Dimensão, etc										Código/ref./fabricante				
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância														Desenhista/Projetista Alexander.B	Diedro	
Comprimento	acima		6	30	120	315	1000	2000	4000	Argul	acima		10°	50°	Conferido por :	
	até	6	30	120	315	1000	2000	4000	8000		até	10°	50°	120°	Aprovado por :	
Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3			Tolerância	±1°	±30'	±20'	Escala S/E	Formato A3
Cliente/Número de projeto: <b>GRACE/0059</b>														Data <b>28/03/14</b>		
Denominação : <b>SKID GRACE 0059</b>																
Código de fornecimento ServProject: <b>SK   1000021-C</b>														Revisão	Folhas	
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Item	Qtd	Denominação, Material, Dimensão, etc										Código/ref./fabricante	
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância													
Comprimento		acima	6	30	120	315	1000	2000	4000	c	acima	10°	50°
		até	6	30	120	315	1000	2000	4000	até	10°	50°	120°
Tolerância		±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3	Tolerância	±1°	±30'	±20'
Conferido por : Alexander.B													
Aprovado por :													
Escala S/E Formato A3													
Cliente/Número de projeto: GRACE/0059													
Data 07/05/14													
Denominação : Conjunto estrutural													
Código de fornecimento ServProject: SK   1000044													
Revisão   Folhas 00   1/2													
Este Desenho Pertence a ServProject Imp. Exp. e Mont. Equip. Ltda, É Vedada a Reprodução Parcial ou Total, Bem Como a exibição ou Entrega a Terceiros, Sem a Previa Autorização													



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23	01	Suporte para painel do transformador	SK 1000052
22	08	Porca M16 DIN 934 /Aço INOX AISI 304	-
21	08	Arruela Lisa M16 DIN 125/Aço INOX AISI 304	-
20	04	Pé articulado Ø100x150mm	-
19	02	Caixa de junção das células de carga	Toledo
18	01	Estrutura inferior	-
17	01	Estrutura superior módulo 02	-
16	01	Estrutura superior módulo 03	-
15	07	Suporte para registro de 1/2"	-
14	02	Emenda dos módulos 03 e 04	-
13	04	Sensor capacitivo 24VCC	-
12	04	Conjunto suporte do sensor	SK 1000021
11	01	Haste para suporte do sensor	SK 1000020
10	1 conj.	Suporte da valvula atuada V/A 3	SK 1000045
09	06	Célula de carga TCL-LG-220kg	Toledo
08	06	Chapa de fixação do tanque	SK 1000039
07	02	Proteção das bombas	SK 1000036-2
06	02	Bandeja da bomba	SK 1000034
05	01	Estrutura superior módulo 02	SK 1000032
04	16	Coxim Ø30x30mm em NBR( borracha nitrílica)	-
03	07	Braçadeira Standard de 1/2" em PP	-
02	01	Suporte do painel pneumático	SK 1000028-P09
01	01	Suporte do Painel	SK 1000029
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante

Variação admissível conf.DIN 7168 p/dimensões s/  
indicação de Tolerância

Comprimento	acima		6	30	120	315	1000	2000	4000	Largura	acima		10°	50°	Conferido por :	Desenhista/Projetista Alexander.B	Diedro
	até	6	30	120	315	1000	2000	4000	8000		até	10°	50°	120°			
	Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		Tolerância	±1°	±30'	±20'			



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Cliente/Número de projeto:

GRACE/0059

Data  
28/03/14

Denominação :

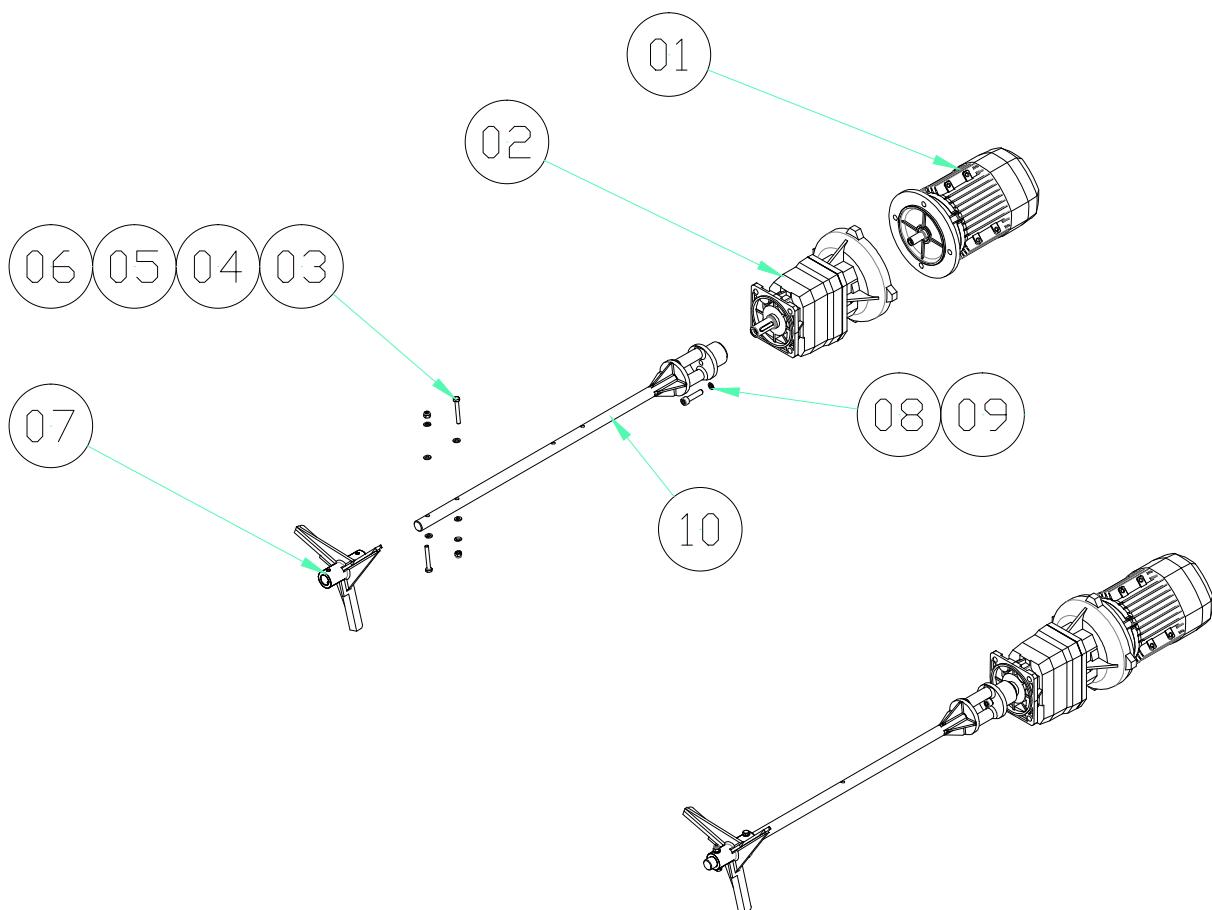
Conjunto mecânico estrutural

Código de fornecimento ServProject:

SK | 1000044

Revisão | Folhas  
00 | 2/2

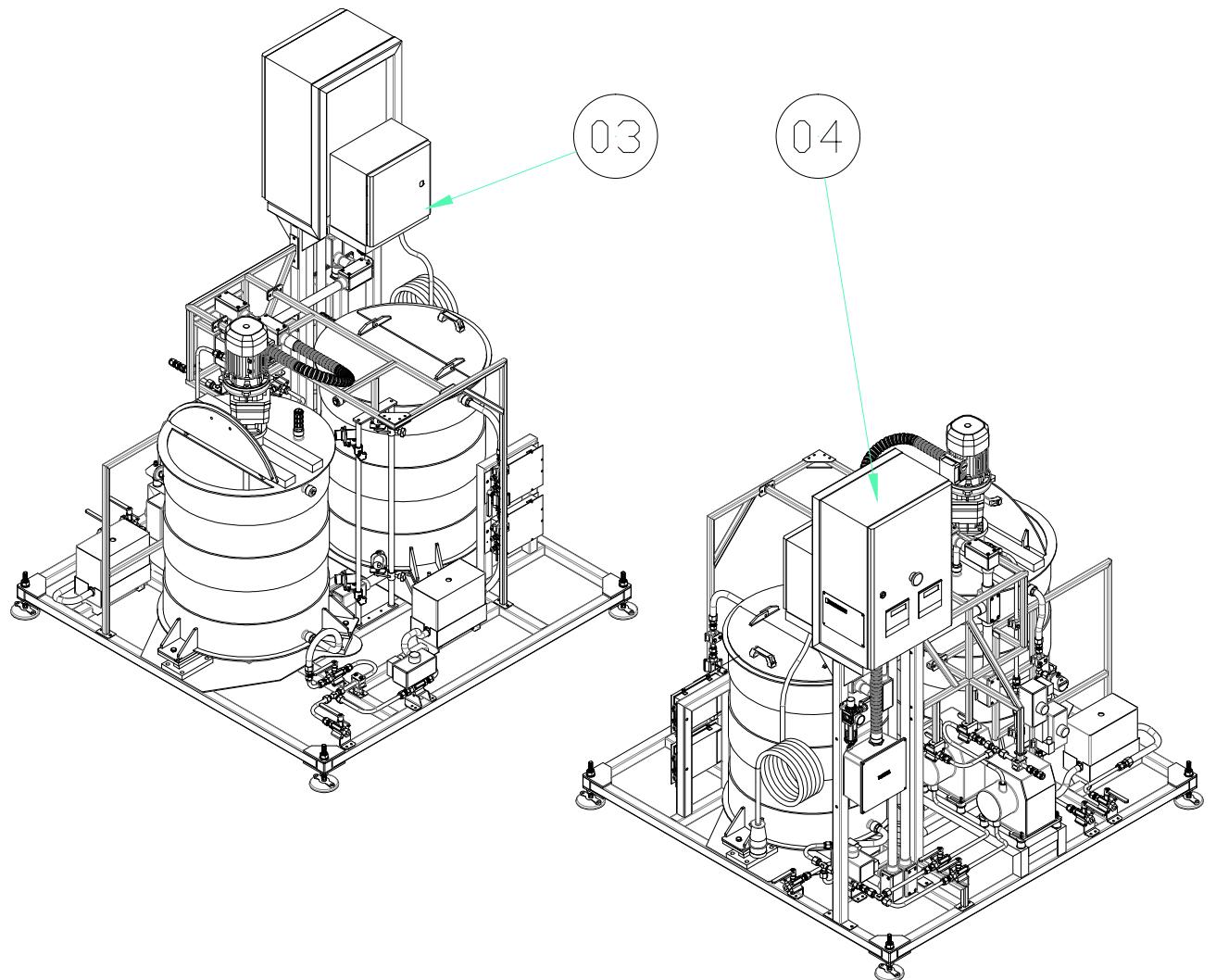
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10	01	Conj.Eixo árvore do misturador	SK 1000037
09	01	Arruela de trava DIN 127 M8 /AISI 304	—
08	01	Parafuso cab.Cilindrica c/ sext. interno DIN 912 M8x25mm/AISI 304	—
07	02	Helice do misturador	SK 1000035
06	04	Porca de torque auto prevalente DIN 7040 M6/AISI 304	—
05	08	Arruela Lisa DIN 125 M6/AISI 304	—
04	04	Arruela de trava DIN 127 M6 /AISI 304	—
03	04	Parafuso Cab.Sextavada Din 933 M6x45mm/AISI 304	—
02	01	Redutor Bonfigliori 12N/m 290 rpm I=6:1	Bonfigliori
01	01	Motor Bonfigliori 0,5 CV 1750 Rpm 220/380 VAC 60Hz	Bonfigliori
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante

Variação admissível conf.DIN 7168 p/dimensões s/  
indicação de Tolerância

Comprimento	acima		6	30	120	315	1000	2000	4000	5000	6000	7000	8000	9000	10000	11000	12000	13000	14000	15000	16000	17000	18000	19000	20000	21000	22000	23000	24000	25000	26000	27000	28000	29000	30000	31000	32000	33000	34000	35000	36000	37000	38000	39000	40000	41000	42000	43000	44000	45000	46000	47000	48000	49000	50000	51000	52000	53000	54000	55000	56000	57000	58000	59000	60000	61000	62000	63000	64000	65000	66000	67000	68000	69000	70000	71000	72000	73000	74000	75000	76000	77000	78000	79000	80000	81000	82000	83000	84000	85000	86000	87000	88000	89000	90000	91000	92000	93000	94000	95000	96000	97000	98000	99000	100000	101000	102000	103000	104000	105000	106000	107000	108000	109000	110000	111000	112000	113000	114000	115000	116000	117000	118000	119000	120000	121000	122000	123000	124000	125000	126000	127000	128000	129000	130000	131000	132000	133000	134000	135000	136000	137000	138000	139000	140000	141000	142000	143000	144000	145000	146000	147000	148000	149000	150000	151000	152000	153000	154000	155000	156000	157000	158000	159000	160000	161000	162000	163000	164000	165000	166000	167000	168000	169000	170000	171000	172000	173000	174000	175000	176000	177000	178000	179000	180000	181000	182000	183000	184000	185000	186000	187000	188000	189000	190000	191000	192000	193000	194000	195000	196000	197000	198000	199000	200000	201000	202000	203000	204000	205000	206000	207000	208000	209000	210000	211000	212000	213000	214000	215000	216000	217000	218000	219000	220000	221000	222000	223000	224000	225000	226000	227000	228000	229000	230000	231000	232000	233000	234000	235000	236000	237000	238000	239000	240000	241000	242000	243000	244000	245000	246000	247000	248000	249000	250000	251000	252000	253000	254000	255000	256000	257000	258000	259000	260000	261000	262000	263000	264000	265000	266000	267000	268000	269000	270000	271000	272000	273000	274000	275000	276000	277000	278000	279000	280000	281000	282000	283000	284000	285000	286000	287000	288000	289000	290000	291000	292000	293000	294000	295000	296000	297000	298000	299000	300000	301000	302000	303000	304000	305000	306000	307000	308000	309000	310000	311000	312000	313000	314000	315000	316000	317000	318000	319000	320000	321000	322000	323000	324000	325000	326000	327000	328000	329000	330000	331000	332000	333000	334000	335000	336000	337000	338000	339000	340000	341000	342000	343000	344000	345000	346000	347000	348000	349000	350000	351000	352000	353000	354000	355000	356000	357000	358000	359000	360000	361000	362000	363000	364000	365000	366000	367000	368000	369000	370000	371000	372000	373000	374000	375000	376000	377000	378000	379000	380000	381000	382000	383000	384000	385000	386000	387000	388000	389000	390000	391000	392000	393000	394000	395000	396000	397000	398000	399000	400000	401000	402000	403000	404000	405000	406000	407000	408000	409000	410000	411000	412000	413000	414000	415000	416000	417000	418000	419000	420000	421000	422000	423000	424000	425000	426000	427000	428000	429000	430000	431000	432000	433000	434000	435000	436000	437000	438000	439000	440000	441000	442000	443000	444000	445000	446000	447000	448000	449000	450000	451000	452000	453000	454000	455000	456000	457000	458000	459000	460000	461000	462000	463000	464000	465000	466000	467000	468000	469000	470000	471000	472000	473000	474000	475000	476000	477000	478000	479000	480000	481000	482000	483000	484000	485000	486000	487000	488000	489000	490000	491000	492000	493000	494000	495000	496000	497000	498000	499000	500000	501000	502000	503000	504000	505000	506000	507000	508000	509000	510000	511000	512000	513000	514000	515000	516000	517000	518000	519000	520000	521000	522000	523000	524000	525000	526000	527000	528000	529000	530000	531000	532000	533000	534000	535000	536000	537000	538000	539000	540000	541000	542000	543000	544000	545000	546000	547000	548000	549000	550000	551000	552000	553000	554000	555000	556000	557000	558000	559000	560000	561000	562000	563000	564000	565000	566000	567000	568000	569000	570000	571000	572000	573000	574000	575000	576000	577000	578000	579000	580000	581000	582000	583000	584000	585000	586000	587000	588000	589000	590000	591000	592000	593000	594000	595000	596000	597000	598000	599000	600000	601000	602000	603000	604000	605000	606000	607000	608000	609000	610000	611000	612000	613000	614000	615000	616000	617000	618000	619000	620000	621000	622000	623000	624000	625000	626000	627000	628000	629000	630000	631000	632000	633000	634000	635000	636000	637000	638000	639000	640000	641000	642000	643000	644000	645000	646000	647000	648000	649000	650000	651000	652000	653000	654000	655000	656000	657000	658000	659000	660000	661000	662000	663000	664000	665000	666000	667000	668000	669000	670000	671000	672000	673000	674000	675000	676000	677000	678000	679000	680000	681000	682000	683000	684000	685000	686000	687000	688000	689000	690000	691000	692000	693000	694000	695000	696000	697000	698000	699000	700000	701000	702000	703000	704000	705000	706000	707000	708000	709000	710000	711000	712000	713000	714000	715000	716000	717000	718000	719000	720000	721000	722000	723000	724000	725000	726000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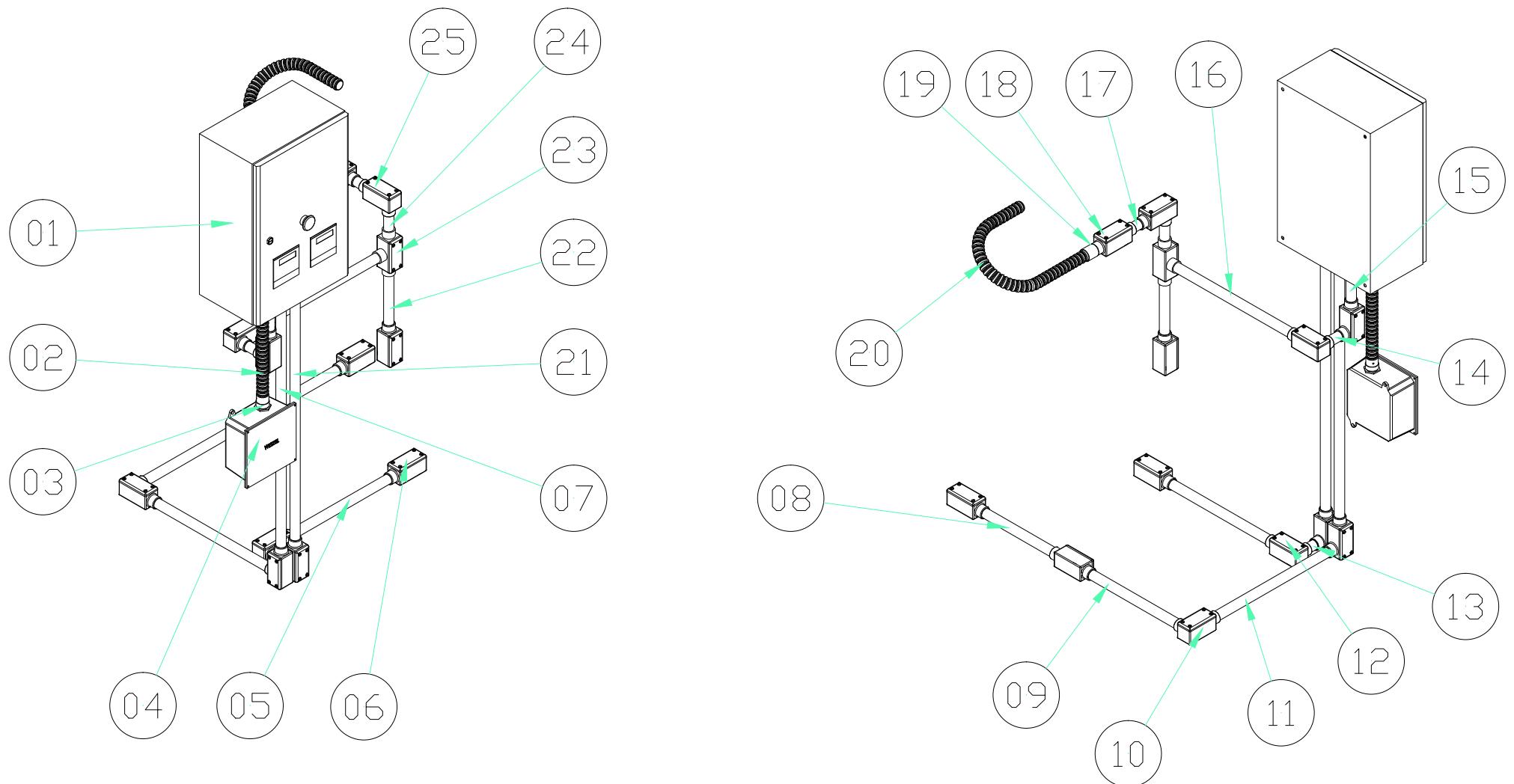


04	01	Sistema de eletroslodos										SK 1000043			
03	01	Conjunto de alimentação do SKID										SK 1000051			
Item	Qtd	Denominação, Material, Dimensão, etc										Código/ref./fabricante			
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância															
Comprimento	acima		6	30	120	315	1000	2000	4000	5000	6000	7000	8000	9000	10000
	até	6	30	120	315	1000	2000	4000	8000						
Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3							
Tolerância										acima	10°	50°	Diedro	Alexander.B	
até										até	10°	50°	120°	Conferido por :	
Tolerância										Tolerância	±1°	±30'	±20'	Aprovado por :	
														Escala	Formato
														S/E	A3
										Cliente/Número de projeto: <b>GRACE/0059</b>			Data <b>28/03/14</b>		
										Denominação : <b>SKID GRACE 0059</b>					
										Código de fornecimento ServProject: <b>SK   1000021-D</b>			Revisão	<b>06</b> <b>1/1</b>	
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Item	Qtd	Denominação, Material, Dimensão, etc										Código/ref./fabricante	
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância													
Comprimento		acima	6	30	120	315	1000	2000	4000	c	acima	10°	50°
		até	6	30	120	315	1000	2000	4000	Angulo	até	10°	50°
Tolerância		±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		Conferido por :		
										Aprovado por :			
											Escala	Formato	
											S/E	A3	
											Cliente/Número de projeto:		
											GRACE/0059		
											Denominação :		
											Sistema de eletrodutos		
											Código de fornecimento ServProject:		
											SK   1000043	Revisão   Folhas	
											06   1/2		
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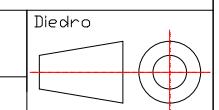
25	2	Dialet Tipo "LB" em Al fundido de 1"	-
24	1	Eletroduto galvanizado de 1"x107,5mm	-
23	1	Dialet Tipo "T" em Al fundido de 1"	-
22	1	Eletroduto galvanizado de 1"x235,5mm	-
21	1	Eletroduto galvanizado de 1"x1010mm	-
20	0,6m	Seal tube 3/4"	-
19	1	Redução sem rosca de 1" x 3/4" em Al fundido	-
18	2	Dialet Tipo "C" em Al Fundido de 1"	-
17	1	Eletroduto galvanizado de 1"x79mm	-
16	1	Eletroduto galvanizado de 1"x545mm	-
15	1	Eletroduto galvanizado de 1"x177mm	-
14	1	Eletroduto galvanizado de 1"x90mm	-
13	1	Eletroduto galvanizado de 1"x77,5mm	-
12	2	Dialet Tipo "LR" em Al fundido de 1"	-
11	1	Eletroduto galvanizado de 1"x530mm	-
10	3	Dialet Tipo "LL" em Al fundido de 1"	-
09	1	Eletroduto galvanizado de 1"x420mm	-
08	1	Eletroduto galvanizado de 1"x345mm	-
07	1	Eletroduto galvanizado de 1"x988mm	-
06	3	Dialet Tipo "E" em Al fundido de 1"	-
05	1	Eletroduto galvanizado de 1"x470mm	-
04	1	Painel pneumático em Al e Si fundido 200x200x100mm	-
03	5	Conexão reta em Al com Si fundido 1"	-
02	0,5m	Seal tube 1"	-
01	1	Painel elétrico 600x400x250mm	-
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante

Variação admissível conf.DIN 7168 p/dimensões s/  
indicação de Tolerância

Comprimento	acima		6	30	120	315	1000	2000	4000	A c o r t a g e s A c o r t a g e s A c o r t a g e s	acima		10°	50°
	até	6	30	120	315	1000	2000	4000	8000		até	10°	50°	120°
Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		Tolerância	±1°	±30°	±20°	

Desenhista/Projetista  
Alexander.B

Conferido por :



Aprovado por :

Escala S/E Formato A3

Cliente/Número de projeto:

GRACE/0059

Data 28/03/14

Denominação :

Lista do sistema de eletrodutos

Código de fornecimento ServProject:

SK | 1000042

Revisão

06 | 2/2

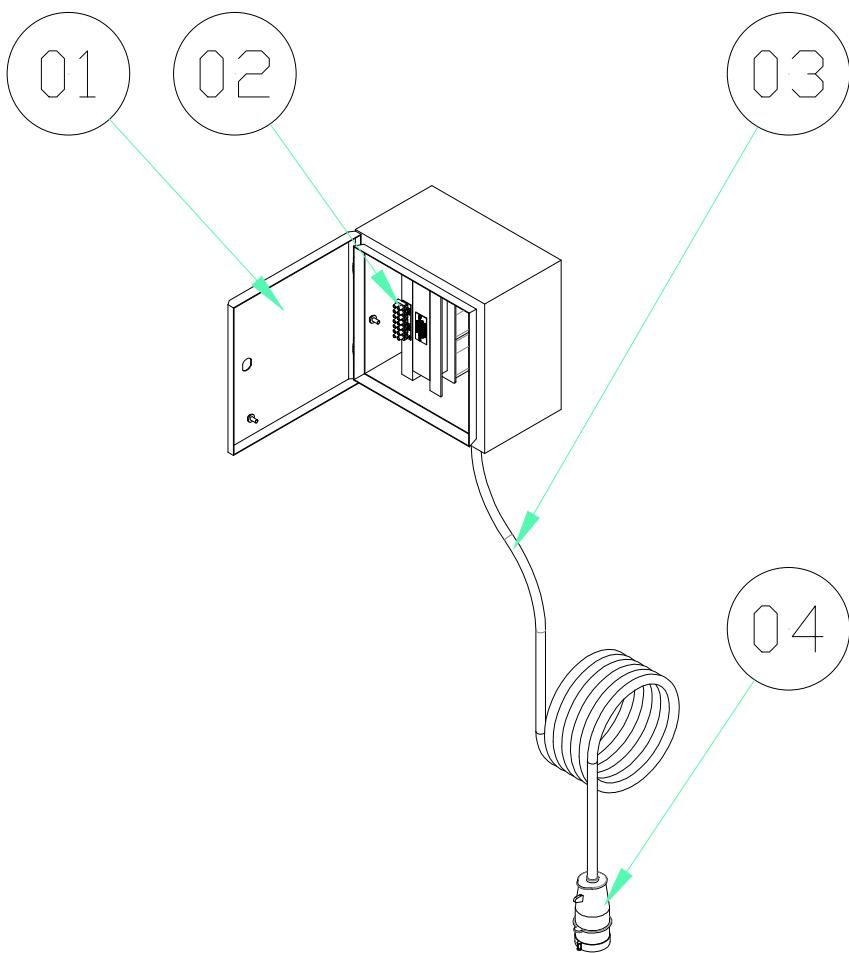


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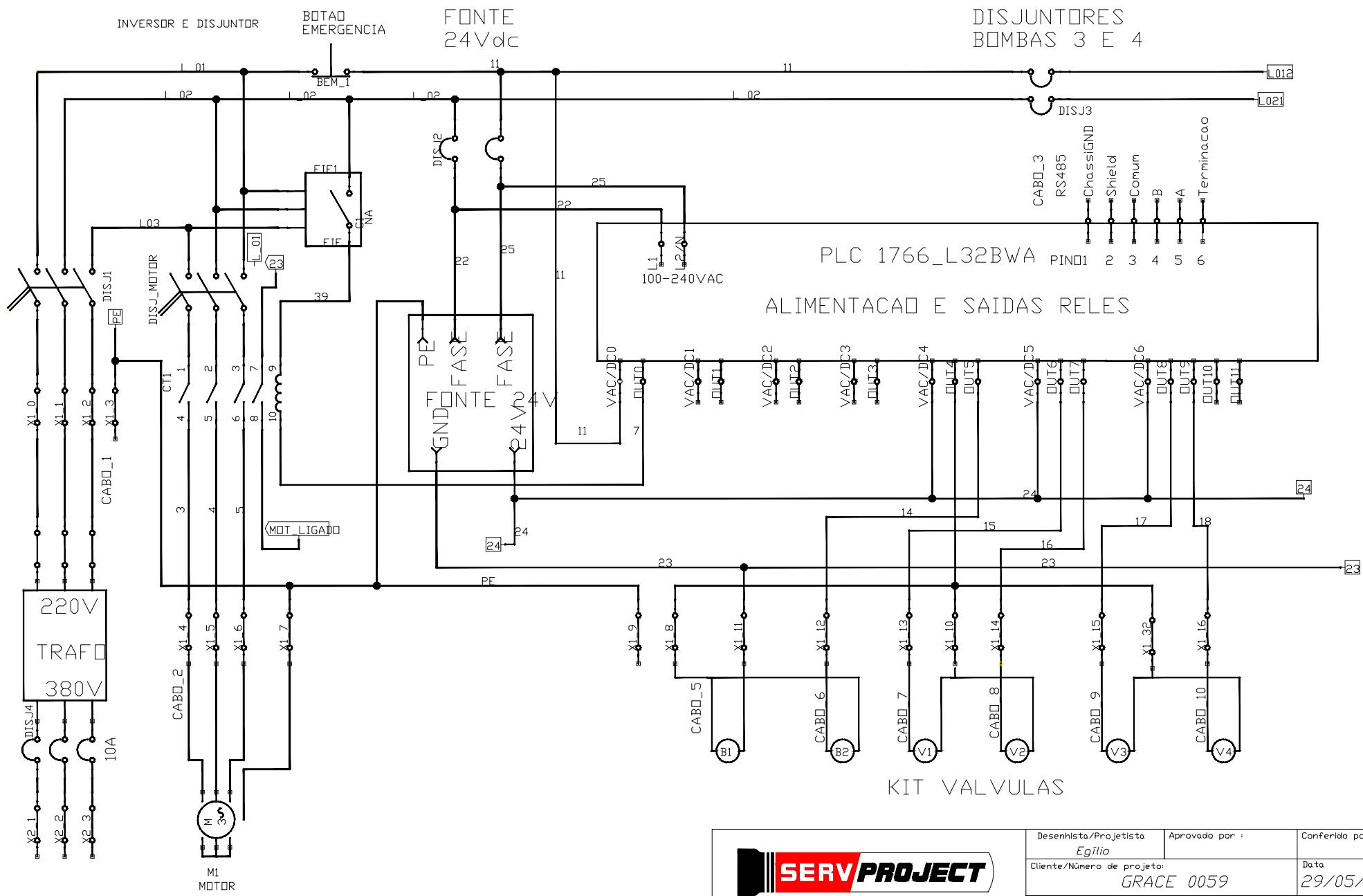
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04	1	Tomada 380VAC trifásica 32A										-		
03	5m	Cabo de alimentação do SKID										-		
02	1	Transformador 380VAC-220VAC										-		
01	1	Painel elétrico 300x300x200mm										-		
Item	Qtd	Denominação, Material, Dimensão, etc										Código/ref./fabricante		
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância												Desenhista/Projetista Alexander.B	Diedro 	
Comprimento	acima		6	30	120	315	1000	2000	4000	A	acima		10°	50°
	até	6	30	120	315	1000	2000	4000	8000	arg	até	10°	50°	120°
Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		A	Tolerância	±1°	±30'	±20'
Conferido por :												Aprovado por :	Escala S/E	Formato A3
Cliente/Número de projeto: GRACE/0059												Data 28/03/14		
Denominação : Conjunto de alimentação do SKID														
Código de fornecimento ServProject: SK   1000051												Revisão 06	Folhas 1/1	
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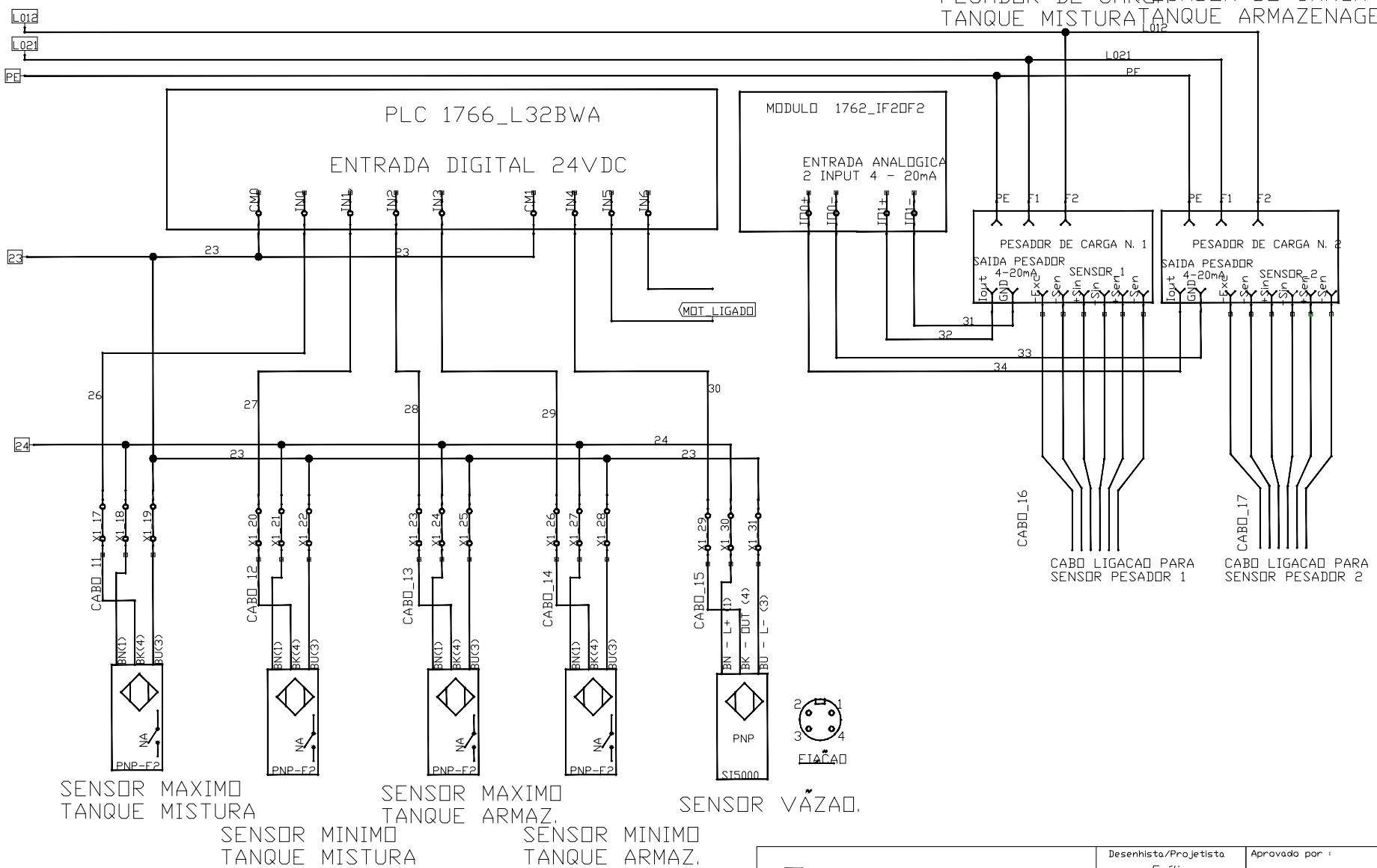
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www.servproject.com.br	Código de fornecimento ServProject	Revisão 02	Folhas 1/4
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PESADOR DE CARGA  
PESADOR DE CARGA  
TANQUE MISTURA TANQUE ARMAZENAGEM



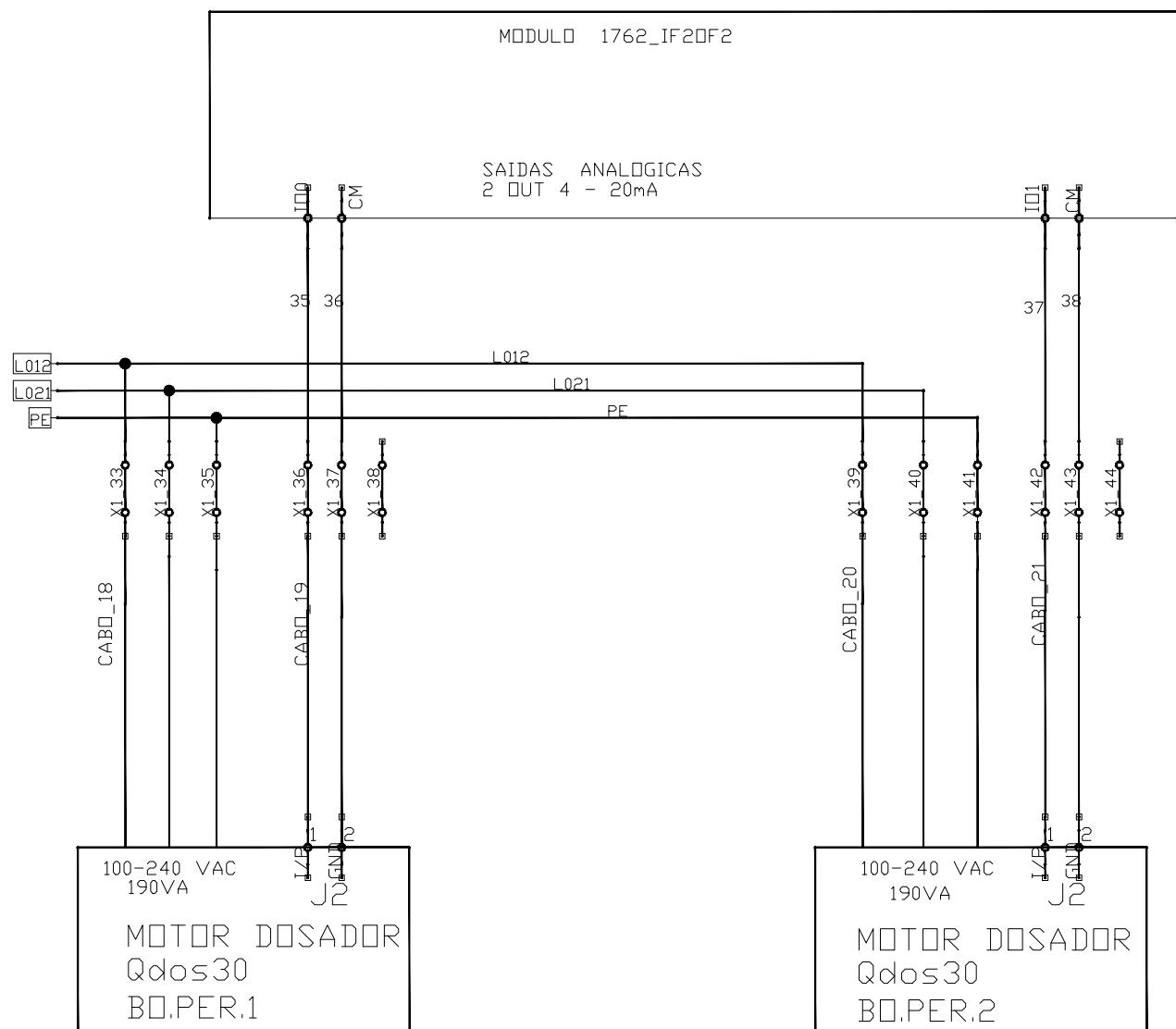
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Denominação : PAINEL ELETTRICO 822.10	Formato A3	
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Denominação : PAINEL ELETTRICO 822.10	Formato A4	
Código de fornecimento ServProject EE   1000003	Revisão 02	Folhas 3/4

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**LISTA DE CABOS**

CB 1 - CABO PP 4X2,5MM<sup>2</sup> - CABO DE FORCA DE ENTRADA  
 CB 2 - CABO PP 4X1,5MM<sup>2</sup> - CABO DE FORCA DE LIGACAO DO MOTOR  
 CB 3 - CABO PP 2X0,75MM<sup>2</sup> - CABO COM SHILD TIPO TRANCA - COMUNICACAO SERIAL  
 CB 4 - CABO PP 9X0,5MM<sup>2</sup> - CABO DE LIGACAO DO SQUID DE VALVULAS  
 CB 5, 6, 7, 8, 9, 10 - CABO PP 2X0,5MM<sup>2</sup> - CABO DE LIGACAO DAS VALVULAS  
 CB 11, 12, 13, 14, 15 - CABO PP 3X0,5MM<sup>2</sup> - CABO DE LIGACAO DOS SENORES  
 CB 16, 17 - CABO PP 3X0,5MM<sup>2</sup> COM SHILD TIPO TRANCA - CABO DE SAIDA DO PESADOR DE CARGA  
 CB18 - CABO PP 3X1MM<sup>2</sup> - CABO DE FORCA DO MOTOR DO DOSADOR BO.PER.1  
 CB19 - CABO MANGA 3X0,5MM<sup>2</sup> COM SHILD TIPO TRANCA- LIGACAO BO.PER.1 COM CLP PAINEL  
 CB20 - CABO PP 3X1MM<sup>2</sup> - CABO DE FORCA DO MOTOR DO DOSADOR BO.PER.2  
 CB21 - CABO MANGA 3X0,5MM<sup>2</sup> COM SHILD TIPO TRANCA- LIGACAO BO.PER.2 COM CLP DO PAINEL

**MODULO PLC 1766 L32BWA**  
SAIDAS

DUT_0	LIGA MOTOR 220VAC
DUT_1	EXTR_1
DUT_2	EXTR_2
DUT_3	EXTR_3
DUT_4	LIGA BOMBA 1 - 24VDC
DUT_5	LIGA BOMBA 2 - 24VDC
DUT_6	LIGA VALVULA 1 - 24VDC
DUT_7	LIGA VALVULA 2 - 24VDC
DUT_8	LIGA VALVULA 3 - 24VDC
DUT_9	LIGA VALVULA 4 - 24VDC
DUT_10	EXTR_4
DUT_11	EXTR_5

**ENTRADAS**

IN_0	SENSOR MAXIMA TANQUE MISTURA
IN_1	SENSOR MINIMA TANQUE MISTURA
IN_2	SENSOR MAXIMA TANQUE ARMAZENAGEM
IN_3	SENSOR MINIMA TANQUE ARMAZENAGEM
IN_4	SENSOR VAZAO
IN_5	ENTRADA LIVRE
IN_6	ENTRADA LIVRE

**MODULO IO 1762 IF20F2**

IO0+	ENTRADA ANALOGICA 4-20mA
IO1+	PESADOR TANQUE ARMAZENAGEM
IO1+	PESADOR TANQUE MISTURA
	SAIDA ANALOGICA 4-20mA
IO0	SINAL MOTOR DOSADOR 1
IO1	SINAL MOTOR DOSADOR 2



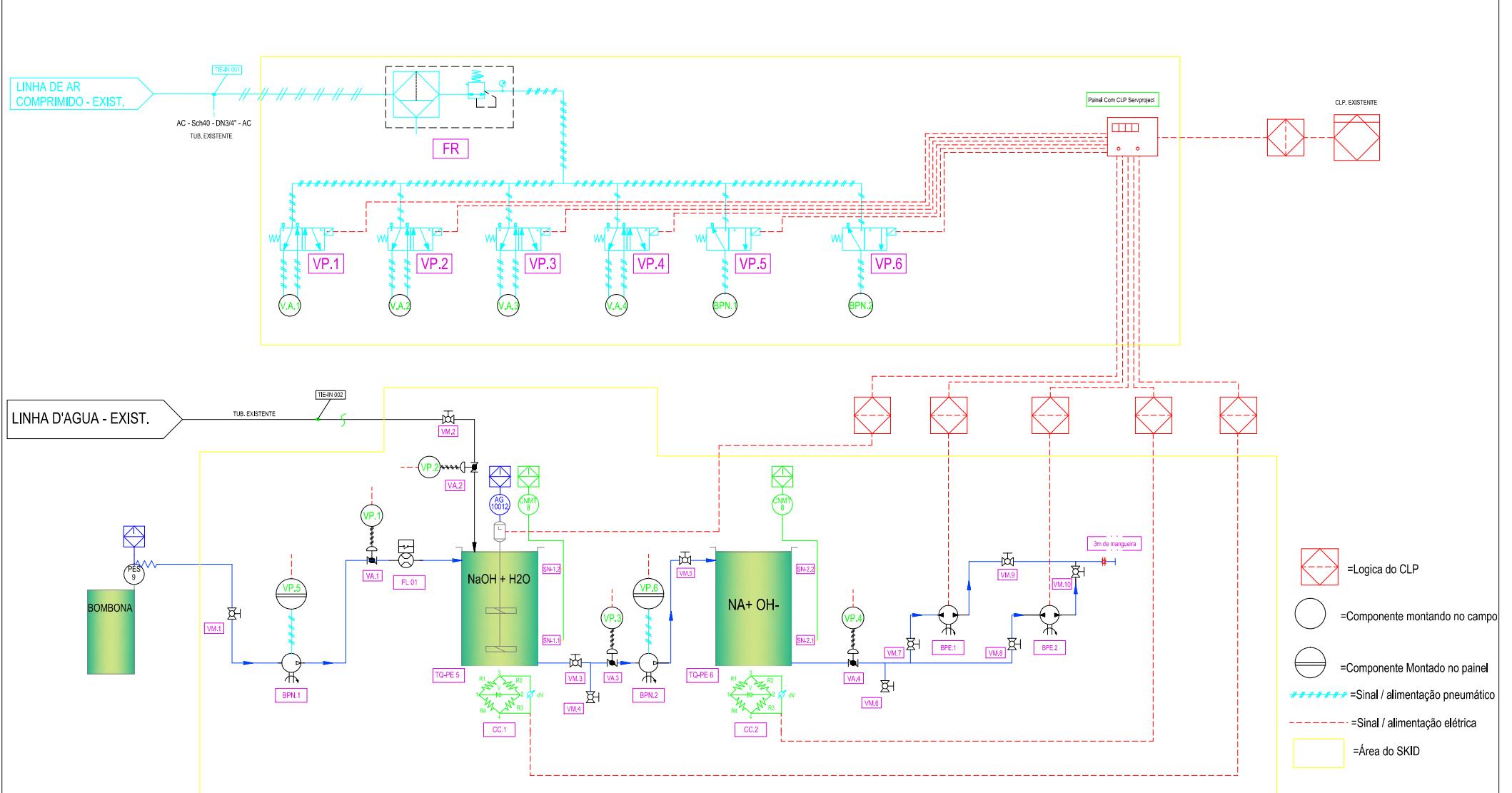
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Denominação : PAINEL ELETTRICO 822.10		Formato A3
Código de fornecimento ServProject EE   1000004	Revisão 02	Folhas 4/4

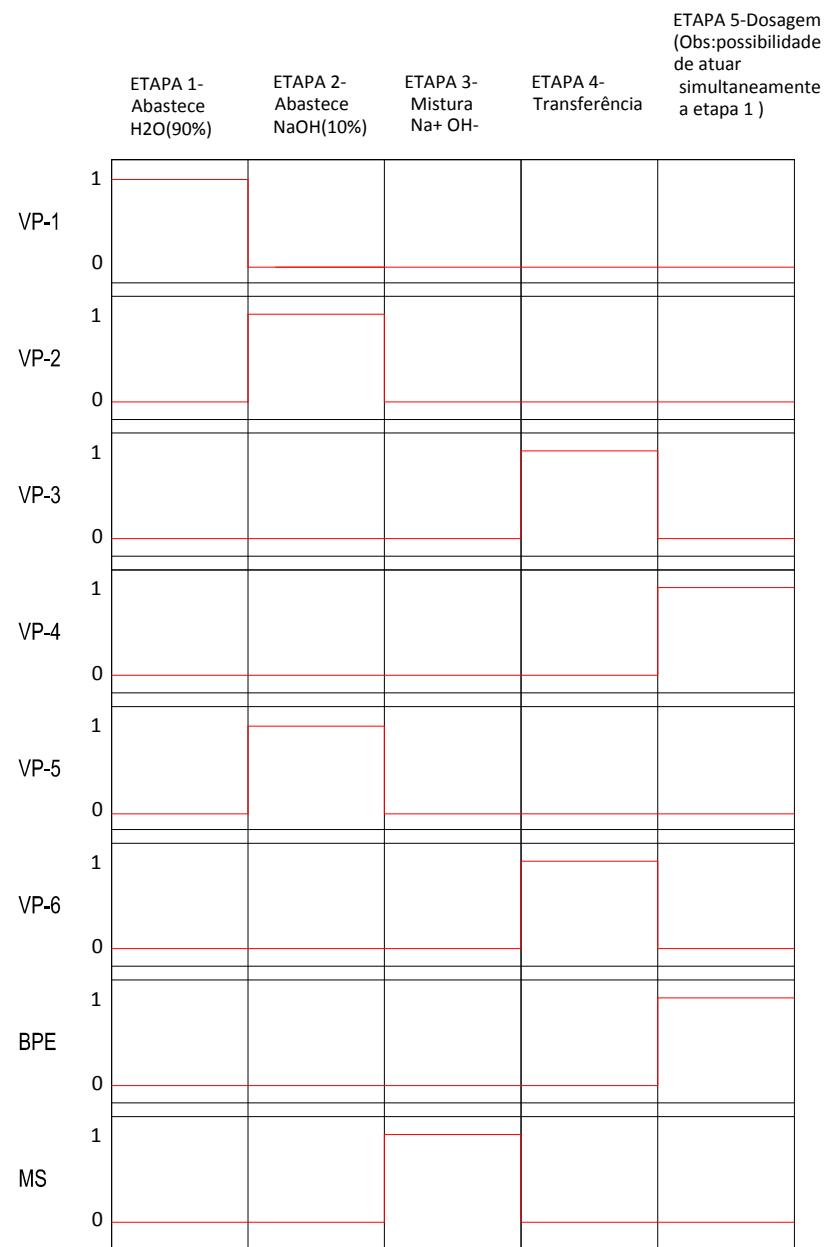


Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante
Variação admissível conf. DIN 7168 p/dimensões s/ indicação de Tolerância		Desenhista/Projetista Alexander.B	Dínero
Comprimento	acima	6 30 120 315 1000 2000 4000	Conferido por :
	até	6 30 120 315 1000 2000 4000	10° 50° 120°
Tolerância	±0,1	±0,2 ±0,3 ±0,5 ±0,8 ±1,2 ±2 ±3	Aprovado por :
		±1° ±30° ±20°	Escala Formato S/E A2
Comprimento	acima	6 30 120 315 1000 2000 4000	Conferido por :
	até	6 30 120 315 1000 2000 4000	10° 50° 120°
Tolerância	±0,1	±0,2 ±0,3 ±0,5 ±0,8 ±1,2 ±2 ±3	Aprovado por :
		±1° ±30° ±20°	Escala Formato S/E A2
Cliente/Número de projeto:	GRACE/0059	Data	29/04/14
Denominação :	Sistema p/ preparação e dosagem de NaOH		
Código de fornecimento ServProject:	SK   1000041	Revisão	Folhas
		02	1/1

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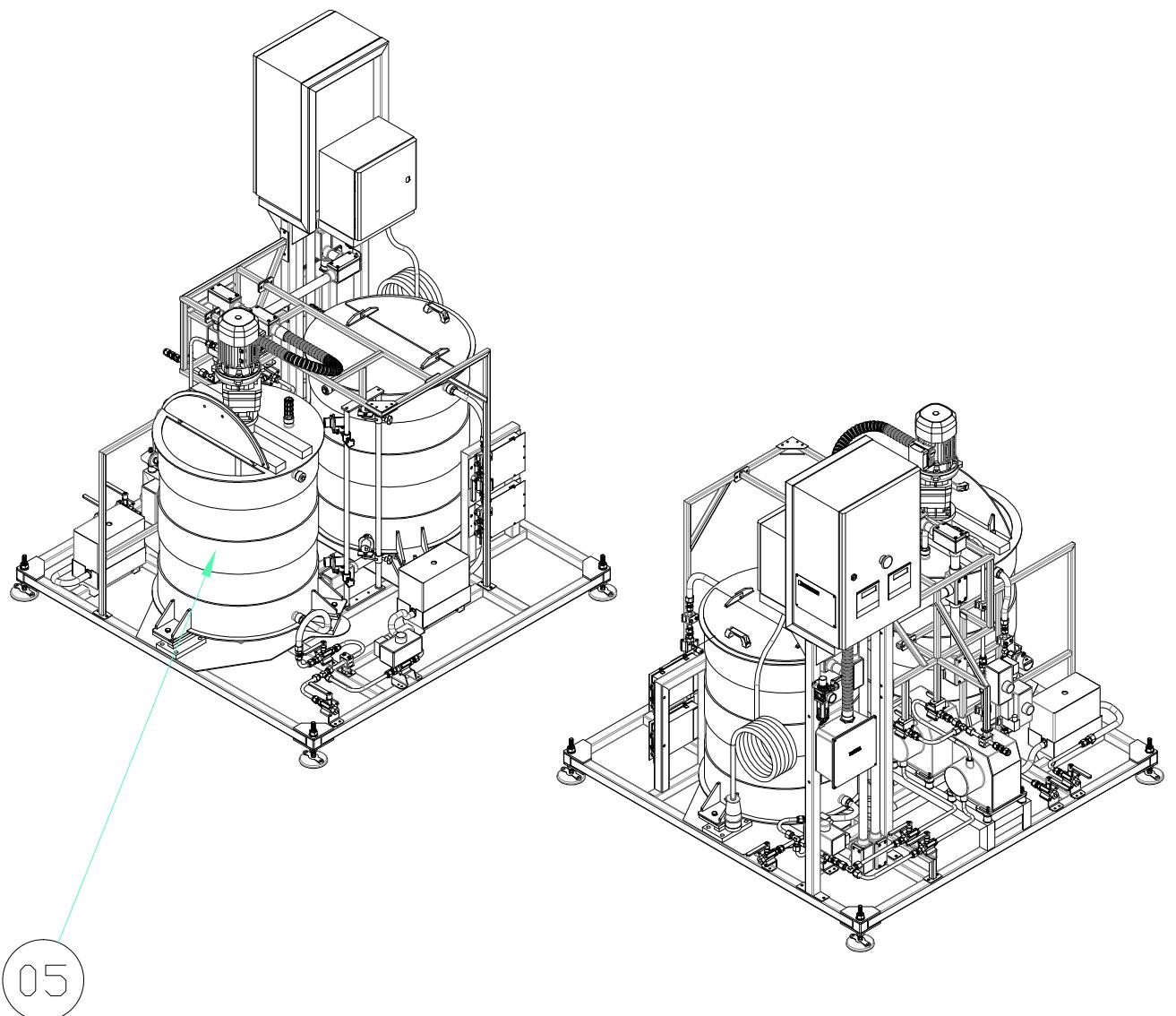
1=ligado/ativado/atuando.  
0=desligado/desativado.



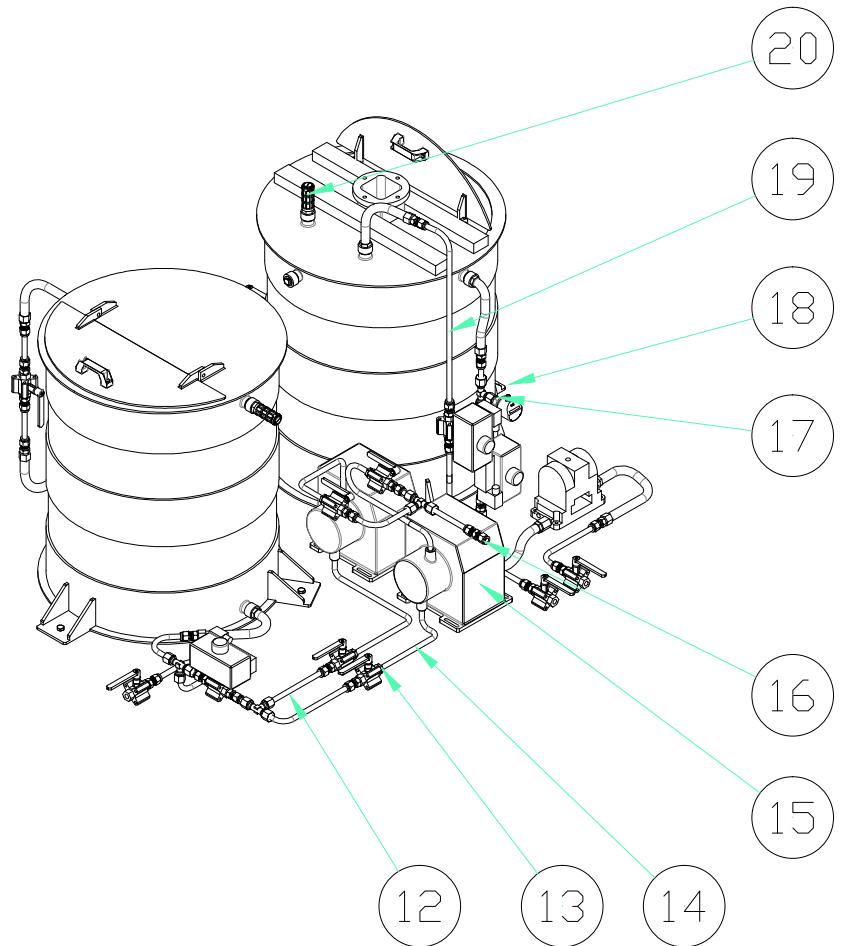
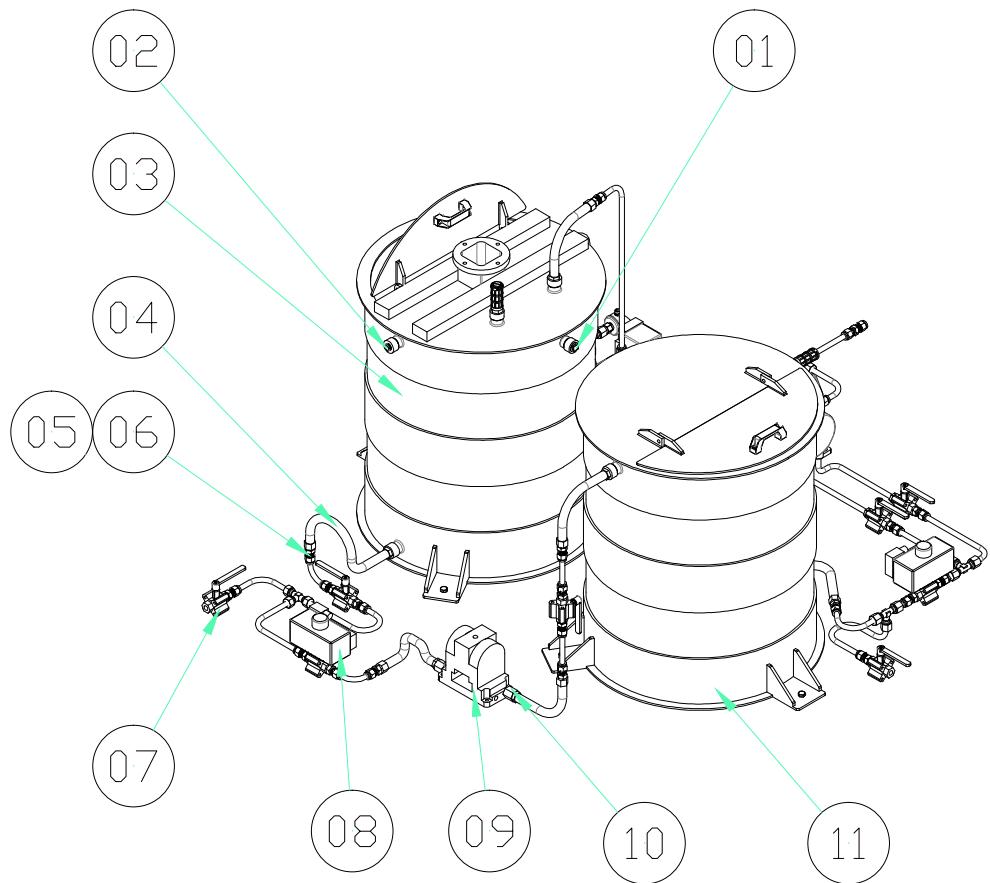
Nomenclatura	Componente	Condição	Interlock	Ajuste Manual									
Válvula atuada pneumática	VP1	1	SN-1.2 / MS / VP3 = 0	VM 1=1									
	VP2	1	SN-1.2 / MS / VP3 = 0	VM 2=1									
	VP3	1	VP1 / VP2 / SN-2.2 / VP4 = 0 (CC1 MIN=1)	VM 3=1 VM 4=0									
	VP4	1	VP3 = 0 (CC2 MIN= 1)	VM 6=0 VM 5=0									
Bombas Pneumáticas	VP5	1	SN-1.2 / VP3 = 0 (VP1 / FL-01 = 1)										
	VP6	1	SN-2.2 / VP1 / VP2 / VP4 = 0 (VP3 / CC1 MIN=1)	VM 5=1									
Célula de Carga	CC1	MIN	MS / VP3 / VP6 = Alarme de nível baixo TQ-01										
	CC2	MIN	BPE 1 / BPE 2 = 0 Alarme de nível baixo TQ-02										
	CC1/CC2		Volume de saída TQ1 igual volume de entrada TQ-2										
Sensor de nível	SN-1.2	1	Alarme de nível alto TQ-01										
	SN-1.1	1	CC 1 =1										
	SN-2.2	1	Alarme de nível alto TQ-02										
	SN-2.1	1	CC 2 =1										
Fluxostato	FL-01	0	VP5 = 0 (tempo p verificação; após 1min)										
Misturador	MS	1	VP1 / VP2 / VP3 / VP5 / VP6 = 0										
Bomba Peristáltica	BPE-1	1	CC2 MIN= 1	VM 8 / VM 10 = 0 (VM 7 / VM 9 = 1)									
	BPE-2	1	CC2 MIN= 1	VM 7 / VM 9 = 0 (VM 8 / VM 10 = 1)									
Válvula manual	VM-1	1		Condição de funcionamento do equipamento									
	VM-2	1											
	VM-3	1											
	VM-4	0											
	VM-5	1											
	VM-6	0											
	VM-7	1	funcionamento BPE 1										
	VM-9	1	funcionamento BPE 1										
	VM-8	0											
	VM-10	0											
Item Qtd Denominação, Material, Dimensão, etc			Código/ref./fabricante										
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância			Desenhista/Projetista	Alexander.B									
Comprimento	acima	6	30	120	315	1000	2000	4000	acima	10°	50°	Conferido por :	John
	até	6	30	120	315	1000	2000	4000	até	10°	50°	120°	
	Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3	±1°	±30'	±20°	Aprovado por :
Escala S/E Formato A3			Cliente/Número de projeto:	GRACE 0059	Data 12/05/14								
Denominação : Passo a passo SKID 0059-Interlock													
Código de fornecimento ServProject:			Revisão	Folhas									
SK   1000048			00	1/1									
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05	01	Conjunto hidráulico	SK 1000047											
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante											
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância			Desenhista/Projetista Alexander.B											
Comprimento	acima	6	30	120	315	1000	2000	4000	Argul. até	acima	10°	50°	Diedro	
	até	6	30	120	315	1000	2000	4000		até	10°	50°	120°	
Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		Tolerância	±1°	±30'	±20'	Aprovado por :
														Escala S/E
														Formato A3
 SERVPROJECT Bombas e Projetos Industriais Fone: 5058-5881 / 2528-6295 <a href="http://www.servproject.com.br">www.servproject.com.br</a>			Cliente/Número de projeto: <b>GRACE/0059</b>	Data <b>28/03/14</b>										
Denominação : <b>SKID GRACE 0059</b>														
Código de fornecimento ServProject: <b>SK   1000021-E</b>			Revisão <b>06</b>	Folhas <b>1/1</b>										
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Item	Qtd	Denominação, Material, Dimensão, etc										Código/ref./fabricante
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância												
Comprimento		acima	6	30	120	315	1000	2000	4000	c até	10°	50°
		até	6	30	120	315	1000	2000	4000	8000	10°	50°
Tolerância		±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		120°	
Angular												
Conferido por :												
Aprovado por :												
Escala S/E Formato A3												
Cliente/Número de projeto:												
GRACE/0059												
Data 07/05/13												
Denominação : Conjunto hidráulico												
Código de fornecimento ServProject: SK   1000047												
Revisão   Folhas 00   1/2												
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20	01	Respiro de 1/2" BSP/PP	-
19	6m	Tubulação hidráulica de 01/2" / Inox AISI 304	-
18	01	Fluxostato SI5000 SID10ABBFPKG/US-100/ Inox AISI 304	-
17	01	Adaptador para fluxostato	SK 1000048
16	01	União Tubo/Tubo 1/2" anilhada / Aço Inox AISI 304	-
15	02	Bomba Dosadora Qdos 30 Universal	-
14	2m	Mangueira Ø9 x Ø12mm / PP	-
13	04	Espigão 1/2" BSP x Ø9mm /Aço Inox AISI 304	-
12	04	Conexão "T" anilhada 1/2" /Aço Inox AISI 304	-
11	01	Tanque de armazenamento 150 lts/PP	-
10	04	Conexão concêntrica 1/2" p/ 1/4" rosca NPT/ AISI 304	-
09	02	Bomba de membrana pneumática /PP	-
08	04	Valvula atuada pneumática 1/2"/Alumínio	-
07	02	Valvula de esfera manual 1/2" / Inox AISI 304	-
06	09	Vedaçao Ø12.7 x Ø18.5 x 1.5mm / Nylon 6.0	-
05	29	Conexão reta de anilha p/ tubo de 01/2" / AISI 304	-
04	09	Mangueira flexível de 1/2" Rosca BSP / AISI 304	-
03	01	Tanque 150 lts p/ conj.misturador / PP	-
02	02	Tampão de 1/2" / PP	-
01	02	Tampão de 3/4" / PP	-
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante

Variação admissível conf.DIN 7168 p/dimensões s/  
indicação de Tolerância

Comprimento	acima		6	30	120	315	1000	2000	4000	L e g e ra ç ão A	acima		10°	50°	Conferido por :	Desenhista/Projetista Alexander.B	Diedro
	até	6	30	120	315	1000	2000	4000	8000		até	10°	50°	120°			
	Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3		Tolerância	±1°	±30'	±20'			Escala S/E



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Cliente/Número de projeto: GRACE/0059		Data 07/05/14
Denominação : Conjunto hidráulico		
Código de fornecimento ServProject: SK   1000047	Revisão 00	Folhas 2/2

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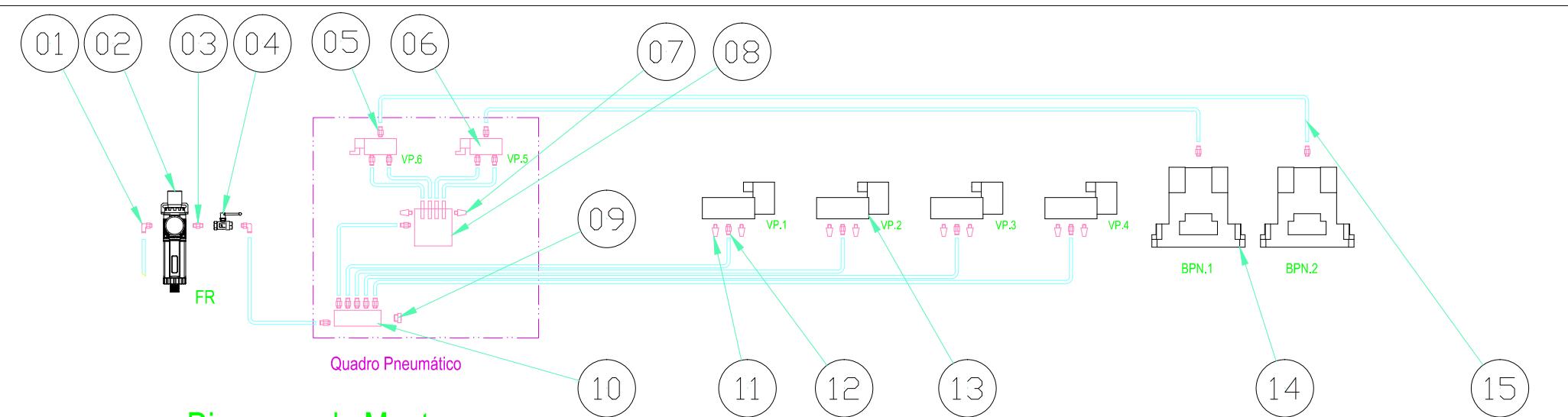


Diagrama de Montagem

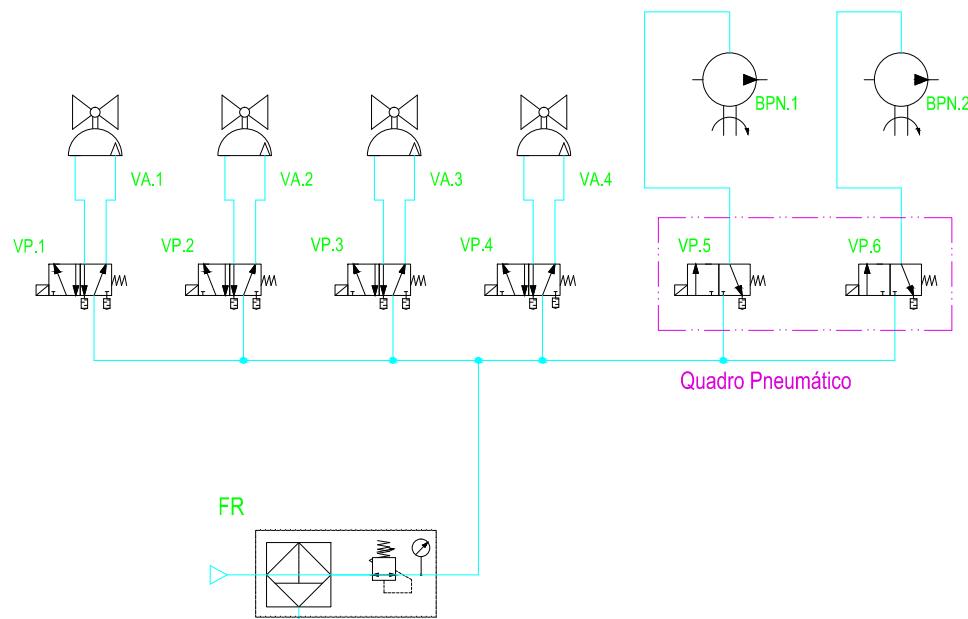


Diagrama Esquemático

14	02	Bomba pneumática de duplo diafrágrama Husky 205 / PP	-									
13	04	valvula coaxial atuada (valvula 5/2 vias simples solenoide)	-									
12	04	Conexão Reta de 3/8" x 06mm	-									
11	08	Silenciador de 1/4"	-									
10	01	Distribuidor de 6 vias	-									
09	01	Tampão de 3/8"	-									
08	01	Manifold 3/8" para 2 Valvulas de 1/4"	-									
07	02	Silenciador 3/8"	-									
06	02	Valvula simples solenoide 3/2 vias	-									
05	19	Conexão reta 1/4" x 06mm	-									
04	01	Valvula de esfera 1/4"	-									
03	01	Nipple 1/4"	-									
02	01	FILTRO REG.SYNTESI 1/4- 5610F100	-									
01	02	Conexão 90° 1/4" 06mm	-									
Item	Qtd	Denominação, Material, Dimensão, etc	Código/ref./fabricante									
Variação admissível conf.DIN 7168 p/dimensões s/ indicação de Tolerância			Desenhista/Projetista Alexander.B									
Comprimento	acima	6	30	120	315	1000	2000	4000	acima	10°	50°	Diedro
	até	6	30	120	315	1000	2000	4000	Conferido por :			
Tolerância	±0,1	±0,2	±0,3	±0,5	±0,8	±1,2	±2	±3	Aprovado por :			Escala S/E Formato A3
Cliente/Número de projeto: GRACE/0059			Data 15/05/14									
Denominação : Diagramas de ligação pneumática												
Código de fornecimento ServProject: SK   1000049			Revisão   Folhas 00   1/1									
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# Watson-Marlow qdos30 Manual pump



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# 1 Declaration of conformity



Watson-Marlow Ltd  
Plymouth  
Cornwall  
TR11 4RU  
England



## EC Declaration of Conformity

Description	qdos30 peristaltic pumps
Products	qdos30 manual, qdos30 remote, qdos30 universal, qdos30 universal+, qdos30 PROFIBUS, qdos30 universal 110 volt logic, qdos30 universal+ 110 volt logic
Conformity	Watson-Marlow Ltd declares that when this pump unit is used as a stand-alone pump it complies with Machinery Directive 2006/42/EC.
Standards	Watson-Marlow Limited declares that the above stated products are in conformance with the following harmonised standards and directives:
<p>Low Voltage Directive 2006/95/EC. Electro-Magnetic Compatibility Directive 2004/108/EC. Safety of Machinery-Electrical equipment of machines; BS EN 60204-1 Safety requirements for electrical equipment for measurement, control and laboratory use; BS EN 61010-1 IEC 61010-1 UL 61010-1 Safety of machinery-Basic concepts, general principles of design BS EN ISO 12100-1 and BS EN ISO 12100-2 Degrees of protection provided by enclosures (IP code) BS EN 60529 Information Technology equipment safety BS EN 60950-1 Digital Data Communication BS EN 61138-2 Conducted emissions BS EN 55011 Class A Radiated emissions BS EN 55011 Class A Electrostatic discharge immunity BS EN 61000-4-2 Radiated RF immunity BS EN 61000-4-3 Fast transient/burst immunity BS EN 61000-4-4 Surge immunity testing BS EN 61000-4-5 Conducted RF immunity BS EN 61000-4-6 Voltage dips and interruptions BS EN 61000-4-11 Mains harmonics BS EN 61000-3-2</p>	

Manufacturer      Watson-Marlow Limited, TR11 4RU, England

Date                17th August 2012

Signature

David Cole, Managing Director, Watson-Marlow Limited



This pump is ETL listed: ETL control number 3050250. Cert to CAN/CSA std C22.2 No 61010-1. Conforms to UL std 61010A-1.

See 7 Pump specifications on page 8.

## 2 Declaration of incorporation



Watson-Marlow Ltd  
Falmouth  
Cornwall  
TR11 4RU  
England

### Declaration of Incorporation

In accordance with the Machinery Directive 2006/42/EC that if this unit is to be installed into a machine or is to be assembled with other machines for installations, it shall not be put into service until the relevant machinery has been declared in conformity.

We hereby declare that:

Peristaltic Pump qdos

Series: qdos 30

that the following harmonized standards have been applied and fulfilled for health and safety requirements:

Safety of Machinery - EN ISO 12100

Safety of Machinery – Electrical Equipment of Machines EN 60204-1.

Quality Management System - ISO 9001.

and the technical documentation is compiled in accordance with Annex VII(B) of the Directive.

We undertake to transmit, in response to a reasoned request by the appropriate national authorities, relevant information on the partly completed machinery identified above. The method of transmission shall be by mail or email.

The pump head is incomplete and must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive.

Person authorized to compile the technical documents:

..... Andrew Green ..... of Watson-Marlow Ltd.

Place and date of declaration: Watson-Marlow Ltd, 17<sup>th</sup> August 2012

Responsible person:

Mr. David Cole  
Managing Director for Watson-Marlow Ltd

The information in this user guide is believed to be correct at the time of publication. However, Watson-Marlow Limited accepts no liability for errors or omissions. Watson-Marlow has a policy of continuous product improvement, and reserves the right to alter specifications without notice. This manual is intended for use only with the pump it was issued with. Earlier or later models may differ. The most up-to-date manuals appear on the Watson-Marlow website: <http://www.wmpg.com>

## 3 Warranty

Watson-Marlow Ltd ("Watson-Marlow") warrants this product to be free from defects in materials and workmanship for three years from the date of shipment, under normal use and service.

Watson-Marlow's sole responsibility and the customer's exclusive remedy for any claim arising out of the purchase of any product from Watson-Marlow is, at Watson-Marlow's option: repair, replacement or credit, where applicable.

Unless otherwise agreed in writing, the foregoing warranty is limited to the country in which the product is sold.

No employee, agent or representative of Watson-Marlow has the authority to bind Watson-Marlow to any warranty other than the foregoing unless in writing and signed by a director of Watson-Marlow. Watson-Marlow makes no warranty of the fitness of its products for a particular purpose.

### In no event:

- (i) shall the cost of the customer's exclusive remedy exceed the purchase price of the product;
- (ii) shall Watson-Marlow be liable for any special, indirect, incidental, consequential, or exemplary damages, however arising, even if Watson-Marlow has been advised of the possibility of such damages.

Watson-Marlow shall not be liable for any loss, damage, or expense directly or indirectly related to or arising out of the use of its products, including damage or injury caused to other products, machinery, buildings, or property. Watson-Marlow shall not be liable for consequential damages, including, without limitation, lost profits, loss of time, inconvenience, loss of product being pumped, and loss of production.

This warranty does not obligate Watson-Marlow to bear any costs of removal, installation, transportation, or other charges which may arise in connection with a warranty claim.

Watson-Marlow shall not be responsible for shipping damage of returned items.

### Conditions

- Products must be returned by pre-arrangement to Watson-Marlow, or a Watson-Marlow approved service centre.
- All repairs or modifications must have been made by Watson-Marlow Ltd, or a Watson-Marlow approved service centre or with the express permission in writing of Watson-Marlow, signed by a manager or director of Watson-Marlow.
- Any remote control or system connections must be made in accordance to Watson-Marlow recommendations.
- All PROFIBUS systems must be installed or certified by a PROFIBUS approved installation engineer.

### Exceptions

- Consumable items including tubing and pumping elements are excluded.
- Pumphead rollers are excluded.
- Repairs or service necessitated by normal wear and tear or by lack of reasonable and proper maintenance are excluded.
- Products which, in the judgment of Watson-Marlow, have been abused, misused, or subjected to malicious or accidental damage or neglect are excluded.
- Failure caused by electrical surge is excluded.
- Failure caused by incorrect or sub-standard system wiring is excluded.
- Damage by chemical attack is excluded.
- Ancillaries such as leak detectors are excluded.
- Failure caused by UV light or direct sunlight.
- All ReNu pumpheads are excluded.
- Any attempt to disassemble a Watson-Marlow product will invalidate the product warranty.

Watson-Marlow reserves the right to amend these terms and conditions at any time.

## 4 When you unpack your pump

Unpack all parts carefully, retaining the packaging until you are sure all components are present and in good order. Check against the components supplied list, below.

### Packaging disposal

Dispose of packaging materials safely, and in accordance with regulations in your area. The outer carton is made of corrugated cardboard and can be recycled.

### Inspection

Check that all components are present. Inspect components for damage in transit. If anything is missing or damaged, contact your distributor immediately.

### Components supplied



- qdos30 pump drive unit
- ReNu pumphead
- User connection collars
- The designated power cable (attached to the pump drive unit)
- CD-ROM containing these operating instructions
- Quick start manual
- Product safety information booklet

### Optional accessories

- Additional ReNu pumphead
- HMI protective cover
- Interface tubing
- Input and output (I/O) leads

### Storage

This product has an extended shelf life. However, care should be taken after storage to ensure that all parts function correctly. Please observe the storage recommendations and use-by dates which apply to tubing you may wish to bring into service after storage.

## 5 Information for returning pumps

In compliance with the UK Health and Safety at Work Act and the Control of Substances Hazardous to Health Regulations, you are required to declare the substances which have been in contact with product(s) you return to Watson-Marlow or its subsidiaries or distributors. Failure to do so will cause delays. Please ensure that you fax us this form and receive an RGA (Returned Goods Authorisation) before you despatch the product(s). A copy of this form must be attached to the outside of the packaging containing the product(s).

Please complete a separate decontamination certificate for each product. A copy of the appropriate decontamination certificate can be downloaded from the Watson-Marlow website at: [www.wmpg.com/decon](http://www.wmpg.com/decon)

You are responsible for cleaning and decontaminating the product(s) before return.

## 6 Safety notes

In the interests of safety, this pump and pumphead should only be used by competent, suitably trained personnel after they have read and understood this manual, and considered any hazard involved. If the pump is used in a manner not specified by Watson-Marlow Ltd, the protection provided by the pump may be impaired.

Any person who is involved in the installation or maintenance of this equipment should be fully competent to carry out the work. In the UK this person should also be familiar with the Health and Safety at Work Act 1974.



**This symbol, used on the pump and in this manual, means:  
Caution, refer to accompanying documents.**



**This symbol, used on the pump and in this manual, means: Do not allow fingers to contact moving parts.**



**Fundamental work with regard to lifting, transportation, installation, starting-up, maintenance and repair should be performed by qualified personnel only. The unit must be isolated from mains power while work is being carried out. The motor must be secured against accidental start-up.**



**There is a non-replaceable fuse on the switch-mode power supply board. In some countries, the mains power plug contains a replaceable fuse. There are no user-serviceable fuses or parts inside this pump.**

This pump must be used only for its intended purpose.

The pump must be accessible at all times to facilitate operation and maintenance. Access points must not be obstructed or blocked. Do not fit any devices to the drive unit other than those tested and approved by Watson-Marlow. Doing so could lead to injury to persons or damage to property for which no liability can be accepted.

If hazardous fluids are to be pumped, safety procedures specific to the particular fluid and application must be put in place to protect against injury to persons.

The exterior surfaces of the pump may get hot during operation. Do not take hold of the pump while it is running. Let the pump cool after use before handling. The drive unit must not be run without a pumphead fitted.

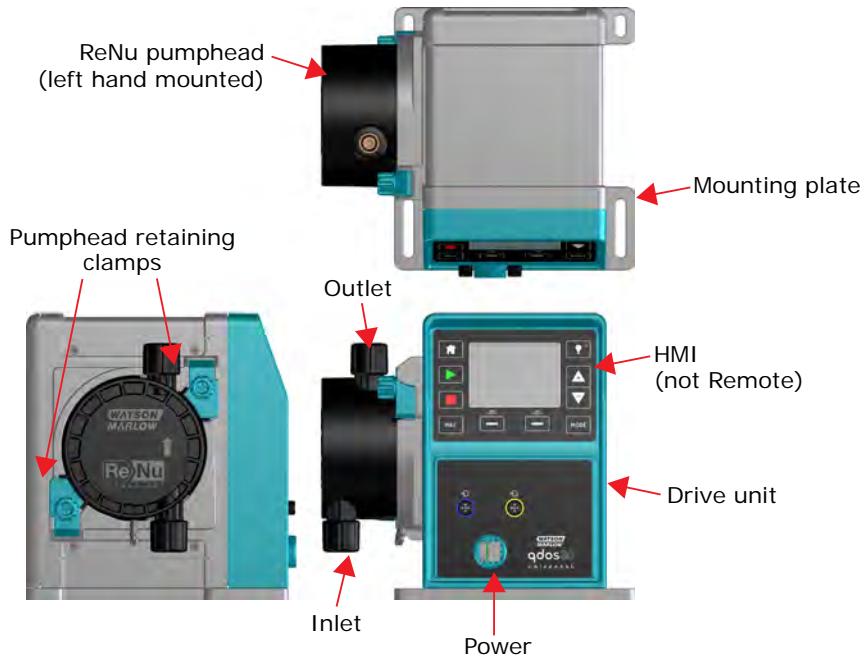


**This product does not comply with the ATEX directive and must not be used in explosive atmospheres.**



**If pumping flammable liquids, a full risk assessment should be completed prior to use.**

## 7 Pump specifications



A nameplate is fixed to the rear of the pump. It contains manufacturer and contact details, product reference number, serial number and model details.



Manufacturer details

## Pump specifications

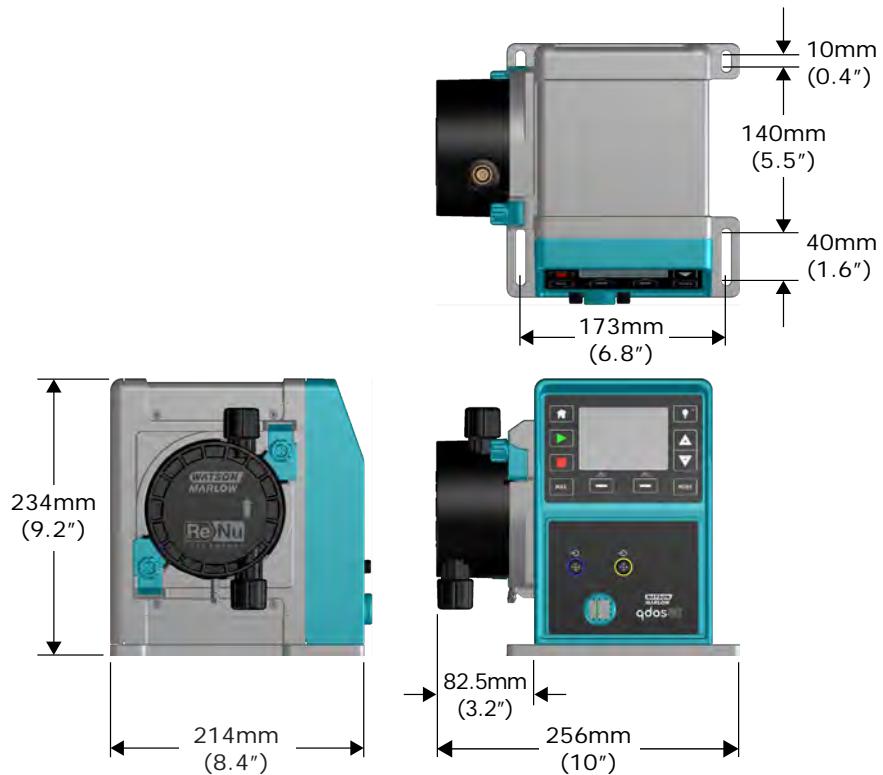
<b>Flow Range (flow control)</b>	0.1-500 ml/min (5000:1)
<b>Supply voltage/frequency</b>	-100-240V 50/60Hz
<b>±10% of nominal voltage. Maximum voltage fluctuation</b>	An electrical mains supply is required along with cable connections to the best practice of noise immunity
<b>Installation category (overvoltage category)</b>	II
<b>Power consumption</b>	190VA
<b>Enclosure rating</b>	IP66 to BS EN 60529 NEMA 4X to NEMA 250*
<b>Operating temperature range</b>	5C to 45C, 41F to 113F
<b>Storage temperature range</b>	-20C to 70C, -4F to 158F
<b>Maximum altitude</b>	2,000m, 6,560ft
<b>Humidity (non-condensing)</b>	80% up to 31C, 88F, decreasing linearly to 50% at 40C, 104F
<b>Pollution degree</b>	2
<b>Noise</b>	<70dB(A) at 1m

\* Requires the fitting of the HMI protective cover

## Standards

<b>EC harmonised standards</b>	Safety requirements for electrical equipment for measurement, control and laboratory use: BS EN 61010-1 incorporating A2 Category 2, Pollution degree 2
	Degrees of protection provided by enclosures (IP code): BS EN 60529 amendments 1 and 2
	Conducted emissions: BS EN 55011 A1 and A2, Class A, called by BS EN 61000-6-4
	Radiated emissions: BS EN 55011 A1 and A2, Class A, called by BS EN 61000-6-4
	Electrostatic discharge: BS EN 61000-4-2
	Radiated RF immunity: BS EN 61000-4-3 A1 and A2, called by BS EN 61000-6-2
	Fast transient burst: BS EN 61000-4-4 A1 and A2, Level 3 (2kV), called by BS EN 61000-6-2
	Surge testing: BS EN 61000-4-5 A1 and A2, called by BS EN 61000-6-2
	Conducted RF immunity: BS EN 61000-4-6, called by BS EN 61000-6-2
	Voltage dips and interruptions: BS EN 61000-4-11, called by BS EN 61000-6-2
<b>Other standards</b>	Mains harmonics: BS EN 61000-3-2 A2
	Pumps and pump units for liquids—common safety requirements: BS EN 809
	UL 61010A-1, UL/CSA 61010-1
	CAN/CSA-C22.2 No 61010-1
	IEC 61010-1
	Radiated emissions FCC 47CFR, Part 15
	NEMA 4X to NEMA 250
	NSF61 for pumphead

## 7.1 Dimensions



## 7.2 Weights

Model	Drive		Drive with pumphead	
	kg	lb	kg	lb
Manual	4.1	9lb	5.05	11lb 2oz
Remote	4.0	8lb 13oz	4.95	10lb 15oz
Universal	4.1	9lb	5.05	11lb 2oz
Universal+	4.1	9lb	5.05	11lb 2oz
PROFIBUS	4.1	9lb	5.05	11lb 2oz
Universal 24V relay	4.3	9lb 8oz	5.25	11lb 9oz
Universal+ 24V relay	4.3	9lb 8oz	5.25	11lb 9oz
Universal 110V logic	4.3	9lb 8oz	5.25	11lb 9oz
Universal+ 110V logic	4.3	9lb 8oz	5.25	11lb 9oz

## 8 Good pump installation practice

### 8.1 General recommendations



Always consult an expert before installing a metering pump in a specialised system. Metering pumps should be maintained by qualified persons.

It is recommended that the pump is bolted to a flat, horizontal, rigid surface, free from excessive vibration, to ensure correct lubrication of the gearbox and correct pumphead operation. Allow a free flow of air around the pump to ensure that heat can be dissipated. Ensure that the ambient temperature around the pump does not exceed 45C (113F).

The STOP key on pumps supplied with a keypad will always stop the pump. However, it is recommended that a suitable local emergency stop device is fitted into the mains supply to the pump.

Do not stack pumps.

This pump is self-priming and self-sealing against backflow. No valves are required in inlet or discharge lines, except as described below. Valves in the process flow must be opened before the pump operates.

**When pumping at pressure, or if gassing chemicals are to be metered, users are advised to fit a non-return valve between the pump and the discharge pipework to avoid the sudden release of pressurised fluid in the unlikely event of a pumphead failure.**



qdos30 is a positive displacement pump; therefore, it is recommended best practice that customers incorporate discharge pressure relief in their piping system. Failure to fit a pressure release valve in the discharge pipework will result in excessive build up of pressure should the discharge become blocked. This may present a safety risk, may cause damage to the system pipework or lead to premature failure of the pumphead. The pressure relief valve shall be rated at 1-2 bar greater than the maximum operating pressure of the system. It shall be installed so as to provide easy access for maintenance, inspection and repair. It shall not be capable of being adjusted without the use of a tool. The discharge opening must be located and directed so that the release material is not directed towards any person and will not deposit on parts that could cause a hazard. There must not be a shut-off valve between the overpressure safety device and the pump.



**Do not block the drain port of the ReNu pumphead.**



**Ensure the chemicals to be pumped are compatible with the pumphead and the pipework and fittings to be used with the pump. Please refer to the chemical compatibility guide which can be found at: [www.wmpg.com/chemical](http://www.wmpg.com/chemical)**

**If you need to use the pump with any other chemical please contact Watson-Marlow to confirm compatibility.**

## 8.2 Do's and do not's

**Do not** build a pump into a tight location without adequate airflow around the pump.

**Do** keep delivery and suction tubes as short and direct as possible - though ideally not shorter than one metre - and follow the straightest route. Use bends of large radius: at least four times the tubing diameter. Ensure that connecting pipework and fittings are suitably rated to handle the predicted pipeline pressure. Avoid pipe reducers and lengths of smaller bore tubing than the pumhead section, particularly in pipelines on the suction side. Any valves in the pipeline must not restrict the flow. Any valves in the flow line must be open when the pump is running.

**Do** use suction and delivery pipes equal to or larger than 6.4mm diameter bore. When pumping viscous fluids use pipe runs with a bore several times larger than the pump tube.

**Do** site the pump at or just below the level of the fluid to be pumped if possible. This will ensure flooded suction and maximum pumping efficiency.

**Do** run at slow speed when pumping viscous fluids. Flooded suction will enhance pumping performance, particularly for materials of a viscous nature.

**Do** recalibrate after changing pumhead, fluid, or any connecting pipework. It is also recommended that the pump is recalibrated periodically to maintain accuracy.

**Do not** pump any chemical not compatible with the pumhead.

**Do not** tilt the drive with a pumhead fitted, even if it is not running.

### Pressure capability

qdos30 can be operated continuously at discharge pressures of up to 7 bar (100 psi). The pump can be operated at discharge pressures of up to 10 bar (145 psi), however flowrate and pumhead life will be affected.

### Dry running

qdos30 will continue to operate when there is gas present in the suction line and will maintain prime in these conditions. The pump can be run dry, however flowrate and pumhead life will be affected.

## 9 Connecting to a power supply

This pump is fitted with a switch mode power supply and will operate from any mains voltage in the range ~100-240V AC, 50/60Hz supplies.

Make suitable connection to an earthed, single-phase mains electricity supply.



**We recommend using commercially available supply voltage surge suppression where there is excessive electrical noise.**

**Power cable:** The pump is supplied fitted with a cable gland and approximately 2.8m (8.5ft) of power cable.

**Recommended cable:** H05RN-F3G0.75; SJTOW 105C 3-18AWG; max OD 8.5mm (5/16in).

Each pump is supplied with a power cable. The connector at the pump end of the cable is IP66 rated. The mains plug at the opposite end of the cable is NOT IP66 rated.



**Ensure that all power supply cables are adequately rated for the equipment.**



**The pump must be positioned so that the disconnection device (the mains plug), is easily accessible when the equipment is in use.**



**When PAT testing this unit ensure that the earth bond test terminal is used.**

**Earth bond test terminal position**



## 10 Start-up check list

- Fit the pumphead to the drive. Refer to: 18 Pumphead replacement on page 43.
- Ensure the pumphead ports are securely fitted to the interface tubing.
- Ensure proper connection has been made to a suitable power supply.
- Ensure that the recommendations in: 8.1 General recommendations on page 11 are followed.

## 11 Switching on the pump for the first time

Power-up the pump.

The pump displays the start-up screen with the Watson-Marlow Pumps logo for three seconds.

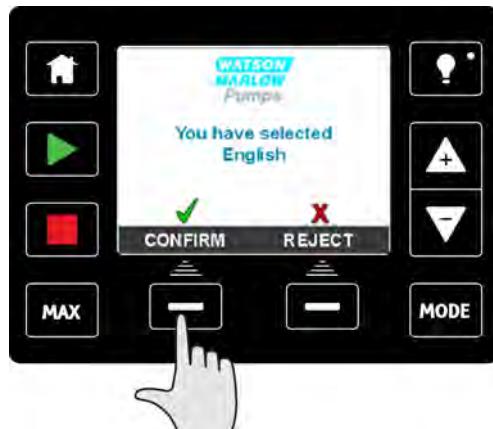


### Selecting your chosen display language

Use the +/- keys to move the selection bar to your required language. Press **SELECT** to choose.



Your selected language will now be displayed on screen, choose **CONFIRM** to continue, all displayed text will now appear in your chosen language.



Choose **REJECT** to return to the language choice screen.

The pump is preset with operational parameters as shown in table below:

First-time start-up defaults			
<b>Flowrate</b>	240ml/min	<b>Pump status</b>	Stopped
<b>Calibration</b>	4 ml/rev	<b>Flow unit</b>	ml/min
<b>Backlight</b>	30 minutes	<b>Pump tag</b>	WATSON-MARLOW
<b>Auto restart</b>	Off		

This then proceeds to the home screen.



**The pump is now ready to operate according to the defaults listed above.**

**Note:** The display background colour changes according to running state as follows:

- **White** background indicates pump stopped
- **Blue** background indicates pump running
- **Red** background indicates error or alarm

All operating parameters may be changed by means of key-presses (see Section 13 Pump operation on page 18).

## 12 Switching the pump on in subsequent power cycles

Subsequent power-up sequences will jump from the start-up screen to the home screen.

- The pump runs a power-on test to confirm proper functioning of the memory and hardware. If a fault is found, an error code is displayed (see 16.2 Error codes on page 41).
- The pump displays the start-up screen with the Watson-Marlow Pumps logo for three seconds followed by the home screen.
- Start-up defaults are those in place when the pump was switched off last.

Check that the pump is set to operate as you require it.

The pump is now ready to operate.

All operating parameters may be changed by means of key-presses (see Section 13 Pump operation on page 18).

### Power interruption

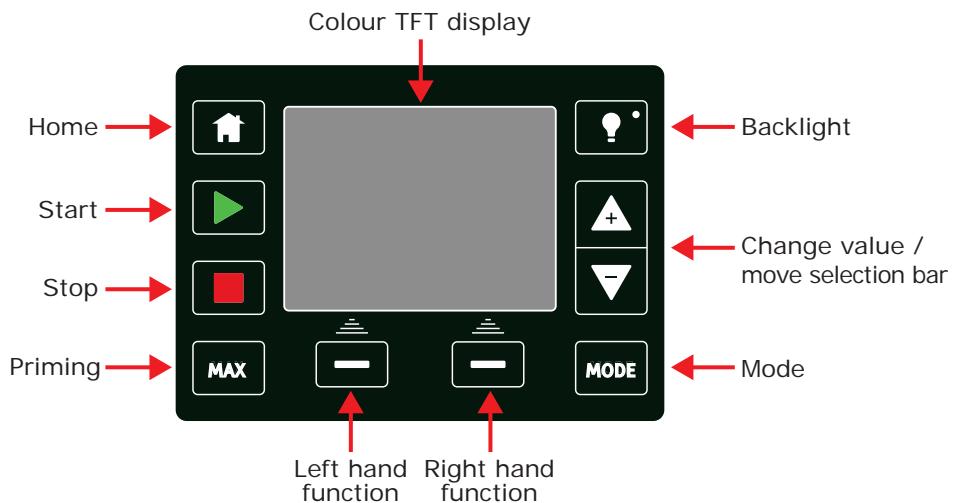
This pump has an auto restart feature which, when active, will restore the pump to the operating state it was in when power was lost. See: 15 Main menu on page 27.

### Stop / start power cycles

Do not power up/power down for more than **20 starts per hour**, whether manually or by means of the auto restart facility. We recommend remote control where a high frequency of power cycles is required.

# 13 Pump operation

## 13.1 Keypad functions



### HOME

When the **HOME** key is pressed it will return the user to the last known operating mode. If modifying pump settings when the **HOME** key is pressed, it will disregard any setting changes and return you to the last known operating mode.

### START

This key will start the pump at the displayed set speed when in manual mode or flow calibration.

### STOP

This key will stop the pump when pressed at **any** time.

### MAX

This key can be used to prime the pump when in manual mode. When pressed the pump will operate at maximum flowrate.

### FUNCTION KEYS

When pressed will perform the function displayed on the screen directly above the relevant function key.

After 30 minutes of no keypad activity, the HMI display will dim to 50% brightness.

To restore full power to the display and reset the timer, press the **BACKLIGHT** key.

#### **+/- KEYS**

These keys are used to change programmable values within the pump. For example, flowrate. These keys are also used to move the selection bar up and down in the menus.

#### **MODE**

To change modes or mode settings, press the **MODE** key. The **MODE** key can be pressed at any time to enter the mode menu. If modifying pump settings when the **MODE** key is pressed, it will disregard any setting changes and return you to the **MODE** menu.

#### **SCREEN SAVER**

The display refreshes every 60 seconds. When this occurs you may notice a brief flash.

## 13.2 MODE menu



Using **+/-** keys will scroll through the available modes.

The available modes are:

- **Manual** (default)
- **Flow calibration**
- **Fluid recovery**
- **CANCEL**

Use **SELECT** to choose mode. Use the right hand function key to alter mode settings.

### 13.3 Manual

All settings and functions of the pump in manual mode are set and controlled by means of key-presses. Immediately after the start-up display sequence detailed in: Section 12 Switching the pump on in subsequent power cycles on page 17, the manual mode home screen will be displayed unless auto restart is enabled.

If enabled, the pump will return to the last known operating state when the power was lost. When the pump is running it displays an animated clockwise arrow. In normal operation, the direction of flow is into the bottom port of the pumphead and out of the top port.

If an exclamation mark (!) is displayed, it indicates that Auto restart is on (see 15.3 General settings on page 34). If a padlock icon shows, it indicates that the keypad lock is on.

#### START



Starts the pump at the current flow displayed, and the display background changes to blue. If the pump is running pressing this has no effect.

#### STOP



Stops the pump. The display background changes to white. If the pump is not running pressing this has no effect.

## INCREASING AND DECREASING FLOWRATE

Using the +/- keys will increase or decrease the flowrate.



### Decreasing flowrate:

- A single key press will decrease flowrate by the least significant digit of the chosen flowrate unit.
- Repeat key presses as required to achieve the desired flowrate.
- Hold down the key for flowrate scrolling.

### Increasing flowrate:

- A single key press will increase flowrate by the least significant digit of the chosen flowrate unit.
- Repeat key-presses as required to achieve the desired flowrate.
- Hold down the key for flowrate scrolling.

## MAX 100% FUNCTION (Manual mode only)

- Press and hold the **MAX** key to run at maximum flow.
- Release the key to stop the pump.
- The volume dispensed and time elapsed are displayed whilst the **MAX** key is pressed and held.

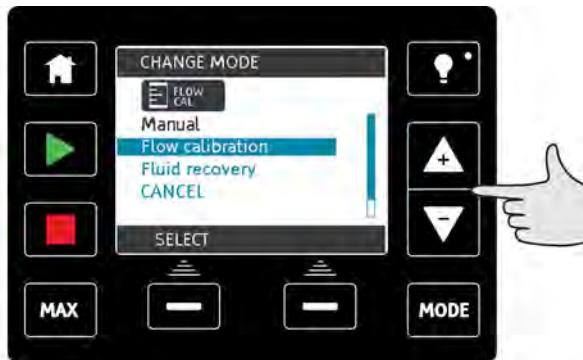


## 13.4 Flow calibration

This pump displays flowrate in ml/min.

### Setting the flow calibration

Select MODE



Using the +/- keys scroll to Flow calibration and press SELECT.



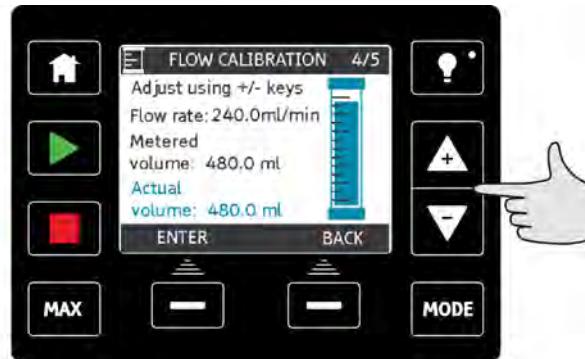
Using the +/- keys enter the maximum flowrate limit and press ENTER.



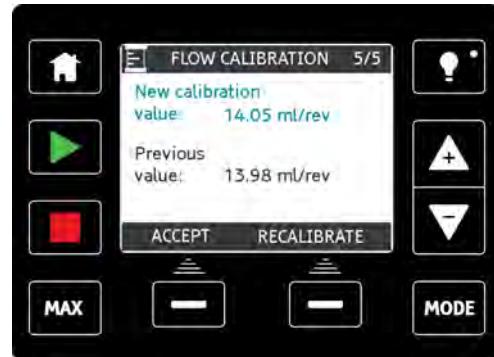
Press START to begin pumping a volume of fluid for calibration.



Press **STOP** to stop pumping fluid for the calibration.



Using the **+/- keys** enter the actual volume of fluid pumped.



To accept the new calibration press **ACCEPT** or **RECALIBRATE** to repeat the procedure. Press **HOME** or **MODE** to abort.

- The pump is now calibrated.

## 14 Fluid recovery mode

In this operating mode the pump can be run in reverse for short periods to recover fluid/chemicals pumped. This is mainly used for maintenance purposes.



Press the **MODE** key, using the **+/-** keys position the selection bar over the fluid recovery menu option and press **SELECT**.



If the pump is already running then the following screen will be displayed. The pump must be stopped before it can be reversed to recover fluid. Press **STOP PUMP**.

An instruction is now displayed. There is a warning to ensure that your system design permits reverse flow. If unidirectional valves are installed then reverse flow will not function and the pump will build up excessive pressure within the pipework.



Press and hold **RECOVER** to start running the pump in reverse and recover fluid. The screen below will be displayed whilst **RECOVER** is held down. As fluid is recovered the volume recovered and time elapsed will increase.



Release **RECOVER** to stop running the pump in reverse.

## 15 Main menu

To access the main menu press the **MENU** button from one of the HOME screens or INFO screens.

For example: **Manual HOME screen**



**Manual INFO screen**



This will display the main menu as shown below. Use the +/- keys to move the selection bar between the available options.

Press **SELECT** to choose an option.

Press **EXIT** to return to the screen from where the MENU was called.

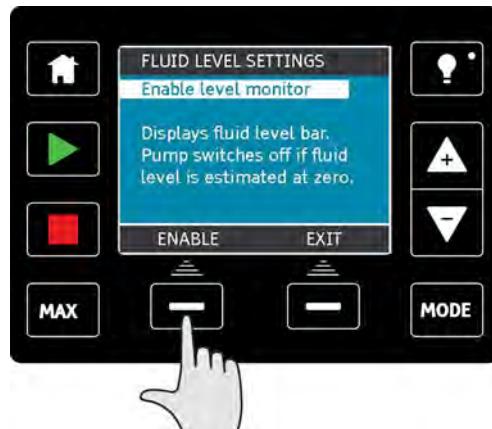


## 15.1 Fluid level monitor

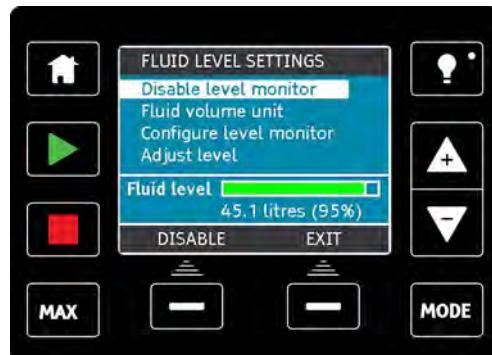
The fluid level monitor can be used to estimate the fluid level left in your supply tank. When activated, the pump will display a bar on the home screen indicating the volume of fluid in the tank. As the pump meters fluid, the volume of fluid in the supply reservoir will reduce, the bar will track the reducing volume. The pump can be set up to output an alarm when a defined level of fluid is reached. This will warn the operator to change the fluid supply barrel or level to ensure that the pump does not run dry.

When the fluid level is estimated at zero the pump will stop.

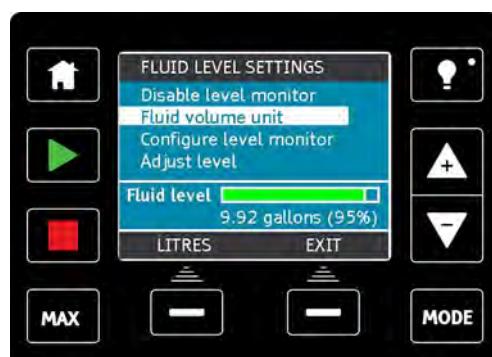
On selection of this function from the main menu, it will ask you whether you wish to **ENABLE** the fluid level bar.



After pressing **ENABLE**, the pump will display the fluid level setup options.



If you press **DISABLE** the pump will deactivate the fluid level monitor. The fluid bar will no longer appear on the **HOME** screens.



The fluid volume unit can be changed by pressing the **US GALLONS** or **LITRES** key, the key name will change depending upon the unit selected.

To configure the level monitor select this option from the menu.



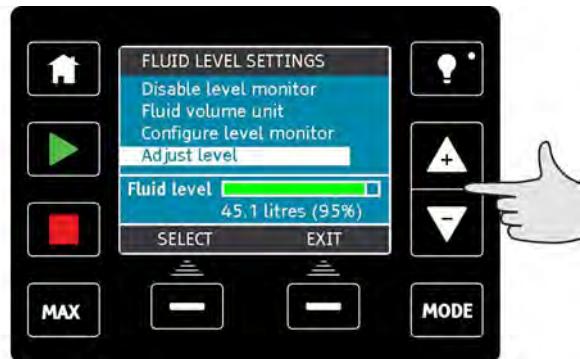
Enter the maximum level of your reservoir or supply container using the +/- keys to adjust the volume.

Press **NEXT** when you are happy you have the correct volume.

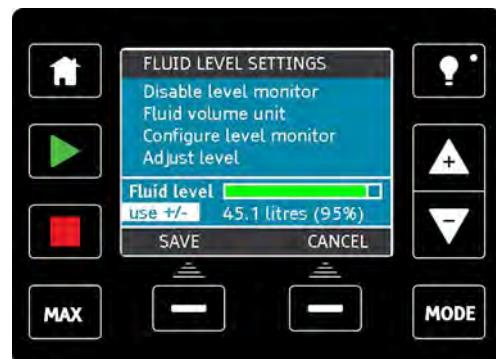


Now use the +/- keys to set the alert level. In the screen above the alert level is set to 20%. Press **SELECT** to return to the fluid level monitor menu.

If you need to adjust the volume of fluid in the tank, for example when re-filling, then press **SELECT** when the bar highlights the **Adjust level** option.



You can now use the +/- keys to adjust the level of fluid in the tank.



The accuracy of the fluid level monitor will improve with regular calibration of the pump.

## 15.2 Security settings

Security settings can be changed by selecting **SECURITY SETTINGS** from the **Main menu**.

### Auto keypad lock

Press **ENABLE/DISABLE** to switch on/off the **Auto keypad lock**. When active the keypad will 'lock' after 20 seconds of inactivity.



Once locked it will display the screen below when any key is pressed. To unlock the keypad press the two unlock keys together.



The padlock icon will appear on the operating mode home screen to show that keypad lock is activated.



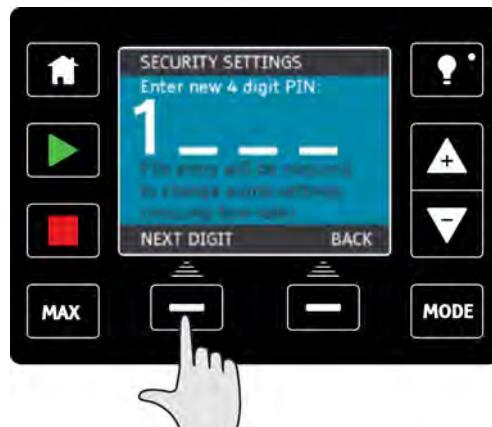
Note that the **STOP** and **BACKLIGHT** keys will always work whether the keypad is locked or not.

## PIN protection

Using the +/- keys in the security settings menu, highlight pin protection.

Press **ACTIVATE/DEACTIVATE** to switch on/off the **PIN protection**. When active, the PIN protection will request a PIN before allowing any change of operating mode settings, or entry to the menu.

Once a correct PIN has been entered, all settings can be changed. PIN protection will turn back on automatically after 20 seconds of no keypad activity.



To define a four digit number for your PIN, use +/- to select each digit from 0-9. Once you have the required digit press the **NEXT DIGIT** key. After selecting the fourth digit press **ENTER**.

Now press **CONFIRM** to check that the number entered is the PIN you require. Press **CHANGE** to return to PIN entry.



Pressing the **HOME** or **MODE** key at anytime before you confirm your PIN will abort the process.

If you enter an incorrect PIN it will display the following screen.



There is an override feature, should you forget your PIN. Please contact Watson-Marlow for details of how to reset the PIN.

## 15.3 General settings

To view the general settings menu, select **GENERAL SETTINGS** from the main menu.



### Auto restart

Press **ENABLE/DISABLE** to turn the auto restart feature on/off

This pump offers an auto restart feature. If active on power loss, it restores the pump when power returns to the operating state it was in when power was lost. For example, if the pump was running in analog mode prior to power loss, it would return to the same operating mode and continue to run at a proportional speed to the analog input.

If power is lost in the middle of a dose, when the power is returned it will continue and finish the interrupted dose.

Any pulses that were in memory before power loss will be remembered. Pulses received during power loss will be lost.



**Do not use auto restart for more than 20 starts per hour. We recommend remote control where a high number of starts is required.**

The ! icon is displayed on the home screens to indicate that the auto restart feature is active.



### Flow units

The current chosen flow unit is displayed on the right hand side of the screen. To change flow units move the selection bar over the flow unit menu entry and press **SELECT**.



Use the +/- keys to move the selection bar over the required flow unit.

Press **SELECT** to define the flow units to use. All flowrates displayed on screens will now be in the chosen units.

### Asset number

The asset number is a user defined 10 digit alphanumeric number which can be stored in the pump. This number can be re-called if required from the help screen, accessed from the main menu.

To define or edit the asset number, move the selection bar over the asset number menu entry and press **SELECT**. If an asset number has been previously defined, this will be displayed on screen to allow editing, otherwise the number display will be blank.

Use the +/- keys to scroll through the available characters for each digit. The available characters are 0-9, A-Z, and SPACE.

Press **NEXT** to move onto the next character, or **PREVIOUS** to move back to the previous character.

Press **FINISH** to save the entry and return to the general settings menu.



## Pump label

The pump label is a user defined 20 digit alphanumeric label which is displayed in the header bar of the home screen. To define or edit the pump label, move the selection bar over the pump label menu entry and press **SELECT**. If a pump label has been previously defined, this will be displayed on screen to allow editing, otherwise it will display the default label "WATSON-MARLOW".



Use the **+/-** keys to scroll through the available characters for each digit. The available characters are 0-9, A-Z, and SPACE.

Press **NEXT** to move onto the next character, or **PREVIOUS** to move back to the last character.

Press **FINISH** to save the entry and return to the general settings menu.

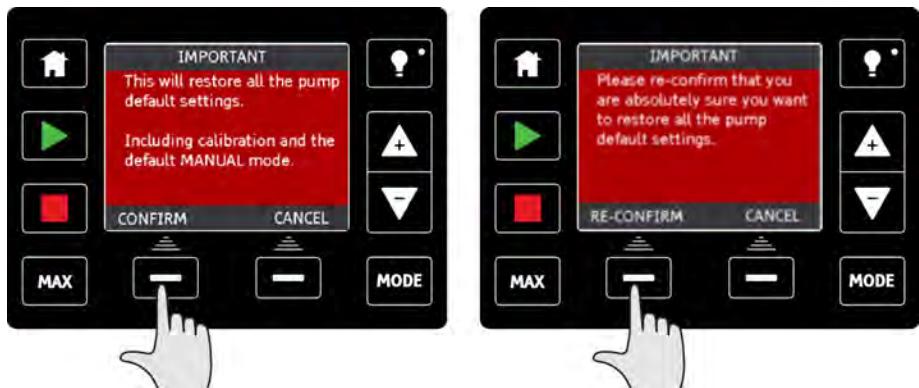


## Restore defaults

To restore the factory default settings select **restore defaults** from the general settings menu.

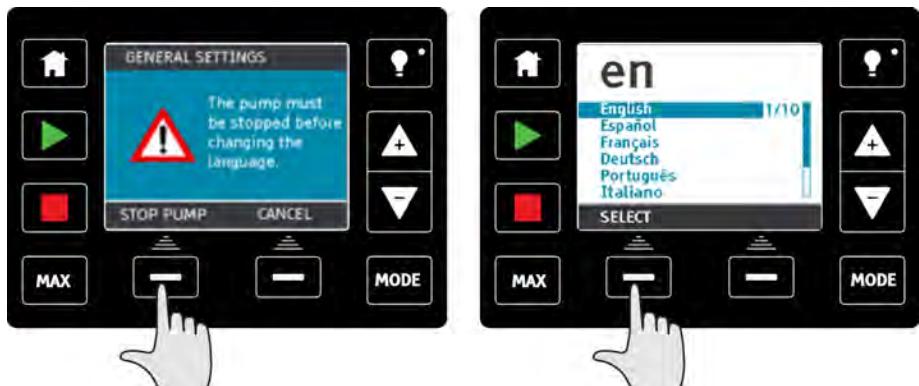
There are two confirmation screens to ensure that this function is not carried out in error.

Press **CONFIRM** followed by **RE-CONFIRM** to reset the defaults.



## Language

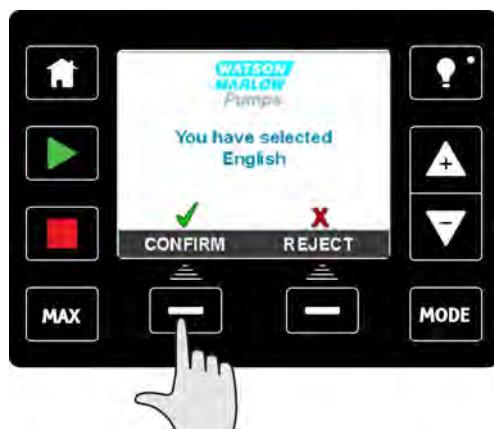
Select **language** from the general settings menu to choose an alternative display language for the pump. The pump must be stopped before changing the language.



Use the **+/-** keys to move the selection bar to your required language. Press **SELECT** to confirm.

Your selected language will now be displayed on screen. Press **CONFIRM** to continue, all displayed text will now appear in your chosen language.

Press **REJECT** to return to the language choice screen.



## 15.4 MODE menu

Selecting **MODE** menu from the main menu will navigate you to the **MODE** menu. This is the same as pressing the **MODE** key. Please see 13.2 MODE menu on page 20 for further details.

## 15.5 Control settings

Select **CONTROL SETTINGS** from the main menu to access the sub menu shown below.



Use +/− keys to move the selection bar. Press **SELECT** to choose the required function.

### Speed limit

The maximum speed the pump is capable of running at is 125 rpm.

Select **Speed limit** from the control settings menu to define a lower maximum speed limit for the pump.

## Reset run hours

Select **reset run hours** from the control settings menu.



Select **RESET** to zero the run hours counter. The run hours counter can be viewed by pressing **INFO** from your home screen.

## Reset volume counter

Select **reset volume counter** from the control settings menu.



Select **RESET** to zero the volume counter. The volume counter can be viewed by pressing **INFO** from your home screen.

## Help

Select **Help** from the main menu to access the help screens.



## 16 Troubleshooting

If the pump display remains blank when the pump is switched on, make the following checks:

- Check that mains power is available to the pump.
- Check the fuse in the wall plug if one is present.

If the pump runs but there is little or no flow, make the following checks:

- Check that fluid is supplied to the pump.
- Check for any kinks or blockages in the lines.
- Check that any valves in the lines are open.

### 16.1 Leak detection

If a leak is detected the pump will display the following message:



Follow the instructions in 18 Pumphead replacement on page 43 to replace your pumphead.

If this message is repeated when power is returned to the pump remove the pumphead, check that the mounting face is clean and free of debris and refit the pumphead, taking care to ensure it is correctly orientated with the arrow pointing upwards.

If the message constantly repeats after several pumphead installations, then there may be a leak detection sensor failure. Please contact Watson-Marlow for repair.

If you need to bypass a faulty leak detection sensor then you can do so by pressing **IGNORE**. If the power is cycled, the leak detection sensor will be switched back on.

## 16.2 Error codes

If an internal error occurs, an error screen with a red background is displayed.  
**Note:** **Signal out of range**, **Over signal** and **Leak detected** error screens report the nature of an external condition. They do not flash.

Error code	Error condition	Suggested action
Er 0	FRAM write error	Attempt to reset by switching power OFF / ON. Or seek support
Er 1	FRAM corruption	Attempt to reset by switching power OFF / ON. Or seek support
Er 2	FLASH write error during drive update	Attempt to reset by switching power OFF / ON. Or seek support
Er 3	FLASH corruption	Attempt to reset by switching power OFF / ON. Or seek support
Er 4	FRAM shadow error	Attempt to reset by switching power OFF / ON. Or seek support
Er 9	Motor stalled	Stop pump immediately. Check pumphead and tube. Power OFF / ON may reset. Or seek support
Er10	Tacho fault	Stop pump immediately. Power OFF / ON may reset. Or seek support
Er14	Speed error	Stop pump immediately. Power OFF / ON may reset. Or seek support
Er15	Over current	Stop pump immediately. Power OFF / ON may reset. Or seek support
Er16	Over voltage	Stop pump immediately. Check supply. Power OFF/ON may reset
Er17	Under voltage	Stop pump immediately. Check supply. Power OFF/ON may reset
Er19	Over temperature	Stop pump immediately. Turn OFF. Seek support
Er20	Signal out of range	Check analog control signal range. Trim signal as required. Or seek support
Er21	Over signal	Reduce the analog control signal
Er30	Over power	Turn OFF. Check power supply. Check pumphead and tubing. Wait 30 minutes. Power ON may reset. Or seek support
Err50	Communication error	Attempt to reset by switching power OFF / ON. Or seek support

## 16.3 Technical support

Watson-Marlow Limited  
Falmouth  
Cornwall  
United Kingdom  
TR11 4RU

Telephone: +44 (0)1326 370370

Email: aftersales@watson-marlow.co.uk

Web: www.wmpg.com

## 17 Drive maintenance

There are no user serviceable parts inside the pump. The unit should be returned to Watson-Marlow for service.

## 18 Pumphead replacement

The pumphead is a consumable part and cannot be serviced.



Always isolate the pump from the mains power supply before changing the pumphead, suction or discharge lines.



**It is only possible to fit the pumphead in one orientation with the arrow pointing upwards.**



**The pumphead retaining clamps should only be loosened or tightened by hand.**

**Note:** In this manual we have shown removal and replacement of the left hand mounted pumphead. Replacing the right hand mounted pumphead is the identical procedure.

### Removing the pumphead

- Drain down.
- Ensure that there is no pressure in the pipeline.
- Isolate the pump from the mains power supply.
- Ensure that protective clothing and eye protection are worn if hazardous products have been pumped.
- Remove input and output connections from the pumphead.



- Fully loosen the two pumphead retaining clamps.



- To disengage pumphead from the retaining clamps, carefully detach the pumphead from the pump housing and rotate in an anti-clockwise direction by approximately 15°.



- Remove the pumphead from the pump housing.



- Safely dispose of the used pumphead in accordance with safety best practice.

## **Fitting a new pumphead**

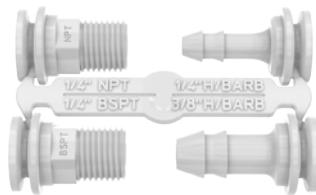
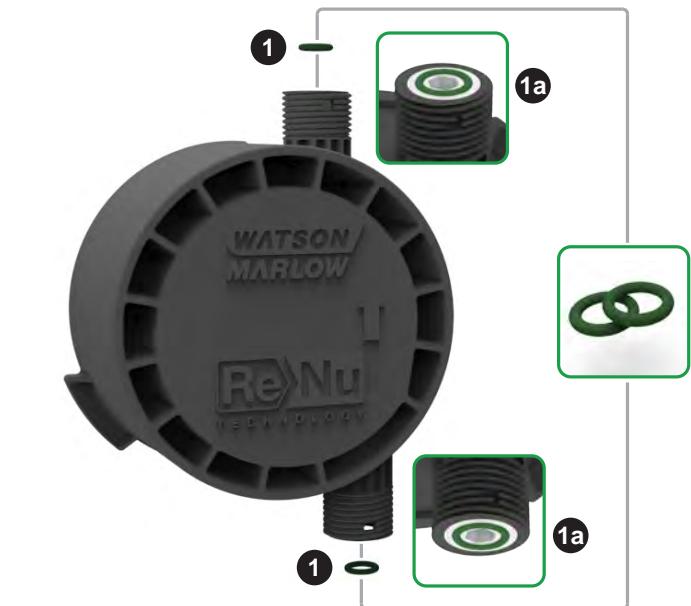
Fitting a new pumphead is a reverse procedure of the pumphead removal.

- Remove the new pumphead from its packaging.
- Align the new pumphead with the pump drive shaft and slide into position on the pump housing.
- Rotate the pumphead in a clockwise direction by approximately 15° to engage the retaining clamps.
- Tighten the retaining simultaneously clamps to secure the pumphead into position.
- Connect the input and output connections to the pumphead.
- Apply mains power to the pump, press start and run the pumphead for a few revolutions.
- Stop the pump and isolate it from the mains power supply, then tighten the clamps further if necessary.

## 18.1 Connecting interface tubing

**Note:** Please refer to the diagram below in conjunction to the text when connecting interface tubing to the pumphead.

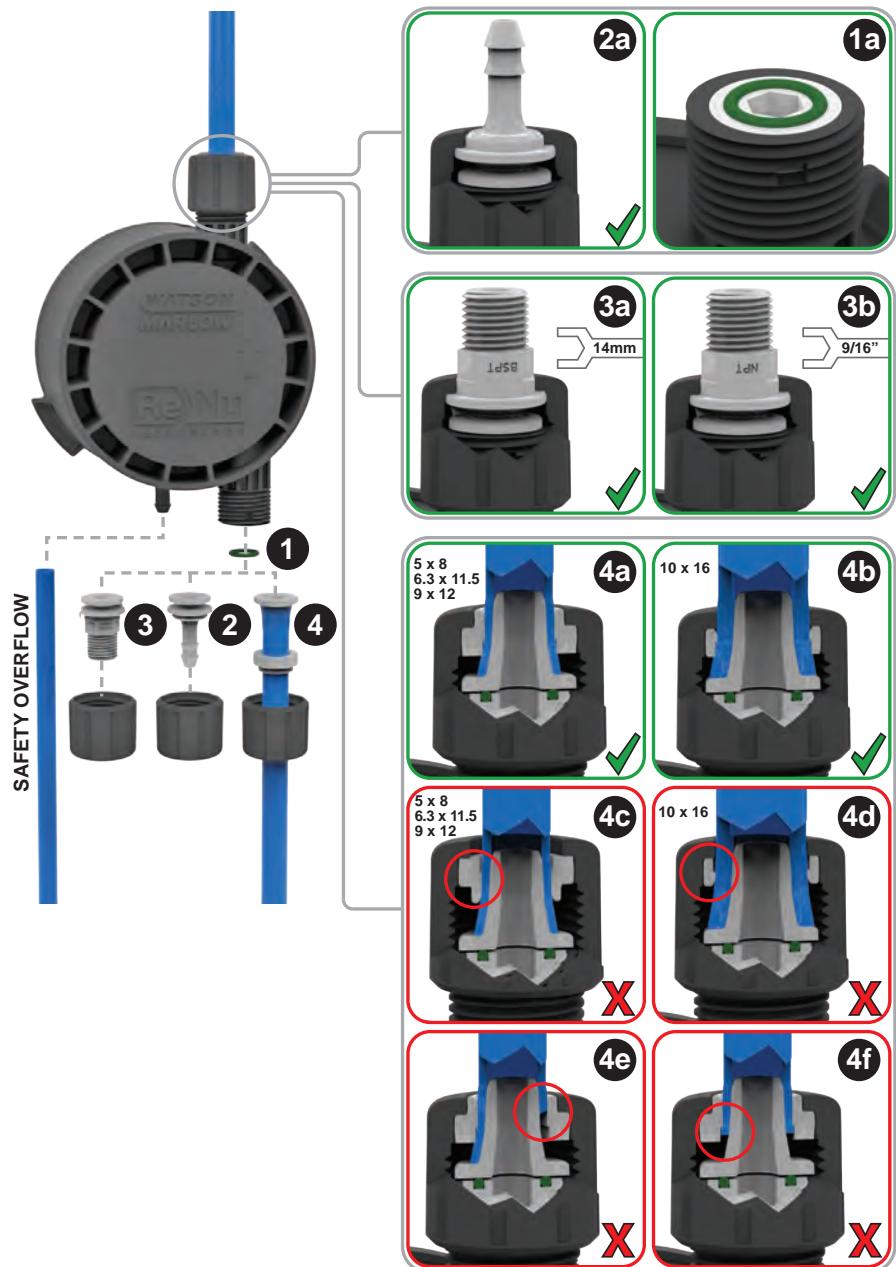
Before connecting the interface tubing, ensure that the Viton O-rings (**1**) supplied separately are correctly fitted in the head ports (**1a**) and that the Viton O-ring and connector material is compatible with pumped fluid.



Hydraulic connector pack –  
polypropylene barb/threaded fittings



Hydraulic connector pack –  
polypropylene compression fittings



### Hose barbs

- Detach the desired connector from the sprue (**2**).
- Place user connection collar over the chosen fitting and tighten onto the pumphead (**2a**).
- Press tube onto connector until it reaches the back face.
- Secure with suitable retaining clip.

### Threaded connectors

- Detach the desired connector from the sprue (**3**).
- Place user connection collar over the chosen fitting and tighten onto the pumphead (**3a**) and (**3b**).
- When attaching the mating thread, restrain the connector using a 14mm spanner for the 1/4" BSPT (**3a**) and 9/16" spanner for the 1/4" NPT (**3b**).

**Note:** It may be necessary to use a thread sealing tape to get a leak-proof seal.

### **Compression fittings**

- Select the correct compression fittings for the size of tube using the markings on the sprue and detach both the relevant parts **(4)**.
- Cut the end of the tubing so that it is square **(4a)** and **(4b)** not (4e).
- Slide the user connection collar onto the tube.
- Slide the compression ring onto the tube ensuring the inner step is facing the cut end. See **(4a)** and **(4b)** in the diagram on the previous page for correct orientation not (4c) or (4d).
- Press the tube onto the cone until it reaches the back face **(4a)** and **(4b)** not (4f) (it may be necessary to widen the end of the tube).
- Whilst continuing to hold the tube against the back face of the cone, slide the compression ring and user connection collar back down the tube and tighten onto the pumhead **(4a)** and **(4b)**.

The pump is now ready for use.

### **Fluid overflow**

- When a leak is detected, the leak detection sensor will stop the pump. In the unlikely event of a sensor failure, the safety overflow provides a safe leak path for the mixture of the fluid and lubricant to be removed.
- The user is responsible for ensuring that this overflow is connected to a compatible vented storage container to contain the waste fluid.

## 19 Ordering information

### 19.1 Pump part numbers

Description	Part number					
	United Kingdom	USA, Canada, Brazil, Japan	Europe	Australia, New Zealand	Argentina	Switzerland
qdos Manual 30 l/hr (8 gph), LHS pumphead*	OM0.223L.GLU	OM0.223L.GLA	OM0.223L.GLE	OM0.223L.GLK	OM0.223L.GLR	OM0.223L.GLC
qdos Manual 30 l hr (8 gph), RHS pumphead*	OM0.223L.GRU	OM0.223L.GRA	OM0.223L.GRE	OM0.223L.GRK	OM0.223L.GRR	OM0.223L.GRC
qdos Universal 30 l/hr (8 gph), LHS pumphead*	OM0.224L.GLU	OM0.224L.GLA	OM0.224L.GLE	OM0.224L.GLK	OM0.224L.GLR	OM0.224L.GLC
qdos Universal 30 l hr (8 gph), RHS pumphead*	OM0.224L.GRU	OM0.224L.GRA	OM0.224L.GRE	OM0.224L.GRK	OM0.224L.GRR	OM0.224L.GRC
qdos Universal+ 30 l/hr (8 gph), LHS pumphead*	OM0.225L.GLU	OM0.225L.GLA	OM0.225L.GLE	OM0.225L.GLK	OM0.225L.GLR	OM0.225L.GLC
qdos Universal+ 30 l hr (8 gph), RHS pumphead*	OM0.225L.GRU	OM0.225L.GRA	OM0.225L.GRE	OM0.225L.GRK	OM0.225L.GRR	OM0.225L.GRC
qdos Universal 24V relay 30 l/hr (8 gph), LHS pumphead*	OM0.224R.GLU	OM0.224R.GLA	OM0.224R.GLE	OM0.224R.GLK	OM0.224R.GLR	OM0.224R.GLC
qdos Universal 24V relay 30 l hr (8 gph), RHS pumphead*	OM0.224R.GRU	OM0.224R.GRA	OM0.224R.GRE	OM0.224R.GRK	OM0.224R.GRR	OM0.224R.GRC
qdos Universal+ 24V Relay 30 l hr (8 gph), LHS pumphead*	OM0.225R.GLU	OM0.225R.GLA	OM0.225R.GLE	OM0.225R.GLK	OM0.225R.GLR	OM0.225R.GLC
qdos Universal+ 24V Relay 30 l hr (8 gph), RHS pumphead*	OM0.225R.GRU	OM0.225R.GRA	OM0.225R.GRE	OM0.225R.GRK	OM0.225R.GRR	OM0.225R.GRC
qdos Universal 110V Logic 30 l/hr (8 gph), LHS pumphead*		OM0.224H.GLA				
qdos Universal 110V Logic 30 l hr (8 gph), RHS pumphead*		OM0.224H.GRA				
qdos Universal+ 110V Logic 30 l hr (8 gph), LHS pumphead*		OM0.225H.GLA				
qdos Universal+ 110V Logic 30 l hr (8 gph), RHS pumphead*		OM0.225H.GRA				
qdos Remote 30 l hr (8 gph), LHS pumphead	OM0.221L.GLU	OM0.221L.GLA	OM0.221L.GLE	OM0.221L.GLK	OM0.221L.GLR	OM0.221L.GLC
qdos Remote 30 l hr (8 gph), RHS pumphead	OM0.221L.GRU	OM0.221L.GRA	OM0.221L.GRE	OM0.221L.GRK	OM0.221L.GRR	OM0.221L.GRC
qdos PROFIBUS 30 l hr (8 gph), LHS pumphead*	OM0.227L.GLU	OM0.227L.GLA	OM0.227L.GLE	OM0.227L.GLK	OM0.227L.GLR	OM0.227L.GLC
qdos PROFIBUS 30 l hr (8 gph), RHS pumphead*	OM0.227L.GRU	OM0.227L.GRA	OM0.227L.GRE	OM0.227L.GRK	OM0.227L.GRR	OM0.227L.GRC

\* 7 bar (100 psi), ~100–240V 50/60Hz

## 19.2 Spares and accessories

Description	Part number
ReNu pumphead	OM3.2200.GB0
Hydraulic connection pack, polypropylene compression fittings	OM9.221H.P01
Hydraulic connection pack, polypropylene barb/threaded fittings	OM9.221H.P02
Interface tubing, pvc 6.3x11.5mm, 2m (6.5ft) length	OM9.2222.V6B
Interface tubing, pvc 10x16mm, 2m (6.5ft) length	OM9.2222.VAD
Interface tubing, pvc 6.3x11.5mm, 5m (16ft) length	OM9.2225.V6B
Interface tubing, pvc 10x16mm, 5m (16ft) length	OM9.2225.VAD
Interface tubing, polyethylene 9x12mm, 2m (6.5ft) length	OM9.2222.E9C
Interface tubing, polyethylene 9x12mm, 5m (16ft) length	OM9.2225.E9C
Interface tubing, polyethylene 5x8mm, 5m (16ft) length	OM9.2225.E58
Replacement baseplate	OM9.223M.X00
Input lead, M12 IP66, 3m (10ft) length	OM9.203X.000
Output lead, M12 IP66, 3m (10ft) length	OM9.203Y.000
HMI protective cover	OM9.203U.000

### Pumphead orientation

Please refer to the following guidelines to ensure that you order the correct pumphead for your pump.

As you face the front of the pump, looking at the HMI (not the remote model) and I/O connections:

- A pumphead mounted on the pump housing to the **left** will be a left hand pumphead.
- A pumphead mounted on the pump housing to the **right** will be a right hand pumphead.



## 19.3 Disconnecting the power cable

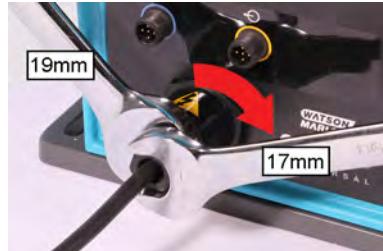


Always isolate from mains power before removing the power cable.



When removing the power cable from the pump, always ensure that the cable gland is removed from the power connector before unscrewing the power cable from the pump.

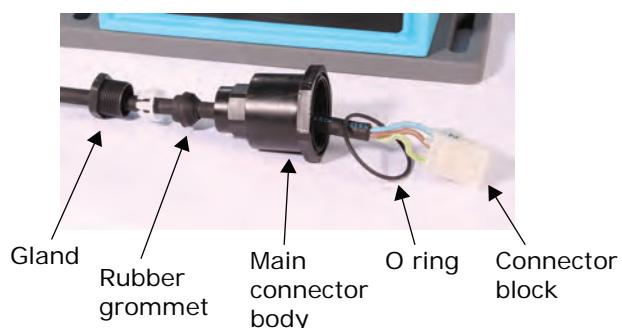
- Unscrew the gland at the rear of the main connector body.



- Unscrew the main connector body from the connection on the front of the pump.



- Carefully remove the power connection block



## 19.4 Connecting the power cable

Connecting the power cable is a reverse procedure of removing the power cable.



**Before attaching the power cable ensure a new O-ring (29mm diameter with 1.5mm ring diameter) is fitted to the main connector.**



- Connect the power connection block.
- Attach the main connector body to the connection on the front of the pump.
- Attach the gland to the rear of the main connector body. Take care to ensure the rubber grommet is not damaged when attaching the gland to the power connector.

# 20 Performance data

## 20.1 Pumping conditions

For precise and repeatable performance it is important to calibrate your pump on a regular basis.

Actual flowrates achieved may vary to those displayed on the screen because of changes in temperature, viscosity, inlet and discharge pressures, system configuration and pumphead performance against time. For the highest accuracy it is advisable to calibrate the pump on a regular basis.

Where discharge pressures are quoted, they are the mean root mean square (RMS) discharge line pressure.

## 20.2 Pressure capability

qdos30 can be operated continuously at discharge pressures of up to 7 bar (100psi). The pump can be operated at discharge pressures of up to 10 bar (145psi) on an intermittent basis, however flowrate and pumphead life will be affected.

## 20.3 Dry running

qdos30 will continue to operate when there is gas present in the suction line and will maintain prime in these conditions. The pump can be run dry, however flowrate and pumphead life will be affected.

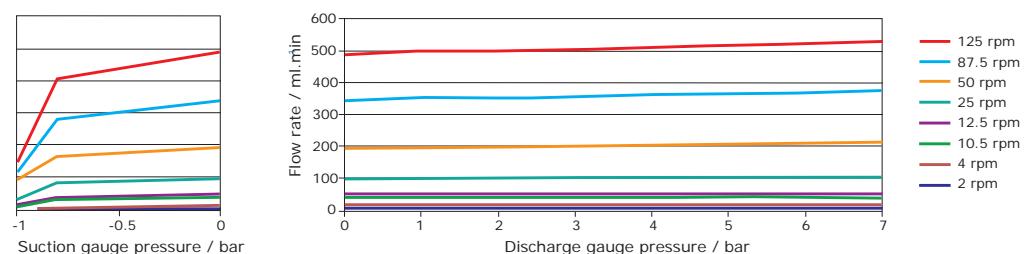
## 20.4 Pumphead life

Application factors that influence pumphead life are pump speed, chemical compatibility and viscosity of the duty fluid and suction and discharge pressure.

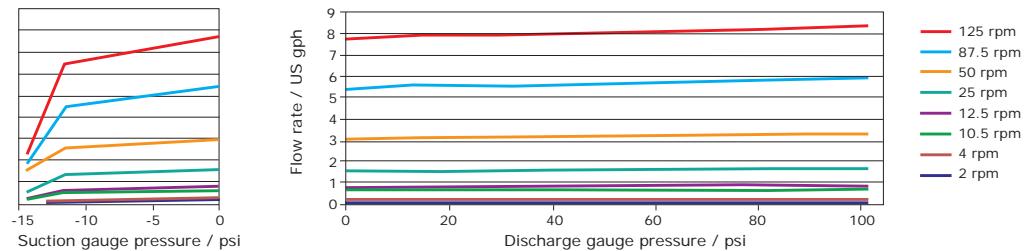
## 20.5 Performance curves

Flowrates for suction and discharge pressures for the pumphead at different drive speeds.

Metric



Imperial



This data was produced pumping water at ambient temperature.

## **21 Trademarks**

Watson-Marlow, qdos, qdos30 and ReNu are trademarks of Watson-Marlow Limited.

## **22 Publication history**

m-qdos30-manual-gb-04: qdos30 Manual pump

First published 07 12. Revised 11 12. Revised 03 13. Revised 07 13

# Bombas Qdos 30 Universal e Universal+ com cabeçote ReNu

**qdos30**  
Metering Pumps

Watson-Marlow Pumps Group

## CARACTERÍSTICAS

- Vazão de 0,1 a 500ml/min a pressão de 7 bar (100psi) RMS
- Cabeçote ReNu proporcionando vazão precisa, linear e repetível
- A recuperação de fluido garante a segurança do operador e evita resíduos químicos
- Controle de vazão 5000:1 com precisão de  $\pm 1\%$
- Funcionalidade de modo manual, analógico ou de contato
- Mostrador TFT colorido de 3,5" (88,9mm), oferecendo informações sobre a bomba através de cores, ícones, gráficos e texto
- Sem necessidade de válvulas ou equipamentos auxiliares



Watson-Marlow...Innovation in Full Flow

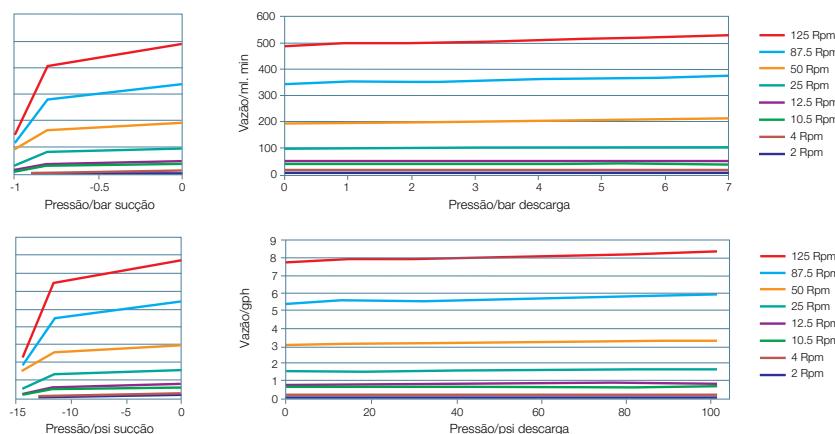
## DESEMPENHO

### Vazões típicas da bomba Qdos 30

	Velocidade (rpm)	Vazão (ml/min)*
Cabeçote ReNu	0,025-125	0,1-500
	Velocidade (rpm)	Vazão (Galão EUA/h)
Cabeçote ReNu	0,016-125	0,001-7,93

\* Precisão de  $\pm 1\%$ , repetibilidade de  $\pm 0,5\%$

### Vazões com pressão de descarga para cabeçotes ReNu em diferentes velocidades de acionamento



## DADOS TÉCNICOS

	Qdos 30 Universal	Qdos 30 Universal+
<b>Funcionalidade</b>		
<b>Modos de operação</b>		
Manual	•	•
Contato	•	•
4-20mA	•	•
Recuperação de fluido	•	•
Relatório de falhas	•	•
<b>Controle manual</b>		
Amplitude de vazão 0,1 a 500ml/min (5000:1)	•	•
Mostrador numérico de vazão	•	•
Mostrador numérico de velocidade	•	•
Mostrador de percentual numérico da velocidade máxima	•	•
Monitor de nível de fluido	•	•
Máx (escorva)	•	•
Reinício automático	•	•

Funcionalidade continuada	Qdos 30 Universal	Qdos 30 Universal+
Recuperação de fluido e detecção de vazamento	•	•
<b>Controle remoto</b>		
entrada de 4-20mA	•	•
Dois pontos de calibração da entrada de 4-20mA		•
Saída de 4-20mA		•
Entrada de contato (pulso/lote)	•	•
Entrada liga/desliga	•	•
Saídas de condição de operação	•	•
Saída de alarme	•	•
Recuperação remota de fluidos	•	•
<b>Proteção</b>		
Bloqueio do teclado	•	•
Bloqueio de PIN para proteção da configuração	•	•

## DIMENSÕES



## ESPECIFICAÇÕES

Qdos 30 Universal e Universal+	
Admissão nominal	IP66
Gabinete	À prova de água / poeira
Umidade	Sem condensação de 5% a 95%
Temperatura	5 °C a 45 °C (41 °F a 113 °F)
Peso da bomba	Acionamento: 4,1kg (9lb 6oz) Cabeçote: 0,95kg (2lb 15oz)
Razão de controle	5000:1
Ruído	< 70dB(A) a 1m
Padrão	CE, NSF 61
Fonte de alimentação.	Fonte de alimentação em modo variável ~100-240V 50-60Hz 190VA

## MATERIAIS DE CONSTRUÇÃO

Componente	Material
Teclado	Poliéster
Carcaça do acionamento	PPE/PS com enchimento 20% vidro
Eixo de acionamento	Aço inoxidável 440C
Gabinete do cabeçote	PPS com enchimento 40% vidro
Rotor	Nylon preenchido com vidro
Mancais do rotor	Aço
Mangueira	Santoprene
Conectores hidráulicos	Polipropileno
Lubrificante	Com base em glicerol

## INFORMAÇÕES SOBRE PEDIDOS

### Códigos de produto da bomba

Descrição	Código	
	Cabeçote localizado na esquerda*	Cabeçote localizado na direita*
Bomba Qdos 30 Universal com plugue Reino Unido	0M0.224L.GLU	0M0.224L.GRU
Bomba Qdos 30 Universal com plugue EUA	0M0.224L.GLA	0M0.224L.GRA
Bomba Qdos 30 Universal com plugue EUA	0M0.224L.GLE	0M0.224L.GRE
Bomba Qdos 30 Universal com plugue Austrália	0M0.224L.GLK	0M0.224L.GRK
Bomba Qdos 30 Universal com plugue Argentina	0M0.224L.GLR	0M0.224L.GRR
Bomba Qdos 30 Universal com plugue Suíça	0M0.224L.GLC	0M0.224L.GRC
Bomba Qdos 30 Universal+ com plugue Reino Unido	0M0.225L.GLU	0M0.225L.GRU
Bomba Qdos 30 Universal+ com plugue EUA	0M0.225L.GLA	0M0.225L.GRA
Bomba Qdos 30 Universal+ com plugue EUA	0M0.225L.GLE	0M0.225L.GRE
Bomba Qdos 30 Universal+ com plugue Austrália	0M0.225L.GLK	0M0.225L.GRK
Bomba Qdos 30 Universal+ com plugue Argentina	0M0.225L.GLR	0M0.225L.GRR
Bomba Qdos 30 Universal+ com plugue Suíça	0M0.225L.GLC	0M0.225L.GRC

\* A localização do lado do cabeçote deve ser informada no pedido. A perspectiva esquerda/direita considera o usuário olhando a frente da bomba. A bomba que aparece no diagrama de dimensões tem seu cabeçote localizado na esquerda.

### Códigos de produto para cabeçote

Descrição	Código
Cabeçote ReNu de 7 bar (100 psi)	0M3.2200.GBO

Todas as vazões indicadas foram obtidas com bombeamento de água a 20 °C (68 °F), com zero de sucção e produção nominal.

Isenção de responsabilidade: As informações neste documento são tidas como corretas, porém a Watson-Marlow Limited não se responsabiliza por nenhum erro que possa conter e se reserva o direito de alterar estas especificações sem aviso prévio. Qdos e ReNu são marcas comerciais da Watson-Marlow Limited. Informe o código do produto ao fazer pedido de bombas e cabeçotes.



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Watson-Marlow... Innovation in Full Flow



**SI5000**

SID10ABBFPKG/US-100

Sensores de fluxo

**precisão / desvios**

precisão do ponto de ajuste	[cm/s]	$\pm 2 \dots \pm 10$ *)
Histerese	[cm/s]	2...5 *)
Repetibilidade	[cm/s]	1...5 *)
derivação de temperatura [cm/s x 1/K]		0,1 **)
Gradiente da temperatura	[K/min]	300

**Tempos de reação**

Retardo de prontidão	[s]	10
Tempo de resposta	[s]	1...10

**Software / programação**

Ajuste do ponto de comutação		botões
------------------------------	--	--------

**condições ambientais**

Resistência à pressão	[bar]	30
Temperatura ambiente	[°C]	-25...80
Temperatura de armazenamento [°C]		-25...100
proteção		IP 67

**Certificações / testes**

CEM		EN 61000-4-2 ESD: EN 61000-4-3 HF irradiado: EN 61000-4-4 Ruptura: EN 61000-4-6 HF conduzido:	4 kV CD / 8 kV AD 10 V/m 2 kV 10 V
Resistência a choques		DIN IEC 68-2-27:	50 g (11 ms)
resistência à vibrações		DIN EN 60068-2-6:	20 g (55...2000 Hz)
MTTF	[anos]		298

**Dados mecânicos**

Conexão de processo		rosca interna M18 x 1,5 para adaptador
Materiais em contato com o fluído		inox 316L / 1.4404; anel O: FKM 8 x 1,5 gr 80° Shore A
Material da carcaça		inox 316L / 1.4404; V2A / 301 / 1.4310; PC (polycarbonato); PBT-GF 20; EPDM/X
Comprimento da haste L	[mm]	45
Peso	[kg]	0,235

**Displays / elementos de operação**

Display de funções	LED	10 LEDs, três cores
--------------------	-----	---------------------

**conexão elétrica**

Conexão		Conexão M12
---------	--	-------------

**Fiação**

2	1	
3		
4		

Diagrama de fiação:

```

graph LR
    1 --- Lplus[L+]
    4 --- GND[GND]
    3 --- Lminus[L-]
    
```

**Notas**

Notas		*) para água; 5...100 cm/s; 25°C (ajuste de fábrica) **) para água; 5...100 cm/s; 10...70°C
Quantidade	[peça]	1

**efector300**<sup>®</sup>

**SI5000**

SID10ABBPKG/US-100



**Sensores de fluxo**

ifm electronic gmbh • Friedrichstraße 1 • 45128 Essen — Nos reservamos o direito de fazer alterações técnicas sem aviso prévio — BR — SI5000 — 09.07.2013

1	EN	Instruction Manual	DC Power Supply
2	DE	Bedienungsanleitung	DC Stromversorgung
3	FR	Manual d'instructions	DC Alimentation d'Énergie
4	ES	Manual de instrucciones	DC Fuente De Alimentación
5	IT	Manuale di Istruzione	DC Gruppo di alimentazione
6	PT	Manual de Instruções	DC Fonte De Alimentação

## Read this first!

English 1

Before operating this unit please read this manual thoroughly and retain this manual for future reference! This device may only be installed and put into operation by qualified personnel. If damage or malfunction should occur during operation, immediately turn power off and send unit to the factory for inspection. The unit does not contain serviceable parts. The tripping of an internal fuse (if included) is caused by an internal defect. The information presented in this document is believed to be accurate and reliable and may change without notice. For any clarifications the English translation will be used.

**Intended Use:** This power supply is designed for installation in an enclosure and is intended for general use such as in industrial control, office, communication, and instrumentation equipment. Do not use this power supply in aircraft, trains and nuclear equipment where malfunction may cause severe personal injury or threaten human life.

### ⚠ WARNING

Risk of electrical shock, fire, personal injury or death.

- 1) Do not use the power supply without proper grounding (Protective Earth).
- 2) Turn power off before working on the device. Protect against inadvertent re-powering.
- 3) Make sure that the wiring is correct by following all local and national codes.
- 4) Do not modify or repair the unit.
- 5) Do not open the unit as high voltages are present inside.
- 6) Use caution to prevent any foreign objects from entering the housing.
- 7) Do not use in wet locations or in areas where moisture or condensation can be expected.
- 8) Do not touch during power-on, and immediately after power-off. Hot surfaces may cause burns.

### WARNING EXPLOSION HAZARDS (Notes for use in hazardous locations only)

Units which are marked with "Class I Div 2" are suitable for use in non-hazardous or Class I Division 2 Groups A, B, C, D locations only.

Substitution of components may impair suitability for Class I Division 2 environment. Do not disconnect equipment unless power has been switched off.

Wiring must be in accordance with Class I, Division 2 wiring methods of the National Electrical Code, NFPA 70, and in accordance with other local or national codes.

### CAUTION

Reduction of output current may be necessary when:

- 1) Minimum installation clearance can not be met.
- 2) Altitude is higher than 2000m.
- 3) Device is used above +60°C ambient.
- 4) Mounting orientation is other than input terminal located at the bottom and output at the top.
- 5) Airflow for convection cooling is obstructed.

Details for de-rating can be found in this manual and in the datasheet of the unit..

## Vor Inbetriebnahme lesen!

Deutsch 2

Bitte lesen Sie diese Warnungen und Hinweise sorgfältig durch, bevor Sie das Gerät in Betrieb nehmen. Bewahren Sie die Anleitung zum Nachlesen auf. Das Gerät darf nur durch fachkundiges und qualifiziertes Personal installiert werden. Bei Funktionsstörungen oder Beschädigungen schalten Sie sofort die Versorgungsspannung ab und senden das Gerät zur Überprüfung ins Werk. Das Gerät beinhaltet keine Servicebauteile. Interne Sicherungen (falls vorhanden) lösen nur bei Gerätedefekt aus. Die angegebenen Daten dienen allein der Produktbeschreibung und sind nicht als zugesicherte Eigenschaften im Rechtssinne aufzufassen. Im Zweifelsfall gilt der englische Text.

**Bestimmungsgemäßer Gebrauch:** Diese Stromversorgung ist für den Einbau in ein Gehäuse konzipiert und zur Verwendung für allgemeine elektronische Geräte, wie z.B. Industriesteuerungen, Bürogeräte, Kommunikationsgeräte oder Messgeräte geeignet. Benutzen Sie diese Stromversorgung nicht in Steuerungsanlagen von Flugzeugen, Zügen oder nuklearen Einrichtungen, in denen eine Funktionsstörung zu schweren Verletzungen führen oder Lebensgefahr bedeuten kann.

### ⚠ WARNUNG

Misachtung nachfolgender Punkte kann einen elektrischen Schlag, Brände, schwere Unfälle oder Tod zur Folge haben.

- 1) Betreiben Sie die Stromversorgung nie ohne Schutzleiter.
- 2) Schalten Sie die Eingangsspannung vor Installations-, Wartungs- oder Änderungsarbeiten ab und sichern Sie diese gegen unbeabsichtigtes Wiedereinschalten.
- 3) Sorgen Sie für eine ordnungsgemäße und fachgerechte Verdrahtung.
- 4) Führen Sie keine Änderungen oder Reparaturversuche am Gerät durch.
- 5) Gerät niemals öffnen. Im Inneren befinden sich gefährliche Spannungen.
- 6) Verhindern Sie das Eindringen von Fremdkörpern, wie z.B. Büroklammern und Metallteilen.
- 7) Betreiben Sie das Gerät nicht in feuchter Umgebung oder in einer Umgebung, bei der mit Befeuung oder Kondensation zu rechnen ist.
- 8) Gehäuse nicht während des Betriebes oder kurz nach dem Abschalten berühren. Heiße Oberflächen können Verletzungen verursachen.

### VORSICHT

Rücknahme der Ausgangsleistung kann erforderlich sein:

- 1) wenn die minimalen Einbaubstände nicht eingehalten werden können.
- 2) bei Aufstellhöhen über 2000m.
- 3) Betrieb bei Umgebungstemperaturen über +60°C.
- 4) bei Einbaulagen abweichend von der Standardbaulage (Eingang unten, Ausgang oben).
- 5) bei behinderter Luftzirkulation.

Details zur Leistungsrücknahme befinden sich in dieser Betriebsanleitung oder im Datenblatt des Gerätes.

### ACHTUNG EXPLOSIONSGEFAHR! (Hinweise für den Betrieb in explosionsgefährdeten Umgebungen)

Geräte, die am Leistungsschaltkreis mit "Class I Div 2" gekennzeichnet sind, sind für den Einsatz in Klasse I Division 2 Gruppen A,B,C,D oder für nicht explosionsgefährdete Aufstellorte geeignet. Veränderungen an Bauteilen können die Tauglichkeit für Klasse I Division 2 beeinträchtigen. Anschlüsse nicht trennen, solange Spannung anliegt. Anschluss muss unter Berücksichtigung der Anforderungen nach Klasse I Division 2 Artikel 501-4(b) des National Electrical Code, NFPA 70, erfolgen.

## A lire avant mise sous tension!

Français 3

Merci de lire ces instructions de montage et d'entretien avant de mettre l'alimentation sous tension. Conservez ce manuel qui vous sera toujours utile. Cette alimentation doit être installée par du personnel qualifié et compétent. Le déclenchement du fusible interne traduit très probablement un défaut au niveau de l'appareil. Si un défaut quelconque apparaît en cours de fonctionnement, débrancher au plus vite l'alimentation. Dans ce deux cas de figure, il convient de faire contrôler l'alimentation en usine! Les données indiquées dans ce document servent uniquement à donner une description du produit et n'ont aucune valeur juridique. En cas de divergences, le texte anglais fait foi.

**Utilisation:** Cet appareil est conçu pour être installé dans une armoire et pour tous les équipements électroniques, tel que l'équipement industriel de commande, l'équipement de bureau, le matériel de communication et les instruments de mesures. N'utilisez pas cet appareil pour l'équipement de commandes dans les avions, les trains et l'équipement atomique où un problème de fonctionnement de l'alimentation pourrait causer des blessures graves ou menacer la vie humaine.

### ⚠ AVERTISSEMENT

Prendre en compte les points suivants, afin d'éviter toute détérioration électrique, incendie, dommage aux personnes ou mort.

- 1) ne jamais faire fonctionner l'alimentation sans raccordement à la terre !
- 2) débrancher l'installation avant toute intervention sur l'alimentation (ou démontage) et s'assurer qu'il n'y a pas risque de redémarrage.
- 3) s'assurer que le câblage a été fait selon les prescriptions
- 4) ne pas effectuer de réparations ou modifications sur l'alimentation
- 5) ne pas ouvrir l'appareil. Des tensions importantes passent à l'intérieur.
- 6) veiller à ce qu'aucun objet ne rentre en contact avec l'intérieur de l'alimentation (trombones, pièces métalliques)
- 7) ne pas faire fonctionner l'appareil dans un environnement humide ou à l'extérieur, non protégé. Ne pas utiliser l'appareil dans un environnement où il peut y avoir de la condensation.
- 8) ne pas toucher le carter pendant le fonctionnement ou après la mise sous tension. Surface chaude risquant d'entraîner des blessures.

### ATTENTION

Des limitations de puissance de sortie peuvent apparaître si :

- 1) les distances d'installation mini. ne peuvent être observées
- 2) installation à une altitude > 2000 m
- 3) pour des fonctionnements en charge et avec une température ambiante > 60°C
- 4) pour des positions de montage différentes de la préconisation standard (entrée dessous, sortie en haut).
- 5) lorsque la circulation d'air est gênée

D'autres informations sont disponibles dans la documentation de mise en service

### ATTENTION RISQUE D' EXPLOSION (Utilisation Class I Div 2)

Les appareils portant la marque 'Class I Div 2' au niveau de la plaque signalétique sont prévus pour fonctionner en Classe I, Division 2, Groupes A,B,C,D ou pour un environnement non explosif et non dangereux. Le remplacement de composants peut rendre le matériel impropre à une utilisation en Classe 1, Division 2. Ne déconnectez l'équipement qu' hors tension ou en zone connue comme non dangereuse. Le raccordement doit obligatoirement tenir compte des exigences de la classe 1, division 2, article 501-4(b) du National Electrical Code, NFPA 70.

**Lea primero!**

Conserve este manual como referencia para futuras consultas. La fuente de alimentación solo puede ser instalada y puesta en funcionamiento por personal cualificado. Por favor lea detenidamente este manual antes de conectar la fuente de alimentación. Cuando se funde un fusible interno, existe gran probabilidad de un fallo interno en el equipo. Si se produce un fallo o mal funcionamiento durante la operación, desconecte inmediatamente la tensión de alimentación. En ambos casos, el equipo debe ser inspeccionado en fábrica. La información presentada en este documento es exacta y fiable en cuanto a la descripción del producto y puede cambiar sin aviso. En caso de duda, prevalece el texto inglés.

**Uso apropiado:** Este equipo ha sido diseñado para su instalación en un ambiente cerrado y ha sido concebido para uso general en instalaciones de control industrial, oficinas, comunicaciones y equipos de instrumentación. No emplee este equipo en aeronaves, trenes e instalaciones atómicas, donde un mal funcionamiento de la fuente de alimentación puede ocasionar lesiones graves o riesgo mortal.

**ADVERTENCIA**

Riesgo de descarga eléctrica, incendio, accidente grave o muerte.

- 1) No conectar nunca la unidad sin conexión de puesta a tierra.
- 2) Desconectar la tensión de red antes de trabajar en la fuente de alimentación. Evite una posible reconnexión involuntaria.
- 3) Asegurarse de que el cableado es correcto de acuerdo a los códigos locales y nacionales.
- 4) No realizar ninguna modificación o reparación de la unidad.
- 5) No abrir nunca la unidad. En el interior existe riesgo de altas tensiones.
- 6) Evitar la introducción en la carcasa de objetos extraños.
- 7) No usar el equipo en ambientes húmedos. No operar el equipo en ambientes donde se espere la formación de rocío o condensación.
- 8) No tocar durante el funcionamiento ni inmediatamente después del apagado. El calor de la superficie puede causar quemaduras graves

**ATENCIÓN**

La deriva en la tensión de salida se produce:

- 1) cuando no pueden mantenerse las distancias mínimas de montaje.
- 2) en caso de que el montaje se realice en altitudes superiores a los 2000 m.
- 3) en caso de funcionamiento a plena carga y temperaturas ambientales superiores a +60°C.
- 4) en caso de posiciones de montaje diferentes a la posición de montaje estándar (terminales de entrada abajo y terminales de salida arriba).
- 5) en caso de que la circulación de aire para la refrigeración por conducción esté obstruida.

Puede encontrar más detalles del caso de deriva en este manual.

**ATENCIÓN PELIGRO DE EXPLOSIÓN! (Uso apropiado Class I Div 2)**

Los equipos marcados con la expresión "Class I Div 2" son adecuados para su uso en ambientes no peligrosos y en entornos con la Clase I División 2 Grupos A, B, C, D. La sustitución de componentes puede perjudicar la idoneidad para la Clase I División 2. No desconecte el equipo a menos que la tensión de alimentación esté desconectada.

El conexionado debe cumplir con la Clase I División 2 métodos de conexión del Código Nacional Eléctrico NFPA 70 o con el resto de códigos locales o nacionales.

**Leggere prima questa parte!****Italiano**

Prima di collegare il sistema di alimentazione elettrica si prega di leggere attentamente le seguenti avvertenze. Conservare le istruzioni per la consultazione futura. Il sistema di alimentazione elettrica deve essere installato solo da personale competente e qualificato. In caso di intervento del fusibile interno, molto probabilmente l'apparecchio è guasto. Se durante il funzionamento si verificano anomalie o guasti, scollegare immediatamente la tensione di alimentazione. In entrambi i casi è necessario far controllare l'apparecchio dal produttore! I dati sono indicati solo a scopo descrittivo del prodotto e non vanno considerati come caratteristiche garantite dell'apparecchio. In caso di differenze o problemi è valido il testo inglese

**Uso previsto:** Questo apparecchio è previsto per il montaggio in un rack per moduli elettronici, ad esempio per controllori industriali, apparecchiature per ufficio, unità di comunicazione o apparecchi di misura. Non utilizzare l'apparecchio in impianti di controllo di aerei, di treni o di impianti nucleari in cui il suo eventuale guasto può comportare gravi lesioni o la morte di persone.

**AVVERTENZA**

Il mancato rispetto delle seguenti norme può provocare folgorazione elettrica, incendi, gravi incidenti e perfino la morte.

- 1) Non far funzionare in nessun caso il sistema di alimentazione elettrica senza conduttore di protezione!
- 2) Prima di eseguire interventi di installazione, di manutenzione o di modifica scollegare la tensione di rete ed adottare tutti i provvedimenti necessari per impedire il ricollegamento non intenzionale.
- 3) Assicurare un cablaggio regolare e corretto.
- 4) Non tentare di modificare o di riparare da soli l'apparecchio.
- 5) Non aprire l'apparecchio. Al suo interno sono applicate tensioni elettriche pericolose.
- 6) Impedire la penetrazione di corpi estranei nell'apparecchio, ad esempio fermagli o altri oggetti metallici.
- 7) Non far funzionare l'apparecchio in un ambiente umido. Non far funzionare l'apparecchio in un ambiente soggetto alla formazione di condensa o di rugiada.
- 8) Non toccare quando acceso e subito dopo lo spegnimento. La superficie calda può causare scottature.

**ATTENZIONE**

È necessario ridurre la potenza di uscita se:

- 1) non è possibile rispettare le distanze minime di montaggio;
- 2) l'apparecchio viene installato in un luogo di altitudine maggiore di 2000 m;
- 3) il funzionamento è a pieno carico a temperatura ambiente maggiore di +60°C;
- 4) la posizione di montaggio differisce da quella standard (ingresso in basso, uscita in alto).
- 5) è ostacolata la libera circolazione dell'aria.

Ulteriori informazioni sono riportate in questo manuale.

**ATTENZIONE: PERICOLO DI ESPLOSIONE! (Uso previsto Class I Div 2)**

Gli apparecchi la cui targhetta riporta "Class I Div 2" sono adatti per l'impiego in ambienti di classe I, divisione 2, gruppi A, B, C e D e non soggetti al pericolo di esplosione. La modifica dei componenti possono influenzare negativamente l'idoneità per ambienti di classe I, divisione 2. Non aprire i morsetti con tensione di alimentazione collegata. Il collegamento deve essere eseguito nel rispetto dei requisiti previsti dalla classe I, divisione 2, articolo 501-4(b) del National Electrical Code, NFPA 70.

**Leia primeiro!****Portuguès**

Recomendamos a leitura cuidadosa das seguintes advertências e observações, antes de colocar em funcionamento a fonte de alimentação. Guarde as instruções para futura consulta, em casos de dúvida. A fonte de alimentação deverá ser instalada apenas por profissionais da área, tecnicamente qualificados. Se o fusível interno se fundir, é grande a possibilidade de existir um defeito no aparelho. Se por acaso, durante a utilização ocorrer algum defeito de funcionamento ou dano, desligue imediatamente a tensão de alimentação. Em ambos os casos, será necessária uma verificação na Fábrica! Os dados mencionados têm como finalidade somente a descrição do produto, e não devem ser interpretados como propriedades garantidas no sentido jurídico. Em caso de dúvida aplique-se o texto em inglês.

**Utilize:** Apenas para o fim pré-estabelecido. Este aparelho foi concebido para ser montado dentro de invólucros, caixas ou armários para aparelhos eletrônicos em geral, como, por exemplo, comandos de instalações industriais, aparelhos para escritórios, aparelhos de comunicação ou instrumentos de medida e quadros eléctricos. Não utilize este aparelho em sistemas de comando de aviões, de comboios ou em instalações movidas por energia nuclear, nos quais um defeito de funcionamento poderá causar danos graves ou significar risco de morte.

**ATENÇÃO**

A não observância ou o incumprimento dos pontos a seguir mencionados, poderá causar uma descarga elétrica, incêndios, acidentes graves ou morte.

- 1) Não use a fonte de alimentação sem o condutor de proteção terra!
- 2) Antes de trabalhos de instalação, manutenção ou modificação, desligue a tensão de alimentação, protegendo-a contra uma nova ligação involuntária.
- 3) As ligações devem ser efectuadas apenas por profissionais competentes.
- 4) Não efectue nenhuma modificação ou tentativa de reparação no aparelho. Quando necessário contacte o seu distribuidor.
- 5) Não abra o aparelho mesmo quando desligado. No seu interior existem condensadores que podem estar carregados electricamente.
- 6) Proteger a fonte de alimentação contra a introdução inadvertida de corpos metálicos, como por ex., cliques ou outras peças de metal.
- 7) Não usar o aparelho em ambientes húmidos. Não usar o aparelho em ambientes propensos a condensações.
- 8) Não tocar enquanto estiver em funcionamento, nem após a desligar. A superfície poderá estar quente e provocar lesões.

**CUIDADO**

Será necessário reduzir a potência de saída nos seguintes casos:

- 1) Quando não forem observadas as distâncias mínimas de montagem.
- 2) Quando instaladas a altitudes superiores a 2000m.
- 3) Existência de temperatura ambiente superior a +60°C, em plena carga do aparelho.
- 4) Montagem invertida do aparelho (Entrada em baixo, saída em cima).
- 5) Montagem em ambiente sem ventilação.

No presente manual de funcionamento encontram-se ainda outras informações.

**ATENÇÃO, RISCO DE EXPLOSÃO! (Utilize Class I Div2)**

Aparelhos que contêm na sua placa de dados elétricos o texto "Class I Div 2" são apropriados para a aplicação na Classe I, divisão 2, Grupos A, B, C, D ou também para locais de instalação isentos de riscos de explosão. Modificações efetuadas em componentes podem restringir ou reduzir a adequação para aplicação na Classe I, Divisão 2. As ligações não devem ser separadas enquanto estiverem ligadas a uma fonte de alimentação elétrica. As ligações devem ser efetuadas levando-se em consideração as exigências normativas da Classe I, Divisão 2.

Technical Data <sup>1)</sup>	Technische Daten <sup>1)</sup>	1606-XLE80E	1606-XLE120E	1606-XLE120EN	1606-XLE120EE	1606-XLE240E	1606-XLE240EP	1606-XLE240EN	1606-XLE240EE	1606-XLE240F
<b>Output Voltage</b>	<b>Ausgangsspannung</b>	nom.	DC 24-28V	DC 24-28V	DC 24-28V	DC 24-28V	DC 24-28V	DC 24-28V	DC 24-28V	DC 48-52V
Factory Setting <sup>17)</sup>	Werkseinstellung <sup>17)</sup>	typ.	24.1V	24.1V	24.1V	24.1V	24.1V	24.1V	24.1V	48.0V
Output Current	Ausgangsstrom	nom.	3.3A @24V	5A @24V	5A @24V	5A @24V	10A @24V	10A @24V	10A @24V	5A @48V
		nom.	2.7A @28V	4.3A @28V	4.3A @28V	4.3A @28V	8.6A @28V	8.6A @28V	8.6A @28V	4.6A @52V
	Power Boost	N/A <sup>14)</sup>	6A @24V <sup>3)4)</sup>	6A @24V <sup>3)4)</sup>	6A @24V <sup>3)4)</sup>	6A <sup>3)</sup> @24V	12A @24V <sup>3)</sup>	12A @24V <sup>3)</sup>	12A @24V <sup>3)</sup>	6A @48V <sup>3)</sup>
	Power Boost	N/A <sup>14)</sup>	5.1A @28V <sup>3)4)</sup>	5.1A @28V <sup>3)4)</sup>	5.1A <sup>3)</sup> @28V	10.3A @28V <sup>3)</sup>	10.3A @28V <sup>3)</sup>	10.3A @28V <sup>3)</sup>	10.3A @28V <sup>3)</sup>	5.5A @52V <sup>3)</sup>
<b>Output Power</b>	<b>Ausgangsleistung</b>	nom.	80W	120W	120W	120W	240W	240W	240W	240W
	Power Boost	N/A <sup>14)</sup>	144W <sup>3)4)</sup>	144W <sup>3)4)</sup>	144W <sup>3)</sup>	288W <sup>3)</sup>	288W <sup>5)</sup>	288W <sup>3)</sup>	288W <sup>3)</sup>	288W <sup>3)</sup>
<b>Output Ripple <sup>19)</sup></b>	<b>Ausgangswelligkeit <sup>19)</sup></b>	max.	50mVpp	50mVpp	50mVpp	50mVpp	50mVpp	50mVpp	50mVpp	100mVpp
<b>AC Input Voltage</b>	<b>AC Eingangsspannung</b>	nom.	100-240Vac ±10%	100-120Vac/ 200-240Vac ±10%	100-120Vac/ 200-240Vac ±10%	200-240Vac ±10%	100-120Vac/ 200-240Vac ±10%	100-120Vac/ 200-240Vac ±10%	100-120Vac/ 200-240Vac ±10%	100-120Vac/ 200-240Vac ±10%
<b>Input Frequency</b>	<b>Eingangs frequenz</b>	nom.	50-60Hz	50-60Hz	50-60Hz	50-60Hz	50-60Hz	50-60Hz	50-60Hz	50-60Hz
AC Input Current <sup>16)</sup>	AC Eingangsstrom <sup>16)</sup>	typ.	1.4 / 0.75	2.6 / 1.4A	2.6A / --	-- / 1.4A	5.0 / 2.7A	5.0 / 2.4A	5.0A / --	-- / 2.7A
Power Factor <sup>17)</sup>	Leistungsfaktor <sup>17)</sup>	typ.	0.61 / 0.56	0.56 / 0.47	0.59 / --	-- / 0.5	0.59 / 0.51	0.59 / 0.57	0.57 / --	-- / 0.52
Harmonic Correction <sup>18)</sup>	Oberwellenkorrektur <sup>18)</sup>	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein
EN 61000-3-2	EN 61000-3-2	PFC-Norm	Yes / Ja	No / Nein	N/A <sup>14)</sup>	Yes / Ja	No / Nein	Yes / Ja	N/A <sup>14)</sup>	No / Nein
Allowed Voltage Phase to Earth	Erlaubte Spannung Phase zu Erde	max.	300Vac / 375Vdc	300Vac	300Vac	300Vac	300Vac	300Vac	300Vac	300Vac
DC Input Voltage <sup>7)</sup>	DC Eingangsspannung <sup>7)</sup>		88 - 375Vdc	N/A <sup>14)</sup>	N/A <sup>14)</sup>	N/A <sup>14)</sup>	N/A <sup>14)</sup>	N/A <sup>14)</sup>	N/A <sup>14)</sup>	N/A <sup>14)</sup>
Input Inrush Current <sup>11)</sup>	Einschaltspitzenstrom <sup>11)</sup>	typ.	23A / 45A	3A / 3A	45A / --	-- / 30A	3A / 3A	3A / 3A	85A / --	-- / 48A
Hold-up Time <sup>17)</sup>	Pufferzeit <sup>17)</sup>	typ.	29 / 120ms	80 / 78ms	80ms / --	-- / 78ms	46 / 47ms	46 / 42ms	46ms / --	-- / 45ms
Efficiency <sup>17)</sup>	Wirkungsgrad <sup>17)</sup>	typ.	88.0/89.8%	89.4/90.2%	90.0% / --	-- / 90.2%	91.0/91.6%	91.0/91.6%	90.8% / --	-- / 91.6%
Power Losses <sup>17)</sup>	Verlustleistung <sup>17)</sup>	typ.	11.1/9.1W	14.5/13.2W	13.5W / --	-- / 13.2W	24.1/22.4W	24.1/24.1W	24.0W / --	-- / 22.7W
Operational Temperature	Betriebstemperatur	nom.	-25 - +70°C	-25 - +70°C	-10 - +70°C	-10 - +70°C	-25 - +70°C	-25 - +70°C	0 - +70°C	-25 - +70°C
Output Derating	Leistungsrücknahme	+60°C to +70°C	1.8W/C	3W/C	3W/C	3W/C	6W/C	6W/C	6W/C	6W/C
Storage Temperature	Lagertemperatur	nom.	-40 - +85°C	-40 - +85°C	-40 - +85°C	-40 - +85°C	-40 - +85°C	-40 - +85°C	-40 - +85°C	-40 - +85°C
Humidity <sup>20)</sup>	Feuchte <sup>20)</sup>	IEC 60068-2-30	5 - 95% r.H.	5 - 95% r.H.	5 - 95% r.H.	5 - 95% r.H.	5 - 95% r.H.	5 - 95% r.H.	5 - 95% r.H.	5 - 95% r.H.
Vibration	Schwingen	IEC 60068-2-6	2g	2g	2g	2g	2g	2g	2g	2g
Shock	Schocken	IEC 60068-2-27	30g 6ms, 20g 11ms	30g 6ms, 20g 11ms	30g 6ms, 20g 11ms	30g 6ms, 20g 11ms	30g 6ms, 20g 11ms	30g 6ms, 20g 11ms	30g 6ms, 20g 11ms	30g 6ms, 20g 11ms
Degree of Pollution <sup>22)</sup>	Verschmutzungsgrad <sup>22)</sup>	EN 62103	2	2	2	2	2	2	2	2
Degree of Protection	Schutzart	EN 60529	IP20	IP20	IP20	IP20	IP20	IP20	IP20	IP20
Class of Protection	Schutzklasse	IEC 61140	<sup>8)</sup>	<sup>8)</sup>	<sup>5)</sup>	<sup>5)</sup>	<sup>5)</sup>	<sup>5)</sup>	<sup>5)</sup>	<sup>5)</sup>
Over-temp. Protection <sup>15)</sup>	Übertemperaturschutz <sup>15)</sup>	OTP	No / Nein	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja
Over-voltage Protect. <sup>15)</sup>	Überspannungsschutz <sup>15)</sup>	OVP, max.	34Vdc	35Vdc	35Vdc	35Vdc	35Vdc	35Vdc	35Vdc	56Vdc
PE- (Leakage) Current <sup>21)</sup>	PE- Ableitstrom <sup>21)</sup>	max.	0.32/0.57mA	0.53/0.60mA	0.53mA / -	/ -0.60mA	0.62/0.85mA	0.62/0.85mA	0.62mA / -	/ -0.85mA
Return Volt Resistance <sup>8)</sup>	Rückspeisefestigkeit <sup>8)</sup>	max.	35Vdc	35Vdc	35Vdc	35Vdc	35Vdc	35Vdc	35Vdc	63Vdc
Parallel Use <sup>12)</sup>	Parallelschaltbar <sup>12)</sup>	-	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein	No / Nein
Serial Use <sup>13)</sup>	Serienschaltbar <sup>13)</sup>	-	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja	Yes / Ja
Dimensions <sup>9)</sup> (WxHxD)	Abmessungen <sup>9)</sup> (BxHxT)	nom.	32x124x102	32x124x117	32x124x117	32x124x117	60x124x117	60x124x117	60x124x117	60x124x117
Weight	Gewicht	max.	430g / 0.95lb	500g / 1.1lb	500g / 1.1lb	500g / 1.1lb	700g / 1.54lb	800g / 1.76lb	700g / 1.54lb	700g / 1.54lb
Approvals	Zulassungen	-	→ <sup>10)</sup>	→ <sup>10)</sup>	→ <sup>10)</sup>	→ <sup>10)</sup>	→ <sup>10)</sup>	→ <sup>10)</sup>	→ <sup>10)</sup>	→ <sup>10)</sup>

- 1) All parameters are specified at 230Vac input voltage, nominal output current, 25°C ambient and after a 5 minutes run-in time unless otherwise noted.
- 2) The model 1606-XLE120EC are identical to the model 1606-XLE120E with the exception that the PC board is conformal coated.
- 3) The PowerBoost is continuously allowed up to an ambient of 45°C. Above that temperature, do not use the PowerBoost longer than a duty cycle of 10% and not longer than 1 minute every 10 minutes.
- 4) The unit can respond with a thermal shut-down when continuously loaded with more than 120W and operated with a mains voltage of 100V or below.
- 5) Do not use the PowerBoost longer than a duty cycle of 10% and not more often than 1 minute every 10 minutes.
- 6) PE connection required (Ground).
- 7) Use a battery or similar DC source. Connect +pole to L and -pole to N.
- 8) Loads such as decelerating motors and inductors can feed voltage back to the output of the power supply. The figure represents the maximum allowed feed back voltage
- 9) Dimensions in mm. Depth without DIN-rail.
- 10) See datasheet or markings on the unit.
- 11) Peak value at an ambient temperature of 40°C, cold start and 120/230Vac.
- 12) The power supplies shall not be used in parallel in order to increase the output power. However, units can be paralleled for building 1+1 redundancy systems or to deliver short-term peak currents to the load when the average current is smaller than the current of one unit.
- 13) Use only power supplies of the same type. The total output voltage should not exceed 150Vdc
- 14) Not applicable
- 15) Output shut-down with automatic restart
- 16) At full load and the lower end of the input voltage of 120/230Vac
- 17) At full load and nominal input voltage of 120/230Vac
- 18) Harmonic correction describes whether the input current waveform is filtered in order to reduce the amount of harmonic current. A not filtered unit does not necessarily mean that the EN 61000-3-2 is not fulfilled.
- 19) 50 Ohm measurement, bandwidth 20MHz
- 20) Do not energize while condensation is present.
- 21) Leakage current at 132Vac, 60Hz / 264Vac, 50Hz, TT/TN-mains
- 22) non conductive
- 1) Alle Werte gelten bei 230Vac Eingangsspannung, Nennausgangsstrom, 25°C Umgebung und nach einer Aufwärmzeit von 5 Minuten, wenn nichts anderes angegeben ist.
- 2) Das Modell 1606-XLE120EC ist identisch zum Modell 1606-XLE120E mit der Ausnahme, dass die Leiterplatten mit Schutzlack überzeugen sind.
- 3) Der PowerBoost kann <45°C dauerhaft entnommen werden. Über 45°C ist eine max. Einschaltdauer von 10% erlaubt, die nicht öfters als 1 Minute alle 10 Minuten wiederholt werden darf.
- 4) Bei einer Dauerbelastung >120W und einer Eingangsspannung <120Vac kann das Gerät thermisch abschalten.
- 5) Der PowerBoost darf mit einer max. Einschaltzeit von 10% und nicht öfters als 1 Minute alle 10 Minuten entnommen werden.
- 6) PE Verbindung erforderlich.
- 7) Geeignet sind Batterien oder ähnliche Quellen. Den + Pol an L und - Pol an N anschließen.
- 8) Bremsende Motoren oder Induktivitäten können Spannung zum Ausgang des Netzteils rückspeisen. Der Wert gibt die max. zulässige Rückspeisespannung an.
- 9) Abmessungen in mm. Tiefe ohne DIN-Schiene
- 10) Siehe Datenblatt oder Prüfzeichen auf dem Gerät.
- 11) Spitzenwert bei einer Umgebungstemperatur von 40°C, Kaltstart und 120/230Vac.
- 12) Ausgänge der Stromversorgung sollen nicht parallel geschaltet werden. Eine Parallelschaltung ist nur für 1+1 Redundanzanwendungen oder zur Abdeckung kurzer Spitzenlasten erlaubt, wenn der mittlere Ausgangsstrom kleiner ist als der Nennstrom eines Gerätes.
- 13) Nur gleiche Geräte bis zu einer Gesamtspannung von 150Vdc
- 14) Nicht anwendbar
- 15) Ausgang schaltet ab und macht regelmäßig automatische Startversuche
- 16) Bei Nennlast und dem unteren Ende der Eingangsspannung von 120/230Vac
- 17) Bei Nennlast und Nenneingangsspannung von 120/230Vac
- 18) Die Angabe Oberwellenkorrektur gibt an, ob die Kurvenform des Eingangsstromes gefiltert ist. Ein nicht gefiltertes Gerät kann aber trotzdem die Anforderungen der EN 61000-3-2 erfüllen.
- 19) 50 Ohm Messung, Bandbreite 20MHz
- 20) Nicht betreiben, solange das Gerät Kondensation aufweist.
- 21) Ableitstrom bei 132Vac, 60Hz / 264Vac, 50Hz, TT/TN-Netze
- 22) nicht leitfähig

### EMC Electromagnetic Compatibility

These devices are suitable for applications in industrial environment as well as in residential, commercial and light industry environment. Please note that for some units restrictions may apply since the EN 61000-3-2 requirements are not fulfilled on all units. See also datasheet for details. These devices comply with FCC Part 15 rules. CE mark is in conformance with EMC directive 2004/108/EC and the low-voltage directive (LVD) 2006/95/EC.

**EMC Immunity:** EN 61000-6-1, EN 61000-6-2

**EMC Emission:** For all units: EN 61000-3-3, EN 61000-6-4, FCC Part 15 Class B  
For units which are marked with "Yes" in the row EN 61000-3-2 of the technical data table: EN 61000-6-3, EN 61000-3-2

### Installation

Use DIN-rails according to EN 60715 or EN 50022 with a height of 7.5 or 15mm. Mounting orientation must be output terminals on top and input terminals on the bottom. For other orientations see datasheet. Do not obstruct air flow as the unit is convection cooled. Ventilation grid must be kept free of any obstructions. The following installation clearances must be kept when power supplies are permanently fully loaded:

Left / right: 5mm (15mm in case the adjacent device is a heat source)

40mm on top, 20mm on the bottom of the unit.

### Input Fuses

All units have input fuses included (device protection, not externally accessible). The units are tested and approved for branch circuits up to 20A. An external protection is only required if the supplying branch has an ampacity greater than this. In some countries local regulations might apply. Also check local codes and requirements. If an external fuse is necessary or utilized, the following minimum ampacity value is necessary to avoid nuisance tripping of the circuit breaker.

	XLE240E/EP/F	XLE240EN	XLE80E	XLE120EN
	XLE240EE	XLE120E	XLE120EE	
Internal Fuse	T6.3A	T6.3A	T4A	T4A
Min. Ampacity B-Characteristic	B10A	B16A	B10A	B16A
Min. Ampacity C-Characteristic	C6A	C10A	C6A	C10A

### Terminals and Wiring

The power supplies are equipped with screw terminals. Use appropriate copper cables that are designed for an operating temperatures of 60°C (for ambient up to 45°C) and 75°C (for ambient up to 60°C), minimum. Follow national installation codes and regulations! Ensure that all strands of a stranded wire enter the terminal connection! Up to two stranded wires with the same cross section are permitted in one connection point (except PE wire). Ferrules are allowed, but not required.

- Solid wire / Stranded wire / American wire gauge: 0.5-6mm<sup>2</sup> / 0.5-4mm<sup>2</sup> / 20-10 AWG
- Wire stripping length: 7mm / 0.25inch
- Screw driver: 3.5mm slotted or Philips No 2.
- Recommended tightening torque: 0.8Nm / 7lb.in

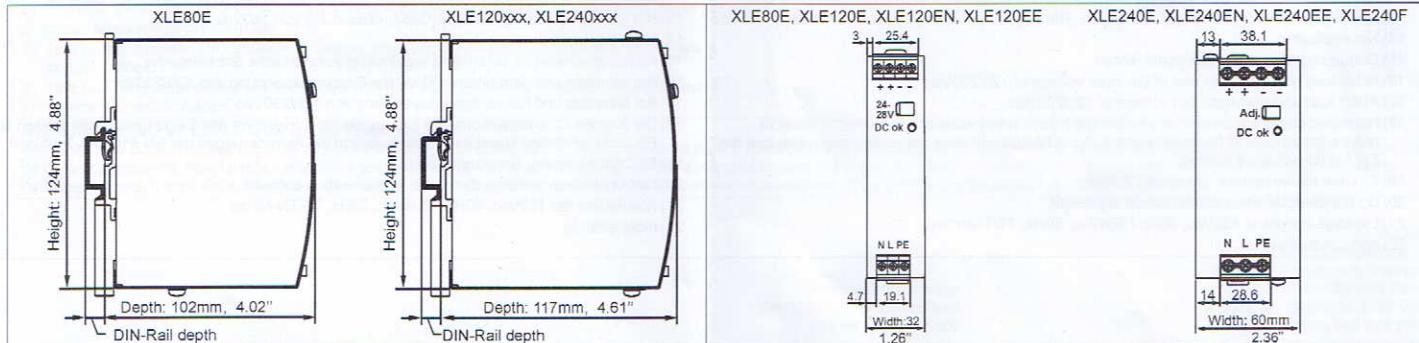
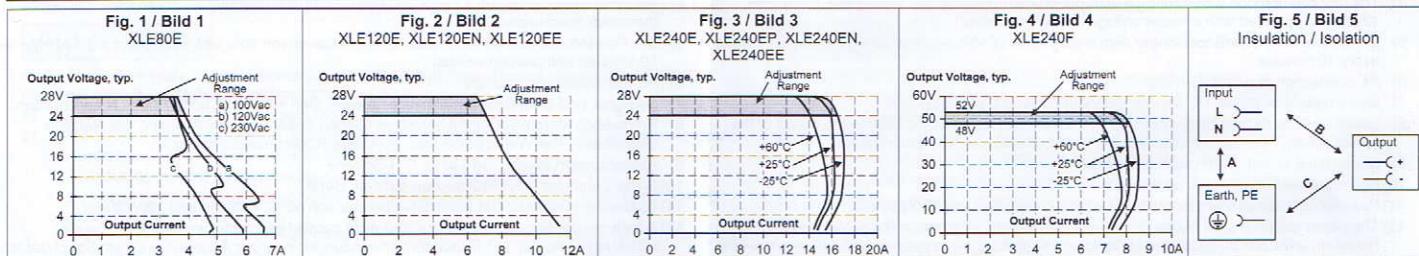
### Output- and Overload Characteristic

The power supplies are overload, no-load, short-circuit proof. The units have power reserves of 20% included (except XLE80E). This extra current may even be used continuously at temperatures up to +45°C (except XLE240EP). At overload, the output current flows continuously. The units do not switch-off or hiccup at overload. The characteristics can be found in the figures 1, 2, 3 and 4.

### Dielectric Strength (see Fig. 5)

The output voltage is floating and separated from the input according to SELV (IEC/EN 60950-1) and PELV (EN 60204-1, EN 50178; IEC 62103, IEC 60364-4-41) requirements. Type and factory tests are conducted by the manufacturer. Field tests may be conducted in the field using the appropriate test equipment which applies the voltage with a slow ramp (2s up and 2s down). Connect L and N together as well as all output poles before the test is conducted. When testing, set the cut-off current settings to the value in the table below.

	A	B	C
Type Test (60s)	2500Vac	3000Vac	500Vac
Factory Test (5s)	2500Vac	2500Vac	500Vac
Field Test (5s)	2000Vac	2000Vac	500Vac
Cut-off current setting	>10mA	>10mA	>20mA



### EMV Elektromagnetische Verträglichkeit

Diese Geräte erfüllen die Anforderungen für Anwendungen sowohl in industrieller Umgebung als auch für den Wohn-, Geschäfts- und Gewerbebereich. Einige dieser Gerätetypen erfüllen die Anforderungen der EN 61000-3-2 nicht und es kann daher zu Einschränkungen bei Anwendungen kommen. Siehe auch Details im Datenblatt. Die Geräte erfüllen auch die Anforderungen der FCC Teil 15. Das CE Zeichen ist angebracht und erklärt die Erfüllung der EMV Richtlinie 2004/108/EG und der Niederspannungsrichtlinie 2006/95/EG.

**EMV Störfestigkeit:** EN 61000-6-1, EN 61000-6-2

**EMV Störäussendung:** Für alle Geräte: EN 61000-3-3, EN 61000-6-4, FCC Part 15 Klasse B  
Für Geräte, die in der Spalte EN 61000-3-2 der Tabelle mit techn. Daten den Eintrag „Ja“ haben: EN 61000-3-2, EN 61000-6-3;

### Installation

Geeignet für DIN-Schienen entsprechend EN 60715 oder EN 50022 mit einer Höhe von 7,5 oder 15mm. Der Einbau hat so zu erfolgen, dass sich die Eingangsklemmen unten und die Ausgangsklemmen oben befinden. Für andere Einbaulagen siehe Datenblatt. Luftzirkulation nicht behindern! Das Gerät ist für Konvektionskühlung ausgelegt. Es ist für ungehinderte Luftzirkulation zu sorgen. Folgende Einbaubstände sind bei dauerhafter Vollast zu einzuhalten:

Links / rechts: 5mm (15mm bei benachbarten Wärmequellen)

Oben: 40mm, unten 20mm vom Gerät.

### Sicherungen am Eingang

Die Geräte haben Sicherungen eingebaut (Gerätesicherung, nicht austauschbar durch Anwender) und sind geprüft und zugelassen zum Anschluss an Stromkreisen bis max. 20A. Ein zusätzlicher Schutz ist nur erforderlich, wenn der Speisestromkreis mit einem höheren Wert abgesichert ist oder wenn nationale Richtlinien es fordern. Falls ein externes Schutzelement verwendet wird, soll dieses den nachfolgenden Wert nicht unterschreiten, um ein fehlerhaftes Auslösen zu vermeiden.

	XLE240E/EP/F	XLE240EN	XLE80E	XLE120EN
	XLE240EE	XLE120E	XLE120EE	
Interne Sicherung	T6.3A	T6.3A	T4A	T4A
Min. Sicherung B-Charakteristik	B10A	B16A	B10A	B16A
Min. Sicherung C-Charakteristik	C6A	C10A	C6A	C10A

### Anschlussklemmen und Verdrahtung

Die Stromversorgungen sind mit Schraubklemmen ausgestattet. Verwenden Sie geeignete Kupferkabel, die mindestens für 60°C (bei einer Umgebungstemperatur bis zu 45°C) und 75°C (bei einer Umgebungstemperatur bis zu 60°C) zugelassen sind. Beachten Sie nationale Bestimmungen und Installationsvorschriften! Stellen Sie sicher, dass keine einzelnen Drähte von Litzen abstehen. Bis zu zwei Leiter mit gleichem Querschnitt sind in einer Klemme zulässig (außer für den Schutzleiter). Aderhülsen sind erlaubt, aber nicht erforderlich.

- Starrdräht / Litze / Amerikanischer Querschnitt: 0.5-6mm<sup>2</sup> / 0.5-4mm<sup>2</sup> / 20-10 AWG
- Abisolierlänge: 7mm / 0.25inch
- Schraubenzieher: 3.5mm Schlitzschraubendreher oder Philips No 2
- Empfohlenes Anzugsdrehmoment: 0.8Nm / 7lb.in

### Ausgangs- und Überlastverhalten

Die Geräte sind leerlauf-, überlast- und kurzschlussfest. Die Geräte verfügen über 20% (außer XLE80E) Reserveleistung, die bis zu einer Umgebungstemperatur von 45°C dauerhaft entnommen werden kann (außer XLE240EP). Bei Überlast fließt kontinuierlich Strom. Die Geräte schalten nicht ab und haben auch keinen "Hiccup" Modus. Das Verhalten ist in den Bildern 1, 2, 3 und 4 gezeigt.

### Isolationsfestigkeit (siehe Bild 5)

Die Ausgangsspannung ist nicht geerdet und ist zum Eingang nach SELV (IEC/EN 60950-1) und PELV (EN 60204-1, EN 50178, IEC 62103, IEC 60364-4-41) getrennt. Typ- und Stückprüfungen werden beim Hersteller durchgeführt. Wiederholungsprüfungen dürfen mittels geeigneten Prüfgeneratoren mit langsam (2s) ansteigenden und abfallenden Spannungsrampen in der Anwendung erfolgen. Vor den Tests sind L und N wie auch alle Ausgangspole miteinander zu verbinden. Die Strom- Abschaltschwelle muss größer als der in der Liste angegebene Wert sein.

	A	B	C
Typprüfung (60s)	2500Vac	3000Vac	500Vac
Stückprüfung (5s)	2500Vac	2500Vac	500Vac
Wiederholungsprüfung (5s)	2000Vac	2000Vac	500Vac
Strom- Abschaltschwelle	> 10mA	> 10mA	> 20mA

Fig. 5 / Bild 5  
Insulation / Isolation

## 1762 MicroLogix™ Expansion I/O Modules

**ATTENTION:**

- Before installing, configuring, operating or maintaining this product, read this document and the documents listed in the Additional Resources section for installing, configuring, or operating equipment. Users should familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.
- Installation, adjustments, putting into service, use, assembly, disassembly, and maintenance shall be carried out by suitably trained personnel in accordance with applicable code of practice. In case of malfunction or damage, no attempts at repair should be made. The module should be returned to the manufacturer for repair. Do not dismantle the module.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- This equipment is certified for use only within a specific surrounding air temperature range. Refer to the table on page 2 for details. The equipment must not be used outside of this range.
- Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication [SGI-1.1](#), available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature> describes some important differences between solid state equipment and hard-wired electromechanical devices.

**IMPORTANT** Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for the purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability for actual use based upon the examples shown in this publication.

### North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations:

Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local authority having jurisdiction at the time of installation.

**WARNING: EXPLOSION HAZARD**

- Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- If this product contains batteries, they must only be charged in an area known to be nonhazardous.
- This product must be installed in an enclosure.
- In Class I Division 2 applications, the bus connector must be fully seated and the bus connector cover must be snapped in place.
- In Class I Division 2 applications, all modules must be mounted in direct contact with each other. If DIN rail mounting is used, an end anchor must be installed ahead of the controller and after the last 1762 expansion I/O module.
- Do not remove or replace lamps, fuses or plug-in modules (as applicable) unless power has been disconnected or the area is known to be free of ignitable concentrations of flammable gases or vapors.
- All wiring must be in accordance with Class I, Division 2 wiring methods of Article 501 of the National Electric Code and/or in accordance with Section 18-1J2 of the Canadian Electrical Code, and in accordance with the authority having jurisdiction.

**Informations sur l'utilisation de cet équipement en environnements dangereux:**

Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.

**AVERTISSEMENT: RISQUE D'EXPLOSION**

- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

### Environment and Enclosure



**ATTENTION:** This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of SVA, V2, V1, VO (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

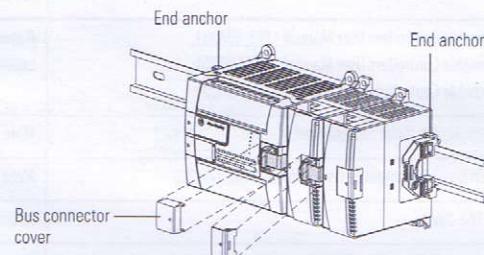
In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, Rockwell Automation publication [1770-4.1](#), for additional installation requirements.
- NEMA Standard 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.

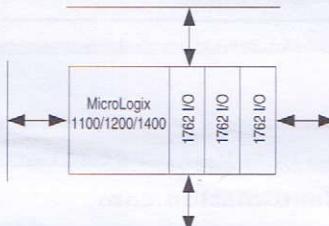
**WARNING: Special Conditions for Safe Use:**

- This product must be installed in an enclosure. All cables connected to the product must remain in the enclosure or be protected by conduit or other means.
- The local programming terminal port is intended for temporary use only and must not be connected or disconnected unless the area is free of ignitable, concentrations of flammable gases or vapors.

### DIN Rail Mounting



### Minimum Mounting Clearance



Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation.



**ATTENTION:** Do not install this product until you read the documentation in your local language. Go to <http://www.rockwellautomation.com/literature> or contact your local sales office or Rockwell Automation representative.

**ATENÇÃO:** Não instale este produto antes de ler os documentos em sua língua. Clique <http://www.rockwellautomation.com/literature> ou entre em contato com o escritório ou representante da Rockwell Automation regional.

**ATTENTION:** N'installez ce produit tant que vous n'avez pas lu la documentation dans votre langue locale. Rendez-vous sur le site <http://www.rockwellautomation.com/literature> ou contactez votre agence commerciale ou votre représentant Rockwell Automation local.

**ATTENZIONE:** Non installare questo prodotto senza prima avere letto la documentazione nella propria lingua. Consultare la pagina web <http://www.rockwellautomation.com/literature> oppure contattare l'ufficio commerciale o il rappresentante Rockwell Automation di zona.

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## Operating Temperature

Model	Operating Temperature
1762-IA8, 1762-IQ8, 1762-IR4, 1762-IT4, 1762-0A8, 1762-OB16, 1762-OB8, 1762-OW8, 1762-0X6I	0...55 °C (32...131 °F)
1762-IF20F2, 1762-IF4, 1762-IQ16, 1762-IQ80W6, 1762-OF4, 1762-OW16	-20...65 °C (-4...149 °F)
1762-IQ32T, 1762-0V32T, 1762-OB32T	-20...60 °C (-4...140 °F)

## Wire Requirements

Model	Wire Type	Wire Size	Terminal Screw Torque
All 1762 expansion I/O modules (except 1762-IQ32T, 1762-0V32T, 1762-OB32T)	Solid wire	Cu-90 °C (194 °F) 0.33...2.08 mm <sup>2</sup> (22...14 AWG)	0.90 Nm (8.0 lb-in.)
	Stranded wire	0.33...1.31 mm <sup>2</sup> (22...16 AWG)	

Model	Wire Type	Wire Size
1762-IQ32T, 1762-0V32T, 1762-OB32T	Solid/Stranded wire	Cu-90 °C (194 °F) 0.13, 0.20, 0.33 mm <sup>2</sup> (26, 24, 22 AWG) 0.13...0.33 mm <sup>2</sup> (26...22 AWG) – when using 1764-N3 Connector

## Additional Resources

Resource	Description
MicroLogix 1100 Programmable Controllers User Manual 1763-UM001, MicroLogix 1200 Programmable Controllers User Manual 1762-UM001, MicroLogix 1400 Programmable Controllers User Manual 1766-UM001	A more detailed description of how to install and use your MicroLogix 1100/1200/1400 programmable controller and expansion I/O system.
MicroLogix 1200 Thermocouple/mV Input Module User Manual 1762-UM002	More detailed information on how to install, configure and use the module.
MicroLogix 1200 RTD/Resistance Input Module User Manual 1762-UM003	More detailed information on how to install, configure and use the module.
Installation Instructions 1762-INxx	Information on installing and using 1762 expansion I/O modules.
Industrial Automation Wiring and Grounding Guidelines 1770-4.1	More information on proper wiring and grounding techniques.
Product Certifications website, <a href="http://www.ab.com">http://www.ab.com</a>	Provides declarations of conformity, certificates, and other certification details.

To view or download product publications, go to <http://www.rockwellautomation.com/literature> and search documents under I/O. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

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PN-131573

# 1766 MicroLogix 1400 Programmable Controllers


**ATTENTION:**

- Before installing, configuring, operating or maintaining this product, read this document and the documents listed in the Additional Resources section for installing, configuring, or operating equipment. Users should familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.
- Installation, adjustments, putting into service, use, assembly, disassembly, and maintenance shall be carried out by suitably trained personnel in accordance with applicable code of practice. In case of malfunction or damage, no attempts at repair should be made. The module should be returned to the manufacturer for repair. Do not dismantle the module.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
- This equipment is certified for use only within the surrounding air temperature range of -20...60 °C (-4...140 °F). The equipment must not be used outside of this range.
- Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls, publication SGI-1.1, available from your local Rockwell Automation sales office or online at <http://www.rockwellautomation.com/literature> describes some important differences between solid state equipment and hard-wired electromechanical devices.
- Do not connect the Comm0 port on the MicroLogix 1400 controller to another MicroLogix family controller such as MicroLogix 1000, MicroLogix 1200, or MicroLogix 1500 using a 1761-CBL-AM00 (8-pin mini-DIN to 8-pin mini-DIN) cable or equivalent. This type of connection will cause damage to the RS-232/485 communication port (Channel 0) of the MicroLogix 1400 and/or the controller itself. Communication pins used for RS-485 communications are alternately used for 24V power on the other MicroLogix controllers.

**IMPORTANT** Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for the purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability for actual use based upon the examples shown in this publication.

## North American Hazardous Location Approval

The following information applies when operating this equipment in hazardous locations: Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, D, Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest "T" number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local authority having jurisdiction at the time of installation.


**WARNING: EXPLOSION HAZARD**

- Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- Do not remove or replace lamps, fuses or plug-in modules (as applicable) unless power has been disconnected or the area is known to be free of ignitable concentrations of flammable gases or vapors.
- If this product contains batteries, they must be changed only in an area known to be nonhazardous.
- All wiring must be in accordance with Class I, Division 2 wiring methods of Article 501 of the National Electric Code and/or in accordance with Section 18-1J2 of the Canadian Electrical Code, and in accordance with the authority having jurisdiction.

Informations sur l'utilisation de cet équipement en environnements dangereux:  
Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation


**AVERTISSEMENT: RISQUE D'EXPLOSION**

- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe I, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

## Environment and Enclosure



**ATTENTION:** This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 m (6562 ft) without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as open-type equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present and appropriately designed to prevent personal injury resulting from accessibility to live parts. The enclosure must have suitable flame-retardant properties to prevent or minimize the spread of flame, complying with a flame spread rating of SVA, V2, V1, V0 (or equivalent) if non-metallic. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

In addition to this publication, see the following:

- Industrial Automation Wiring and Grounding Guidelines, Rockwell Automation publication 1770-4.1, for additional installation requirements.
- NEMA Standard 250 and IEC 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.


**WARNING: Special Conditions for Safe Use:**

- This product must be installed in an enclosure. All cables connected to the product must remain in the enclosure or be protected by conduit or other means.
  - The local programming terminal port is intended for temporary use only and must not be connected or disconnected unless the area is free of ignitable concentrations of flammable gases or vapors.
  - There is a danger of explosion if the lithium battery is incorrectly replaced. Replace the battery only with the indicated type. Do not replace the battery unless power has been removed and the area is known to be nonhazardous.
- Do not dispose of the lithium battery in a fire or incinerator. Dispose of the battery in accordance with local disposal regulations.
- For Safety information on the handling of lithium batteries, including handling and disposal of leaking batteries, see Guidelines for Handling Lithium Batteries, publication AG 5-4.



This product contains a sealed lithium battery which may need to be replaced during the life of the product. For instructions on the removal and replacement of the battery, refer to the product's installation instructions.

At the end of its life, the battery contained in this product should be collected separately from any unsorted municipal waste.

The collection and recycling of batteries helps protect the environment and contributes to the conservation of natural resources as valuable materials are recovered.



**ATTENTION:** Do not install this product until you read the documentation in your local language. Go to <http://www.rockwellautomation.com/literature> or contact your local sales office or Rockwell Automation representative.

**ATENÇÃO:** Não instale este produto antes de ler os documentos em sua língua. Clique <http://www.rockwellautomation.com/literature> ou entre em contato com o escritório ou representante da Rockwell Automation regional.

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**ATTENZIONE:** Non installare questo prodotto senza prima avere letto la documentazione nella propria lingua. Consultare la pagina web <http://www.rockwellautomation.com/literature> oppure contattare l'ufficio commerciale o il rappresentante Rockwell Automation di zona.

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## Removable Terminal Blocks (RTB) Ratings

Model	Torque and Wire Size
All 1766 controllers	0.79 Nm (7.0 lb-in) Solid wire: 14...22 AWG, Cu-90 °C (194 °F) Stranded wire: 16...22 AWG, Cu-90 °C (194 °F) Do not wire more than two conductors on any single terminal.

## Additional Resources

Resource	Description
MicroLogix 1400 Programmable Controllers Installation Instructions <a href="#">1766-IN001</a>	Information on installing and using MicroLogix 1400 programmable controllers.
MicroLogix 1400 Memory Module Installation Instructions <a href="#">1766-IN010</a>	Information on installing the 1766-MM1 Memory Module.
MicroLogix 1400 Programmable Controllers User Manual <a href="#">1766-UM001</a>	A more detailed description of how to install and use your MicroLogix 1400 programmable controller and 1762 expansion I/O system, and additional information for battery handling and removal.
MicroLogix 1400 Instruction Set Reference Manual <a href="#">1766-RM001</a>	A reference manual that contains data and function files, instruction set, and troubleshooting information for MicroLogix 1400.
Installation Instructions 1762-INxxx	Information on installing and using 1762 expansion I/O modules.
Industrial Automation Wiring and Grounding Guidelines <a href="#">1770-4.1</a>	More information on proper wiring and grounding techniques.
Product Certifications website, <a href="http://www.ab.com">http://www.ab.com</a>	Provides declarations of conformity, certificates, and other certification details.

To view or download product publications, go to <http://www.rockwellautomation.com/literature> and search documents under I/O. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

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Start Date: 2013-6-21 23:43:22

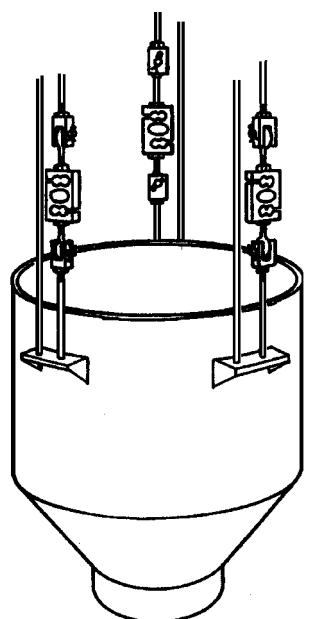
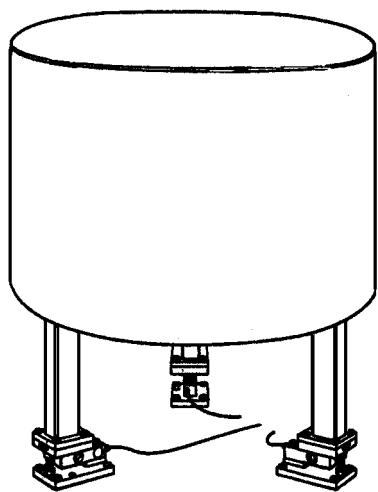
Program Name: AN-373\_100\_00 D 08V01T53P01

Serial Number 10406750

Operator Name 5458

Step	ID	Label	Minimum	Actual	Maximum	Result
1	1	.				
2	2	.				
3	3	.				
4	4	Start Test Input Current (A) UUT GPIB Communications:Test for v:	0.000	0.003	0.020	Pass
5	5	.				
6	6	Auxiliary Converter Test (A) UUT GPIB Communications:Test for v:	0.003	0.008	0.050	Pass
7	7	Output Adjust UUT Out DC Voltage	24.150 V	24.250 V	24.600 V	Pass
8	8	.				
9	9	Power on time @ 80Vac Time	70.000 mS	80.487 mS	130.000 mS	Pass
10	11	Power Off UUT Out DC Voltage	0.000 V	7.707 mV	2.000 V	Pass
11	12	Prompt				
12	14	Power on time @ 230Vac Time	70.000 mS	83.118 mS	130.000 mS	Pass
13	15	Voltage Setpoint min UUT Out DC Voltage	20.000 V	23.350 V	24.000 V	Pass
14	16	Voltage Setpoint max UUT Out DC Voltage	28.000 V	29.163 V	30.000 V	Pass
15	17	Voltage Setpoint UUT Out DC Voltage	24.050 V	24.114 V	24.150 V	Pass
16	18	Load Regulation No Load UUT Out	10.000 mV	67.722 mV	120.000 mV	Pass
17	19	Line Regulation 270Vac UUT Out	-15.000 mV	-2.876 mV	15.000 mV	Pass
18	20	Dynamic Regulation Undershoot UUT Out	0.000 V	191.606 mV	280.000 mV	Pass
		Overshoot UUT Out	0.000 V	154.640 mV	280.000 mV	Pass
		Settle				
19	21	Peak Noise UUT Out Peak to Peak	5.000 mV	34.573 mV	50.000 mV	Pass
20	22	Efficiency (Cold) 230Vac Efficiency	87.000 %	88.088 %	90.400 %	Pass
21	24	.				
22	25	Efficiency (Cold) 120Vac Efficiency	84.000 %	87.292 %	89.000 %	Pass
23	27	.				
24	28	Output Characteristic 1 UUT Out DC Current	3.400 A	3.782 A	4.100 A	Pass
25	29	Output Characteristic 2 UUT Out DC Current	6.500 A	7.252 A	8.000 A	Pass
26	37	.				
27	38	.				
28	39	Operator Prompt OVP UUT Out DC Positive Peak	30.000 V	34.737 V	36.000 V	Pass
29	40	.				
30	41	Check Voltage Setpoint UUT Out DC Voltage	24.050 V	24.118 V	24.150 V	Pass
31	42	Check LED Operator Prompt				Yes
32	43	.				
33	44	Hold up time Time	15.000 mS	20.403 mS	22.000 mS	Pass

PASSED



# GUIA DE UTILIZAÇÃO DE CÉLULAS DE CARGA

GUCC1  
DIRETRIZES GERAIS

## GOSTARÍAMOS INICIALMENTE DE PARABENIZÁ-LO PELA ESCOLHA

*Parabéns. Se você está recebendo este guia de utilização de células de carga, significa três coisas:*

*- Primeiro que você adquiriu as melhores células de carga e indicador digital do mercado com uma excelente relação custo benefício. Segundo: - que você não adquiriu os nossos serviços de engenharia <sup>(1)</sup>; e terceiro: - não contratou a sua instalação através de nosso centro de serviços, ou seja:*

*- Você sabe como e onde utilizá-las.*

*Não obstante, estamos lhe enviamos este guia, elaborado especialmente para você, como um lembrete dos cuidados que você deve ter ao utilizá-las. Se todas as informações aqui contidas já forem do seu conhecimento, muito bem, parabéns de novo. Caso contrário, se a leitura deste guia lhe suscitar alguma dúvida, não hesite em entrar contato com a nossa Engenharia de Soluções <sup>(2)</sup>.*

*Obrigado.*

<sup>(1)</sup> - A Toledo do Brasil, possui uma divisão especialmente criada a mais de 40 anos para lidar com sistemas de pesagem. Este grupo técnico, com largo conhecimento em manuseio de materiais e estruturas metálicas, tem fornecido ao longo destes anos, inúmeros sistemas para os mais variados segmentos de mercado, tais como a fabricação do vidro, aço, cimento, borracha, plástico, indústrias alimentícias e farmacêuticas, manuseio de grãos, etc. assim como também desenvolve todos os projetos elétricos e a automação necessária para utilizar as informações de peso de nossos indicadores digitais e células de carga.

A Engenharia de Sistemas da Toledo do Brasil é composta pela seção de Manuseio e Estrutura de Materiais, da seção de Automação e Controle e da seção de Informática Industrial.

<sup>(2)</sup>- Em caso de dúvidas ou consultas entre em contato com a Engenharia de Soluções, fone (0xx11) 5547-1800, fax (0xx11) 524-4167 e e-mail: [sis@toledobrasil.com.br](mailto:sis@toledobrasil.com.br)

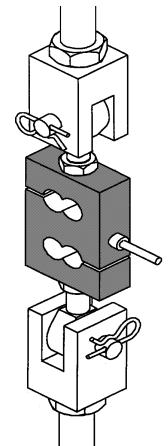
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# I DEFINIÇÕES

## 1. Módulos de pesagem

Para atender as aplicações de pesagem são utilizados os módulos de pesagem. Entende-se aqui como módulo de pesagem, o conjunto formado por uma célula de carga e sua ferragem associada, a qual não só permite que a força peso seja aplicada corretamente à célula de carga e uma fácil fixação da mesma, como também fornece restrições à movimentação do elemento a ser pesado. Os módulos de pesagem são de tração ou de compressão.



Módulo de  
tração  
Figura 1

## 2. Módulos de pesagem à tração

Os módulos à tração são usados para tanques ou moegas que estejam suspensos no teto ou no piso superior. Esta deve ser sempre a primeira escolha a ser utilizada se a capacidade de pesagem assim o permitir. Um módulo de pesagem à tração típica é mostrado na figura 1. São utilizadas células de carga com formato de "S" com rosas nas duas extremidades. Cada rosa recebe rótulas que por suas vez possuem varões que são utilizados para sustentar a moega e de todo o conjunto na superestrutura.

## 3. Módulos de pesagem à compressão

Os módulos de pesagem à compressão se adaptam a maioria das aplicações. Estes módulos podem ser fixados diretamente no solo ou em vigas estruturais. Os tanques, ou qualquer outra estrutura, são montados no topo dos módulos de pesagem.

Um módulo de pesagem à compressão é mostrado na figura 2, consiste de uma célula de carga, uma placa superior (que recebe a carga), um pino de carga e uma placa base (que é fixada ao solo ou qualquer superfície de suporte). Um parafuso limitador é utilizado para impedir que o elemento a ser pesado tombe.

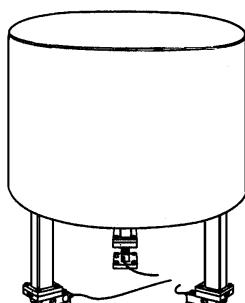
## 4. Módulos de pesagem à compressão Flexmount ou Centerlign?

Os módulos de compressão **Flexmount** são os indicados para tanques e silos de armazenagem de grande porte, cujas únicas forças externas são apenas as contração ou dilatação por origem térmica. Os módulos de compressão **Centerlign** são os indicados para aplicações onde fortes forças horizontais podem ser esperadas. Tais aplicações podem incluir estruturas com forças de choque horizontais elevadas, isto é, um transportador classificador ou um tanque com entrada de alimentações horizontais, nos quais

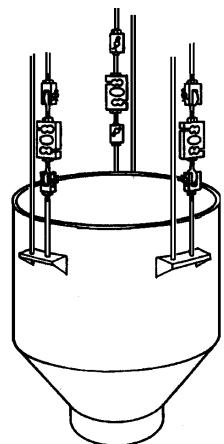
o produto alimentado se choca com pressão contra a parede oposta do tanque. De um modo geral, todas as caçambas de dosagem se enquadram nesta característica. Outras aplicações incluem conversões de balanças de piso mecânicas em eletrônicas, previstas para receber veículos tais como empilhadeiras que irão frear ou acelerar sobre a plataforma, e seções de transportadores usados para pesar sacos pesados, bobinas de papel, ou tambores em movimento.

A diferença entre os módulos de pesagem a compressão Centerlift e os Flexmount está no pino de carga. O pino de carga nos módulos de pesagem Centerlift em vez de estar fixado na célula de carga, é livre para oscilar quando submetido a forças horizontais. Quando a carga na balança se estabiliza, o pino de carga volta a posição vertical para garantir uma pesagem exata.

## 5. O universo da pesagem



**Tanques e silos**  
**Figura 3**



**Moegas e Caçambas**  
**Figura 4**

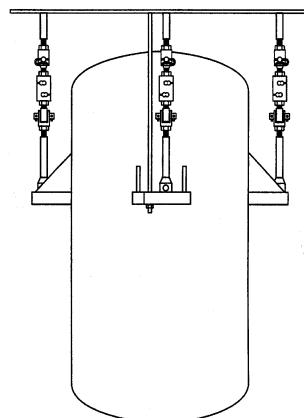
Tanques, silos, moegas, vasos e transportadores são usados para manuseio de materiais em muitas indústrias. Através do uso de módulos de pesagem nós podemos pesá-los com precisão e confiabilidade. Este guia usará o termo “tanque” como o nome genérico para se referir a qualquer tanque, silo, moega ou vaso suportado por módulos de pesagem. Mas cada um deles é um tipo de depósito usado para um propósito típico.

**Tanques/Silos:** O tanque é um depósito fechado usado para armazenar líquidos e o silo para sólidos. Podem variar em tamanho de pequenos como os usados em residências até os de uso industrial com milhares de toneladas de material. A figura 3 mostra um tanque suportado por módulos de pesagem a compressão.

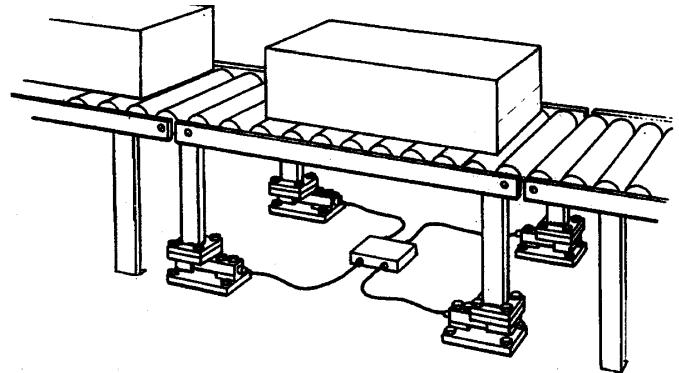
**Moegas:** As moegas (ou caçambas) são um tipo de depósito aberto no topo. São utilizados geralmente para coletar ingredientes a serem processados posteriormente. As moegas tendem a ser menores que os tanques e são normalmente suspensos em uma superestrutura. A figura 4 mostra uma moega suportada por módulos de pesagem a tração.

**Vasos:** Um vaso é um tanque sofisticado com equipamentos que permitem aquecer, resfriar, misturar, pressurizar e outros processos. Muitos vasos hospedam reações químicas (reatores) e então devem ser capazes de fornecer medições precisas dos materiais depositados (figura 5).

**Transportadores de correia:** Para pesarmos objetos transportados em um sistema de roletes, podemos colocar módulos de pesagem em seus suportes. Uma vez que os objetos que estão pesados no transportador normalmente estão em movimento, esta aplicação requer que o módulo de pesagem capaz resistir grande a forças horizontais de cisalhamento e ainda fornecem medidas de peso que se repetem (figura 6).



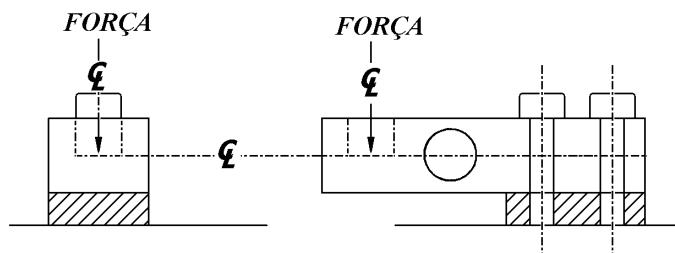
Vasos  
Figura 5



Transportadores  
Figura 6

## II APlicando Forças às Células de Carga

As células de carga baseadas em extensômetros de resistência variável (Strain Gauges) são extremamente sensíveis a ponto de detectarem variações ínfimas nas forças aplicadas a elas. O segredo é se assegurar que elas reajam somente ao peso que nós queremos medir e não a outras forças a que possam estar sendo submetidas. Para se obter leituras de pesos precisas nós devemos controlar **como** e **onde** o peso é aplicado na célula de carga. Idealmente, uma célula de carga deve ser instalada de modo que a carga seja aplicada sempre verticalmente em de toda a faixa de pesagem (figura 7).

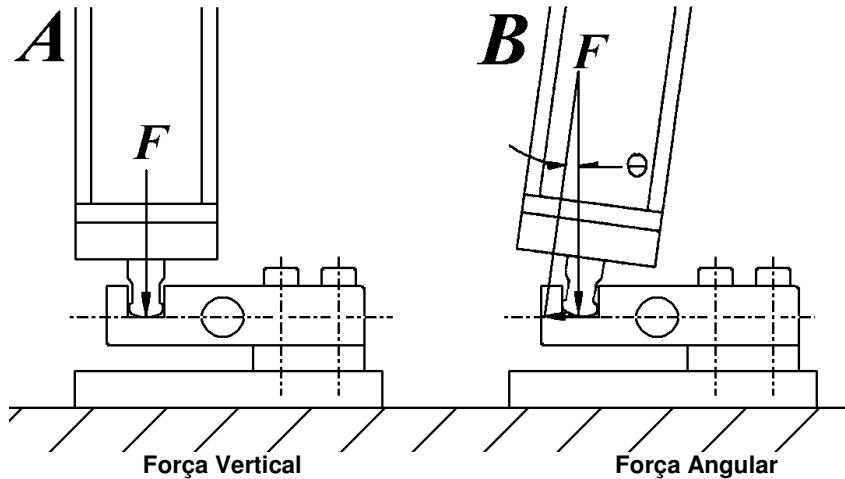


Carregamento ideal – Toda a força aplicada verticalmente  
Figura 7

Para atingir este ideal, o peso do vaso e a célula de carga que o suporta devem estar **nivelados, paralelos e rígidos o máximo possível**. Quando uma balança de tanque e a sua estrutura suporte são projetadas e instaladas cuidadosamente, é possível o sistema resultante ficar próximo da aplicação de carga ideal. Quando a balança não é instalada apropriadamente, existe uma série de forças que podem afetar a sua precisão. Nas seções seguintes descreveremos os problemas mais comuns encontrados nas aplicações de balanças de tanque.

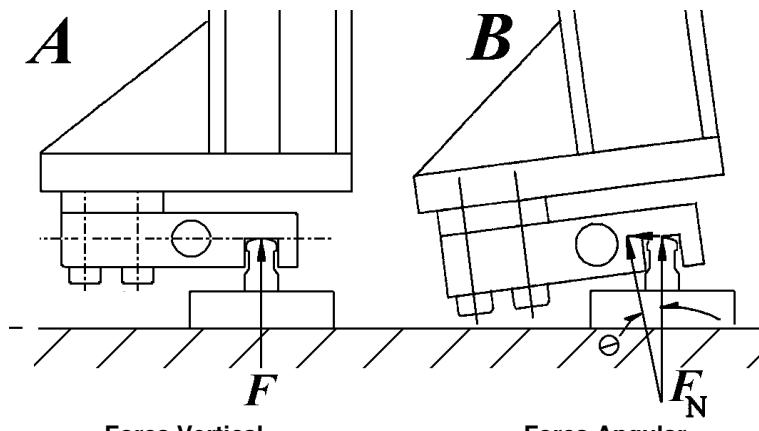
## 6. Carga angular

A aplicação de carga em ângulo ocorre quando a força aplicada na célula de carga não é perfeitamente vertical. Esta força diagonal pode ser definida como a soma de sua componente vertical e da sua componente horizontal. Em uma aplicação de módulos de pesagem bem projetada, a célula de carga irá sentir somente o peso (força vertical), mas não irá sentir a carga lateral (força horizontal). A figura 8 mostra a aplicação de um módulo de pesagem com a célula de carga ancorada na fundação. Na figura



**Figura 8**

8A, a força exercida pelo peso do tanque é perfeitamente vertical. Na figura 8B, a força é aplicada em ângulo. A componente vertical ( $F$ ) desta força angular é normal e é a sentida pela célula de carga. Ela é igual a força aplicada na figura 8A . A componente horizontal (carga lateral) é igual a  $F \times \text{Tangente } \theta$ .

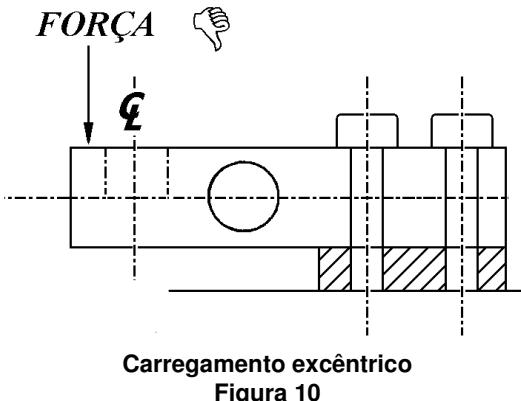


**Figura 9**

A figura 9 mostra como a carga em ângulo pode afetar a célula de carga ancorada no corpo do tanque. A figura 9A mostra a instalação ideal com a aplicação da força perfeitamente vertical. Na figura 9B, a força ( $F_N$ ) que é normal a que é sentida pela célula de carga, pode ser menor que a força vertical ( $F$ ) aplicada na célula de carga na aplicação ideal. Neste caso,  $F_N = F \times \text{Coseno } \theta$ .

## 7. Carga excêntrica

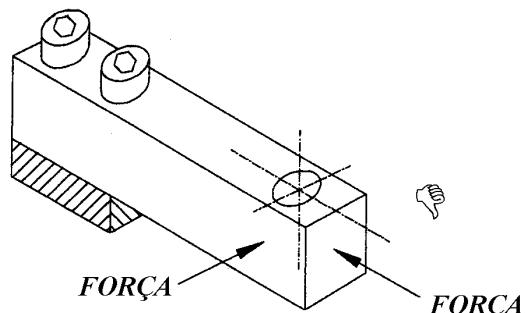
O carregamento excêntrico ocorre quando a força aplicada na célula de carga é efetuada em um ponto que não passe por suas linhas de centro (**CL**) como ocorre na figura 10. Este problema pode ser ocasionado por expansão ou contração térmica ou ainda por um projeto pobre das ferragens associadas. Nós podemos evitar os problemas de carregamento excêntrico utilizando módulos de pesagem que possam compensar os movimentos de contração e expansão.



Carregamento excêntrico  
Figura 10

## 8. Cargas laterais e de topo

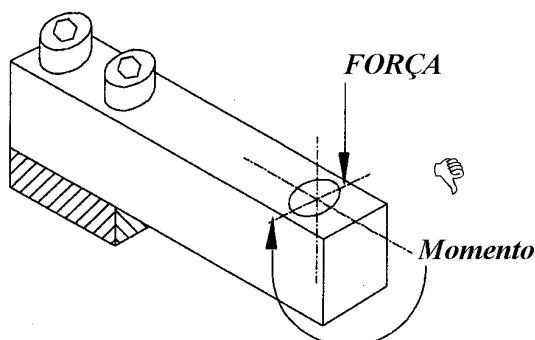
Os carregamentos laterais e de topo ocorrem quando forças horizontais são aplicadas no topo ou na lateral da célula de carga como ocorre na figura 11. Estes problemas podem ser ocasionados por expansão ou contração térmica, por desalinhamento, ou ainda por movimentos dinâmicos do tanque associado. Para aplicações de carga estática deve ser utilizado um módulo de pesagem que compense o movimento térmico (**Flexmount**). Para aplicações com cargas sujeito a movimentos dinâmicos, devemos usar um módulo de pesagem dotado de sistema de autoalinhamento (**Centeralign**).



Carregamento lateral e de topo  
Figura 11

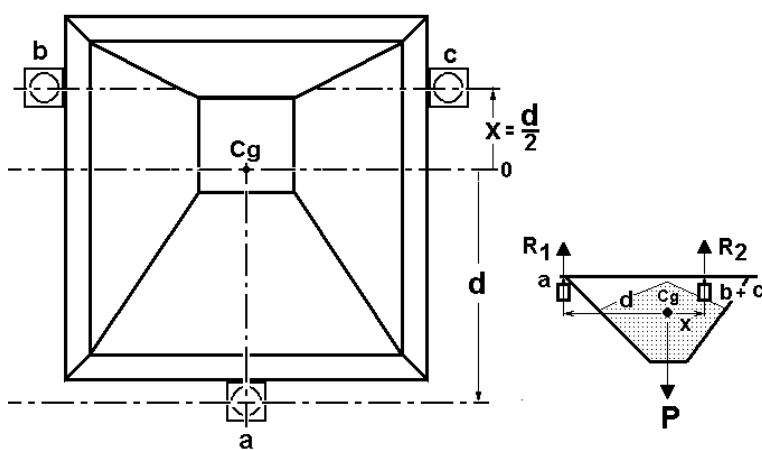
## 9. Carga de torção

O carregamento com torção ocorre quando uma força lateral tem o efeito de torcer a célula de carga como ocorre na figura 12. Este problema pode ser ocasionado por deflexão na estrutura, por movimentos dinâmicos, movimentos térmicos, ou desalinhamento da ferragem associada. As cargas de torção afetam a precisão e a repetibilidade do sistema. Para evitar estes problemas, sempre utilizar os suportes estruturais e as orientações deste guia e usar os módulos de pesagem que possam compensar estes movimentos.



Carregamento a torção  
Figura 12

## 10. Carregamento assimétrico em três células de carga



A distância  $x$  deve ser igual a  $d/2$  para que a carga  $P$  se distribua uniformemente entre todos os apoios.  
Figura 13

Atenção no caso de indicadores de nível onde os pontos **b** e **c** são apoios articulados.

Em estruturas apoiadas em três células de carga, posicionar as células em relação ao centro de gravidade do conjunto (estrutura + material depositado) de modo que haja uniformidade na distribuição de carga.

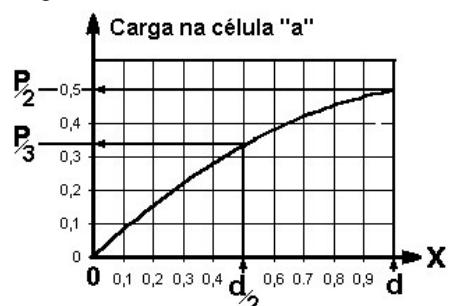


Gráfico: - O peso no apoio **a** varia de zero até  $P/2$  de acordo com a distância os apoios **b** e **c** ao centro de gravidade.

### III PROJETOS DE TANQUES, VASOS E MOEGAS

A precisão de uma balança de tanque pode ser afetada pelo desenho do próprio tanque. Um tanque balança deve ser projetado de modo a que não venha a fletir significativamente sob o peso de seu conteúdo e que não venha a ser submetido a desbalanceamento por pressões quando estiver sendo cheio ou vazio. Se estivermos convertendo em balança um tanque existente, nós devemos ter que modificar (ou enrijecer) o tanque para exercer esta nova função.

#### 11. *Integridade estrutural*

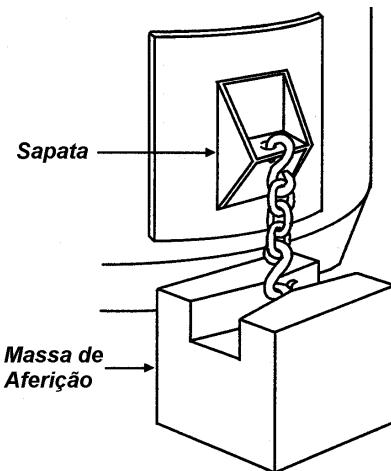
O tanque e a sua estrutura suporte, podem fletir com o peso do seu conteúdo. Esta é uma preocupação especial se o tanque tem um grande diâmetro ou suas pernas são longas e tendem a se arquear (figura 17A). Os módulos Flexmount foram projetados para compensar pequenas deflexões. Mas grandes deflexões (maiores que  $\frac{1}{2}$  grau na vertical) irão causar erros de linearidade e pesagens imprecisas. O projeto de engenharia deve prever e garantir que as deflexões do tanque estejam dentro das especificações. Deflexões excessivas podem ser corrigidas pela amarração ou união das pernas do tanque. Ver figura 17B.

#### 12. *Desbalanceamento por pressão*

Quando o material flui rapidamente para dentro ou para fora de um tanque sem ventilação (respiro), ele pode criar um desbalanceamento interno de pressões. Se o tanque estiver sendo cheio, a pressão de ar dentro do tanque será maior que a pressão do ar externo ao tanque. Por exemplo, vamos supor que  $15\text{ m}^3$  de um líquido proveniente de uma linha pressurizada seja adicionado ao tanque. O líquido irá deslocar  $15\text{ m}^3$  de ar do interior do tanque. A menos que estes  $15\text{ m}^3$  de ar sejam retirados do tanque, o que acontecerá é que a pressão interna irá aumentar. Este aumento de pressão irá produzir um erro de pesagem até que a pressão interna seja equilibrada. Situação similar ocorre quando o material é descarregado rapidamente do tanque, criando um vácuo parcial no interior do tanque. Para prevenir o desbalanceamento por pressões internas, os tanques devem ser providos de dispositivos de ventilação adequada.

### 13. Prever o uso de massas de aferição

Se estivermos prevendo o uso de pesos padrões para calibrar a balança de tanque, iremos necessitar de algum modo de pendurar ou apoiar os pesos no tanque. Em muitos casos, isto pode ser feito com algum tipo de sapata, espaçadas igualmente em torno do tanque. A figura 14 mostra um dispositivo para permitir que a massa seja pendurada.



Sapatas para fixação de massas de aferição  
Figura 14

## IV DIRETRIZES PARA A ESTRUTURA SUPORTE

As diretrizes que se seguem fornecem informações para se instalar os suportes estruturais adequadamente.

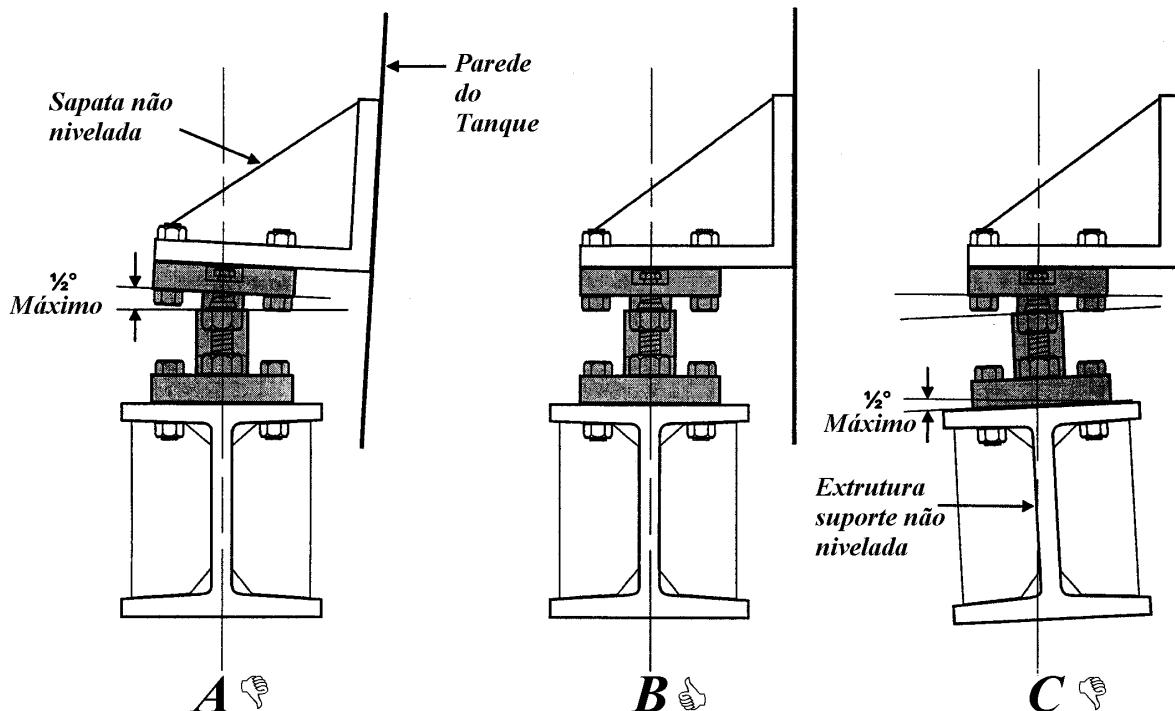
### 14. Deflexão dos suportes

Devido às células de carga defletirem somente entre 0,254mm a 0,762 mm quando submetidas à sua capacidade máxima, elas são muito sensíveis aos mínimos movimentos. Por isto, deflexões em seus suportes de fixação ao tanque podem afetar o peso indicado pelo indicador. Deflexões excessivas ou não uniformes irão introduzir forças não verticais indesejadas na célula de carga, reduzindo a precisão e repetibilidade do sistema. Quando estivermos projetando uma estrutura para suporte dos módulos de pesagem devemos seguir as três recomendações seguintes:

- Os suportes para os módulos de pesagem não devem fletir mais que  $\frac{1}{2}$  grau quando submetidos à capacidade total.
- A base do suporte para o módulo de pesagem não deve ser torcida ou fletir mais de  $\frac{1}{2}$  grau quando submetida à capacidade total.

- A base do suporte para o módulo de pesagem deve fletir uniformemente.

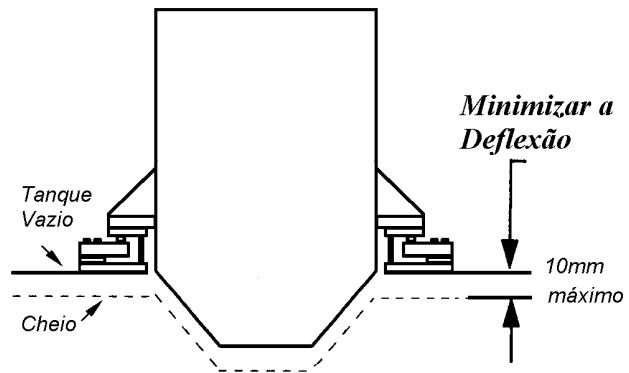
A figura 15 mostra como a flexão do suporte afeta o módulo de pesagem.



Deflexões do elemento de suporte das células de carga  
Figura 15

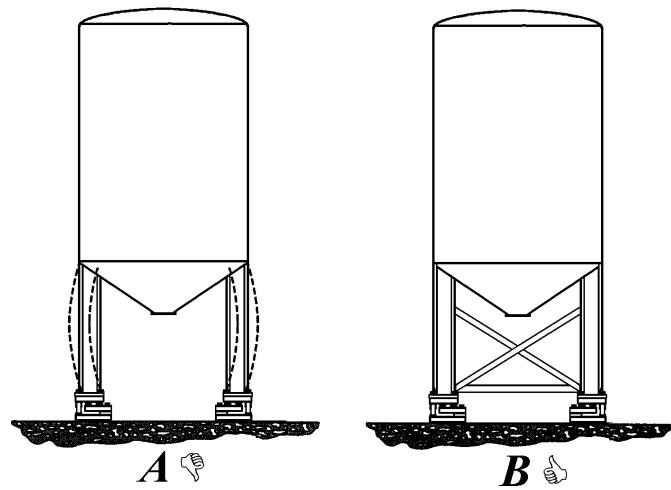
- **Figura 15 A:** A sapata está fora de nível, aplicando forças laterais na célula de carga.
- **Figura 15 B:** A sapata e o suporte estão alinhados adequadamente.
- **Figura 15 C:** A sapata está fora de nível, aplicando forças laterais na célula de carga.

A estrutura suporte de uma balança de tanque deve fletir o mínimo possível, e qualquer deflexão que ocorra deve ser uniforme em todos os pontos de apoio (ver figura 16). Deflexões excessivas podem causar flexões nas tubulações de entrada e saída, criando erros de linearidade. Quando a deflexão não é uniforme, temos erros de repetibilidade e de retorno a zero.



Deflexão máxima do piso  
Figura 16

Em alguns casos, as pernas do tanque irão fletir com o peso do tanque (figura 17A). Se a flexão for grande o suficiente para afetar as leituras de peso, nós devemos travar as pernas mantendo-as rígidas (figura 17B).



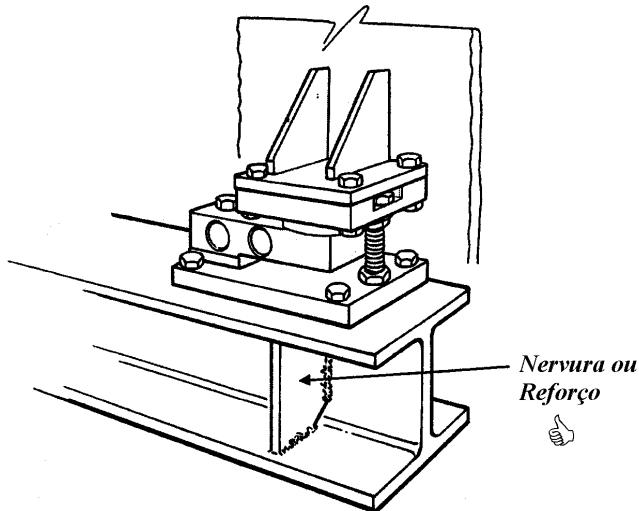
Sapatas para fixação de pesos de aferição  
Figura 17

## 15. Módulos de pesagem e alinhamento dos suportes

A linha de centro da aplicação de carga em uma célula de carga deve estar alinhada com a linha de centro dos módulos de pesagem. A instalação ideal para um módulo de pesagem à compressão e de tração são mostrados nas figuras 18A e 18B.

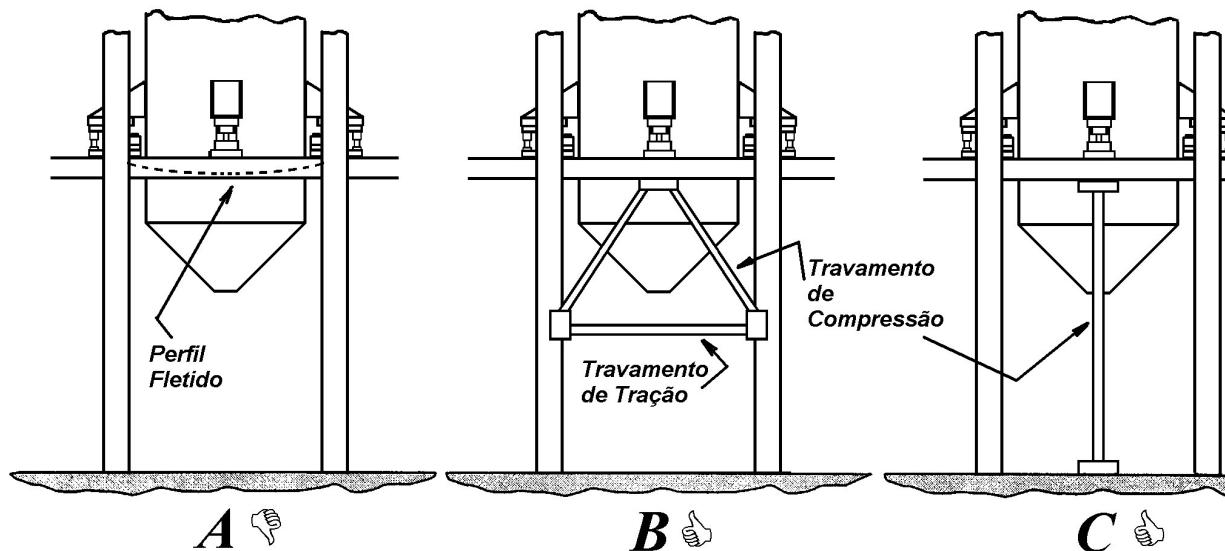
Adicione reforços ou enrijeça os apoios para prevenir que as vigas possam ser torcidas quando submetidas ao carregamento (ver figura 19).

## 16. Enrijecendo as estruturas de suporte



Viga suporte com reforço para receber o módulo de pesagem  
Figura 19

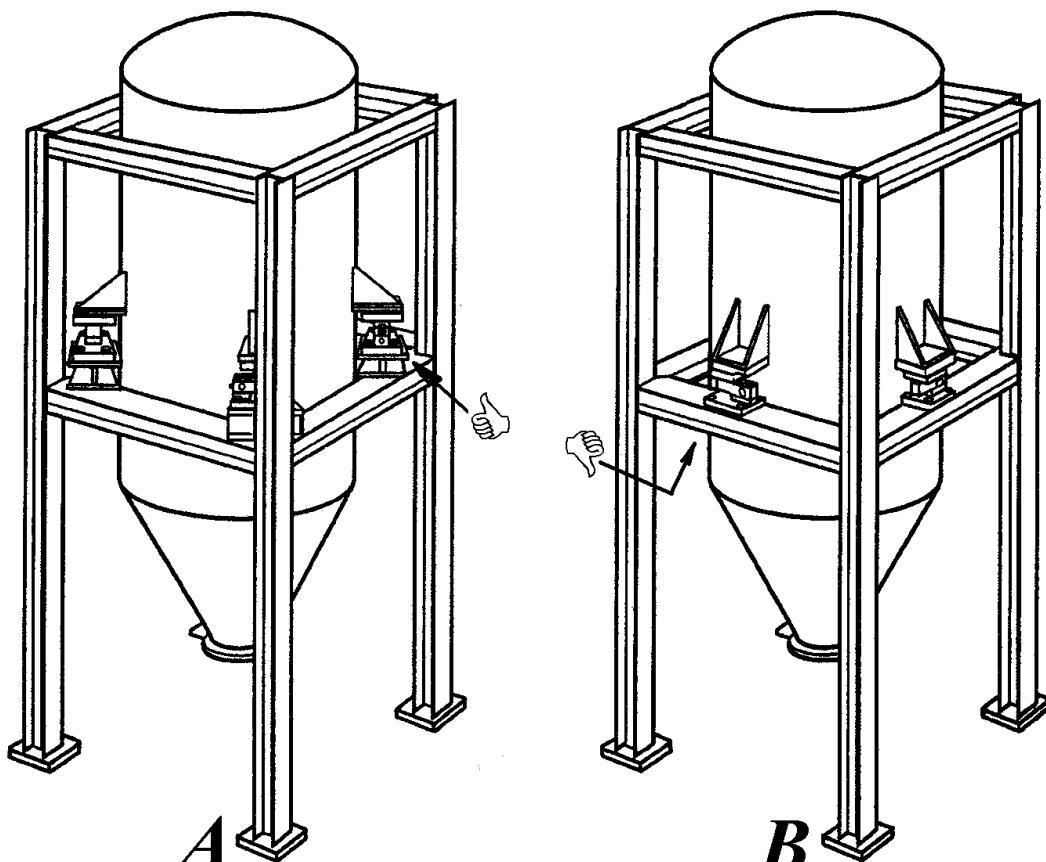
Estruturas metálicas de suporte tendem a se fletir ou se curvar a medida que o peso que suportam aumenta. Uma deflexão muito grande afeta a precisão da balança de tanque. O maior potencial de flexão ocorre quando o módulo de pesagem está no meio de uma viga em balanço. A figura 20A mostra como a viga suporte em balanço pode fletir quando um módulo de pesagem é colocado no meio da mesma. Se este tipo de arranjo não pode ser evitado, então devemos reforçar as vigas para minimizar a flexão. A figura 20B e a figura 20C mostram os dois métodos típicos de reforço.



Travamentos da Estrutura Suporte  
Figura 20

## 17. Suporte via vigas estruturais

O melhor modo de reduzir a flexão é montar os módulos de pesagem próximos das colunas verticais fixas ao solo em vez das vigas centrais ou horizontais. Se assegure que todos os módulos de pesagem estejam suportados por vigas de mesmo tamanho estrutural para impedir flexões diferenciais, as quais podem causar erros de não repetibilidade ou problemas de não retorno a zero. A figura 21A mostra a disposição recomendada com os módulos de pesagem próximos às vigas verticais, e a figura 21B mostra os módulos de pesagem no centro das vigas em balanço, que só pode ser tolerado se *todas as vigas tiverem o mesmo dimensionamento*.



**Disposição recomendada**

Células no canto mais rígido, próximo às colunas verticais.

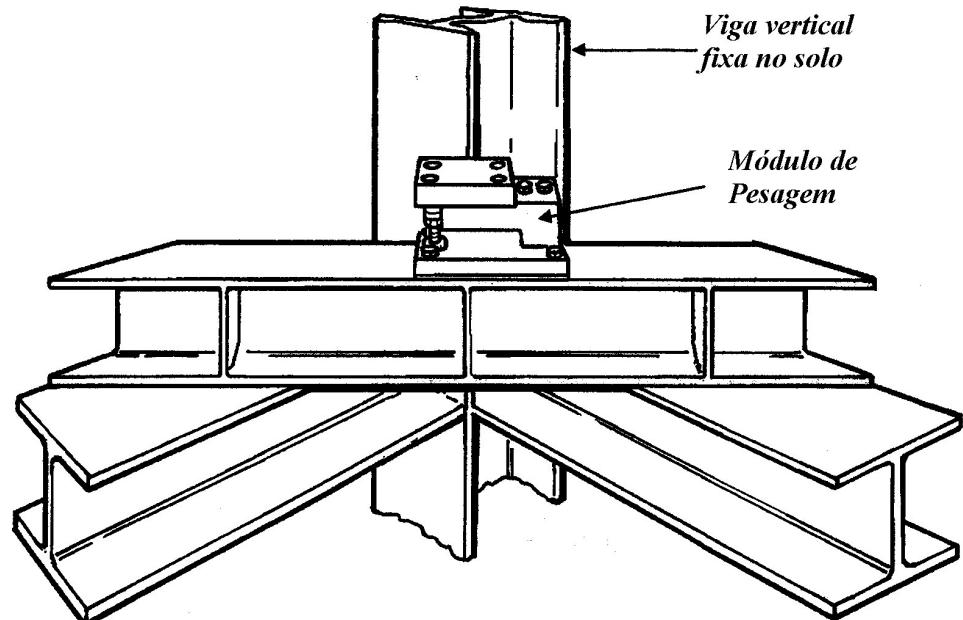
**Figura 20**

**Disposição não recomendada,  
mas aceitável**

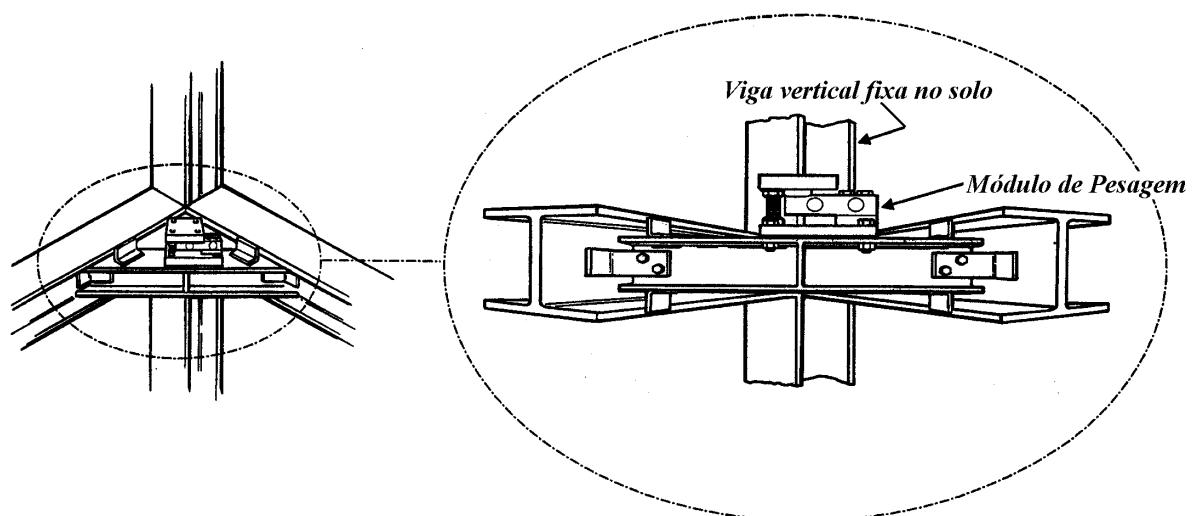
Todos os pontos fletem igualmente.

**Figura 20**

As figuras 22A e 22B mostram detalhes dos métodos utilizados para montar os módulos de pesagem próximos das vigas fixadas ao solo.



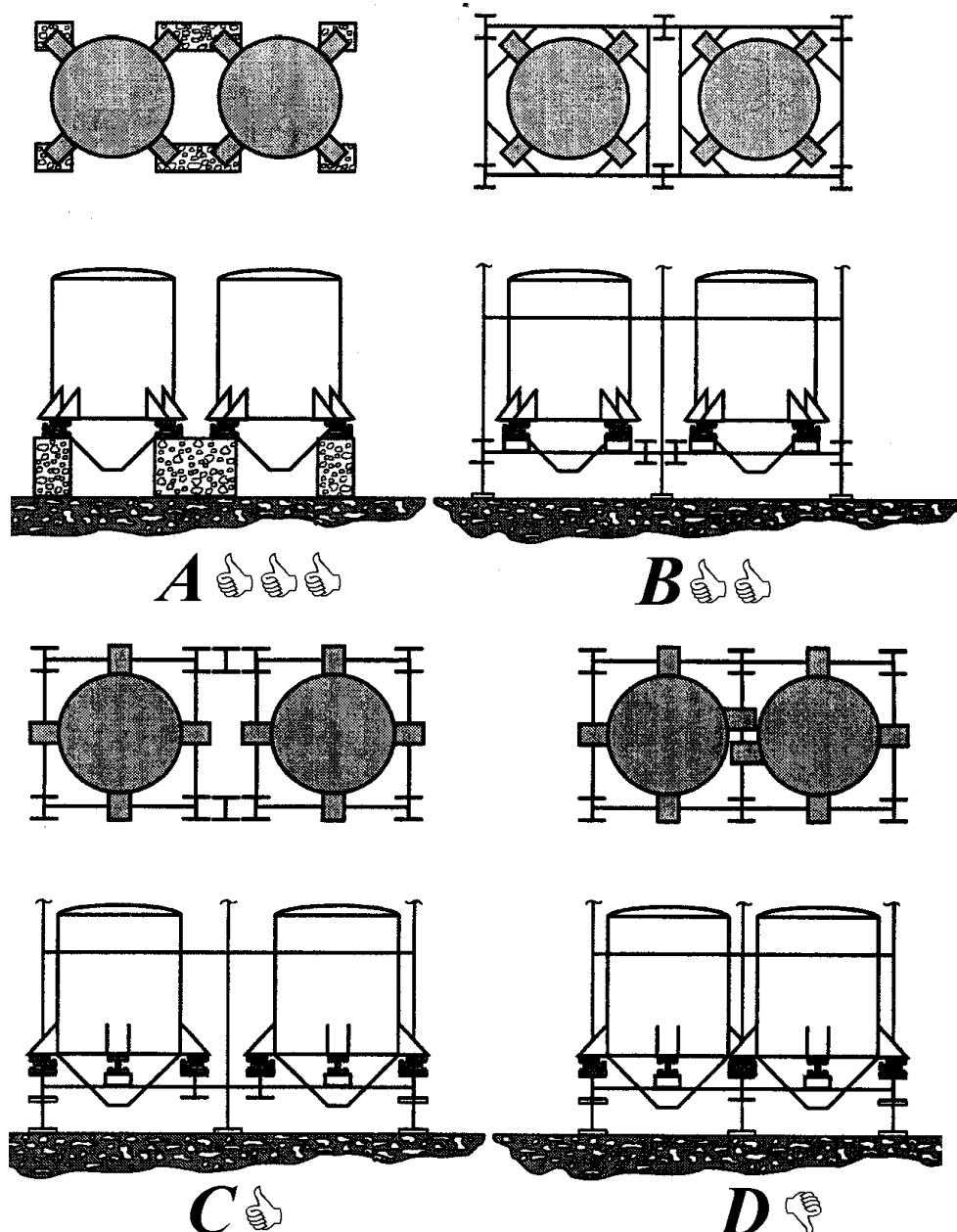
Travamentos da Estrutura Suporte  
Figura 22A



Travamentos da estrutura suporte  
Figura 22B

## 18. Interação entre tanques

Quando balanças de tanque são colocadas próximas umas das outras, o peso de cada tanque pode afetar a carga sentida pelos módulos de pesagem do outro tanque. Existe um forte potencial deste tipo de interação quando os tanques compartilham uma fundação em comum. As figuras a seguir mostram a instalação de quatro tanques, indo da melhor (figura 23A) até a pior (figura 23D) montagem.



Interação entre tanques  
Figura 23

**Figura 23 A:** - A melhor escolha é montar os módulos de pesagem em fundações de concreto. Como o concreto flete muito pouco, dois tanques podem compartilhar a mesma fundação sem interação.

**Figura 23 B:** - A próxima melhor escolha é montar os módulos de pesagem próximo das vigas verticais, com estruturas suportes independentes para cada tanque. Isto limita a deflexão e a interação entre os tanques.

**Figura 23 C:** - A próxima pior escolha é montar os módulos de pesagem no meio das vigas horizontais, com estruturas suportes independentes para cada tanque. Isto limita a interação entre os tanques, mas não a deflexão dos suportes.

**Figura 23 D:** - A pior escolha é montar os módulos de pesagem no meio das vigas horizontais, com os tanques compartilhando a estrutura suporte. Isto permite tanto a interação entre os tanques, como a deflexão dos suportes.

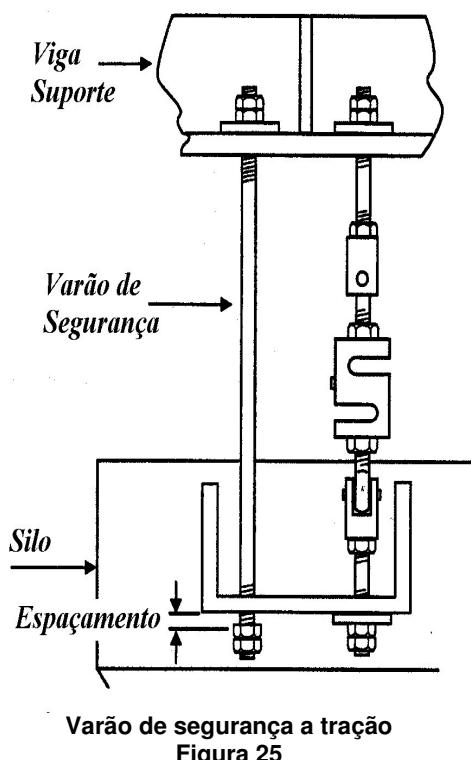
## V MÉTODOS ADICIONAIS DE RESTRIÇÃO DOS TANQUES

A maioria dos módulos de compressão utilizada pela Toledo do Brasil é projetada para serem auto limitantes e proporcionar a proteção adequada contra tombamento. Mas em aplicações em que ventos excessivos ou forças de cargas sísmicas são riscos potenciais, são necessários sistemas de restrições adicionais. Para sistemas suspensos por módulos de pesagem a tração, são sempre necessários sistemas de segurança para sustentar o tanque no caso de falha no conjunto.

### 19. Restrições ao movimento

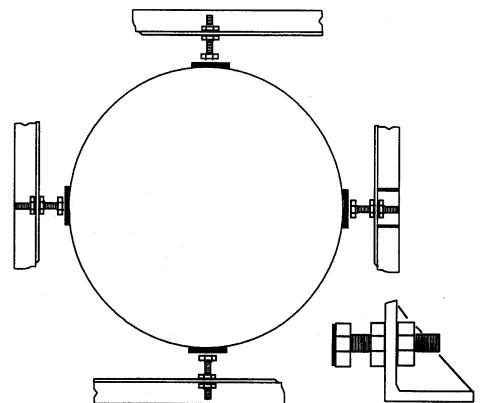
Os varões são usados para limitar o movimento horizontal do tanque de modo a que não tombe ou gire. Eles devem ser posicionados no centro de gravidade ou acima deste. Notar que os varões são tangenciais ao tanque, com espaçamentos entre as porcas de fixação na sapata que o prende ao tanque. Isto permite que os varões restrinjam o tanque ao mesmo tempo em que permitem um mínimo de expansão/contracção térmica. Se os varões forem instalados em perfeita posição horizontal, eles não criam forças verticais que podem afetar as leituras de peso.

## 20. Varões e limitadores de movimento

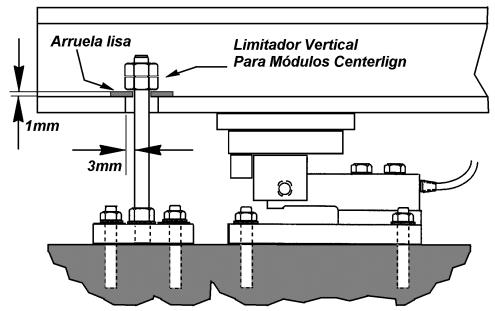


**Varão de segurança a tração**  
**Figura 25**

Todo tanque que for suspenso por módulos de pesagem à tração deve ter um sistema secundário de segurança. Os varões de segurança devem ser suficientemente robustos para suportar o tanque cheio em caso de falha no sistema de suspensão primário. Em muitas aplicações, devem-se instalar varões de segurança próximos a cada módulo de tração (figura 25).



**Limitadores de movimento tipo batente**  
**Figura 26**

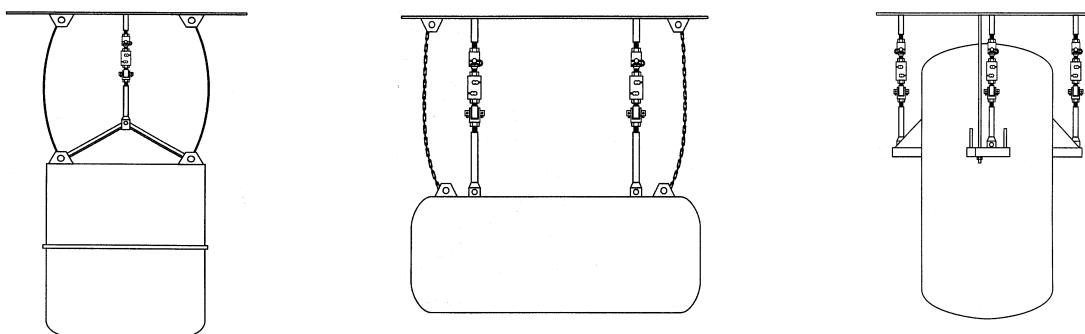


**Limitador Vertical para Centerlign**  
**Figura 27**

Cada varão de segurança deve ser fixo através de um orifício super dimensionado no suporte e com espaçamento entre suas porcas de sustentação de modo que o varão não interfira nas leituras de peso. Os módulos de compressão Centerlign não são providos de proteção contra o levantamento das plataformas associadas aos mesmos. Limitadores verticais devem ser adicionados se este for o caso. (figura 27). Varões horizontais ou batentes podem ser usados em torno do perímetro do tanque para impedir que gire (figura 26).

## 21. Dispositivos de segurança para módulos de tração

Para impedir que qualquer problema no módulo de pesagem provoque a queda do elemento a ser pesado, ou mesmo para facilitar a troca de células, devemos sempre prover o sistema à tração de dispositivos de segurança.



**Dispositivos a segurança**  
**Figura 28**

## 22. Projeto das tubulações

Toda vez que uma tubulação é conectada a um tanque (de uma conexão fixa para uma conexão flexível), existe um risco potencial de curvaturas mecânicas. Se a tubulação não for instalada adequadamente, ela pode causar erros ao puxar ou empurrar o tanque.

A melhor maneira de evitar estes problemas é projetar as tubulações de modo que não exerçam forças no tanque. Listamos a seguir as regras a serem seguidas ao se projetar tubulações:

1. Se assegure que a estrutura de suporte flexione o mínimo possível. Isto irá minimizar a flexão total da tubulação.
2. Faça todas as tubulações correrem horizontalmente a partir do tanque de modo que o tanque não seja suspenso em nenhuma circunstância pela tubulação.
3. Posicione o primeiro suporte rígido da tubulação o mais longe possível do tanque, o que torna a tubulação mais flexível.
4. Use a tubulação com o diâmetro menor e a mais leve bitola possível, o que torna a tubulação mais flexível.

E por quê é importante a tubulação ser flexível? A figura 29A mostra um tanque montado em módulos de pesagem suportados em uma viga. Uma tubulação está conectada ao tanque e rigidamente presa a uma outra estrutura a uma distância  $L$  deste tanque. Quando o tanque está vazio, a tubulação permanece horizontal e não exerce força ao tanque. Quando o tanque está cheio (figura 29B), ele se move para baixo devido a deflexão combinada das células e da viga. Isto puxa a tubulação para baixo na mesma distância que o tanque deflete ( $\Delta h$ ). A tubulação exerce uma força contrária que suspende o tanque, afetando as medições de peso. Quando mais flexível for a tubulação, menor força será exercida no tanque.

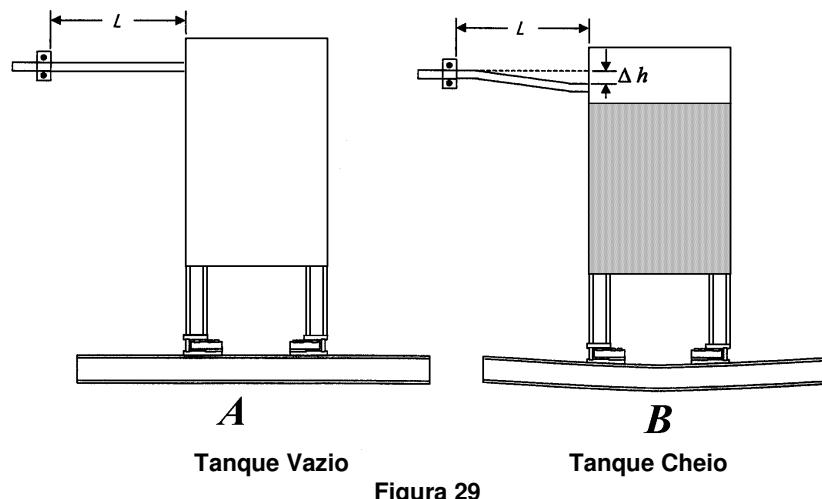
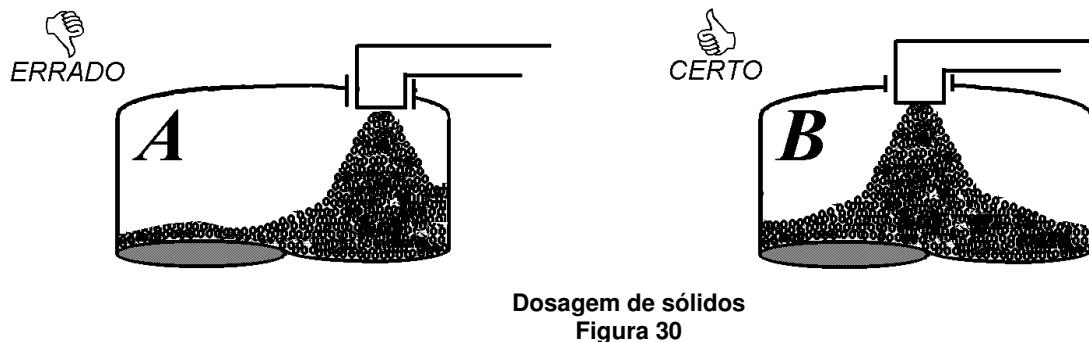


Figura 29

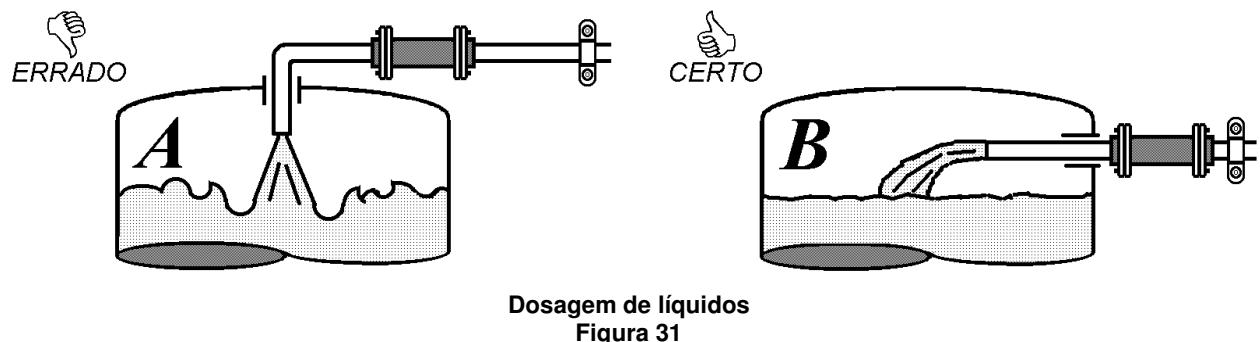
As tubulações podem ter um efeito significativo na precisão da pesagem, especialmente quando muitas tubulações são conectadas a um tanque de baixa capacidade. Através do projeto adequado das tubulações podemos reduzir as forças indesejáveis a uma fração da carga viva do tanque. Assim poderemos compensar as forças remanescentes quando formos calibrar a balança. Como o simulador de células de carga não pode simular as forças produzidas pela tubulação presa ao tanque, a calibração só pode ser efetuada na balança de tanque instalada.

### **23. Projetando a instalação de tubulações**

Esta seção mostra como projetar as tubulações de modo a evitar problemas de deflexões em projeto novos ou solucionar problemas existentes. Quando estivermos projetando a entrada de materiais sólidos em tanques e moegas onde serão **dosados**, devemos sempre evitar que os materiais exerçam pressão contra as paredes laterais ou exerçam carga descentralizadas (Figura 30).

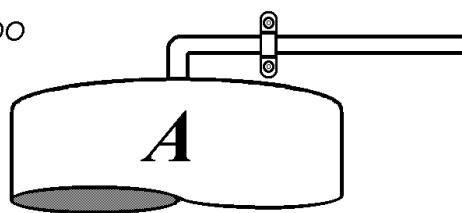


Quando estivermos projetando a entrada de materiais líquidos em tanques e moegas onde serão **dosados**, devemos sempre evitar que os materiais exerçam pressão contra as paredes laterais devido à turbulência (Figura 31B). Não conecte tubulações diretamente no vaso. Procure introduzir a tubulação com folga. Flexíveis podem ser a solução, em caso de sistemas selados.

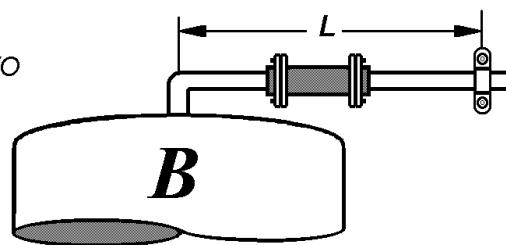


Usar seções de conexões flexíveis de modo que a tubulação não exerça forças indevidas quando o tanque se deflete (figura 32B).

ERRADO



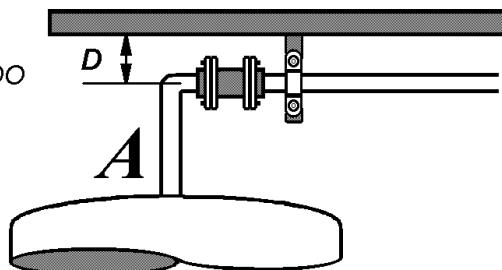
CERTO



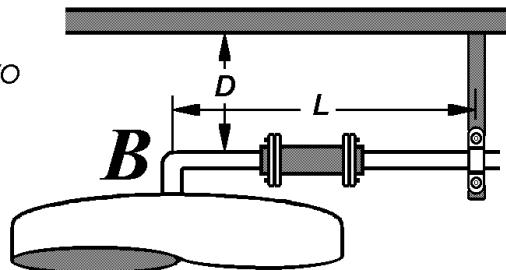
Use sempre tubulações flexíveis  
Figura 32

Quanto maior for à distância entre o tanque e o primeiro suporte externo da tubulação, mais flexível a conexão da tubulação será (figura 33B). Os pontos de fixação devem ser o mais afastados possíveis.

ERRADO



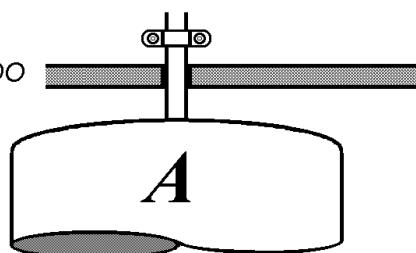
CERTO



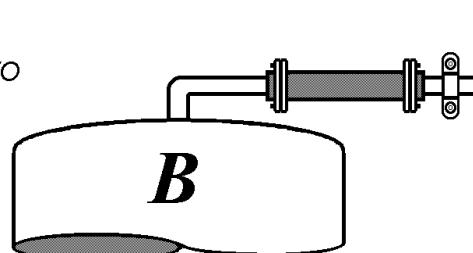
Quanto mais distante melhor  
Figura 33

A fixação vertical não é recomendada. Prefira sempre as horizontais. (figura 34B).

ERRADO

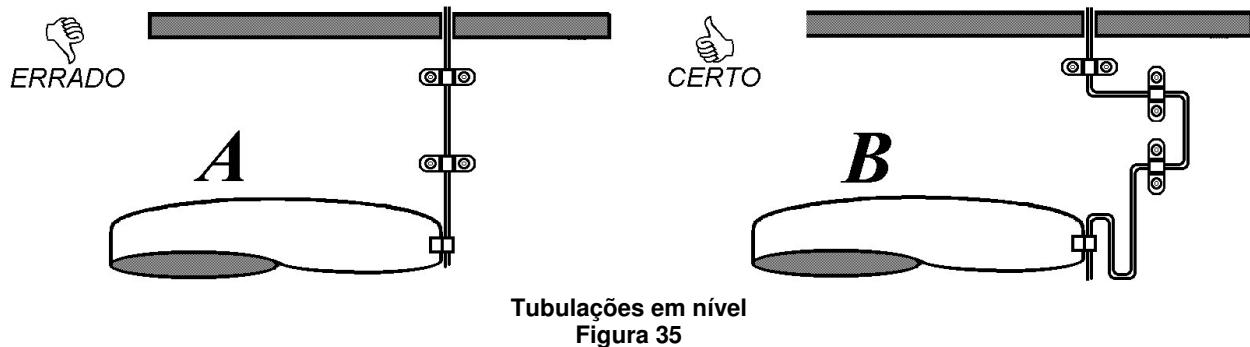


CERTO

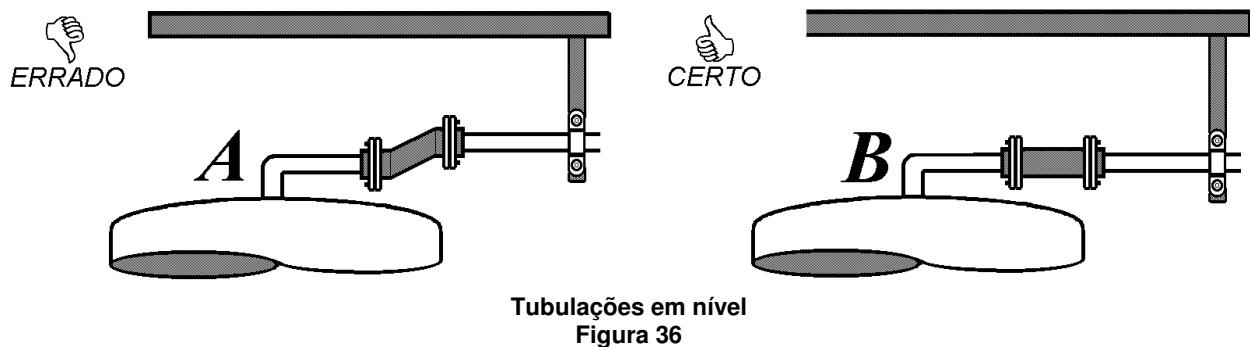


Não usar tubulações na vertical  
Figura 34

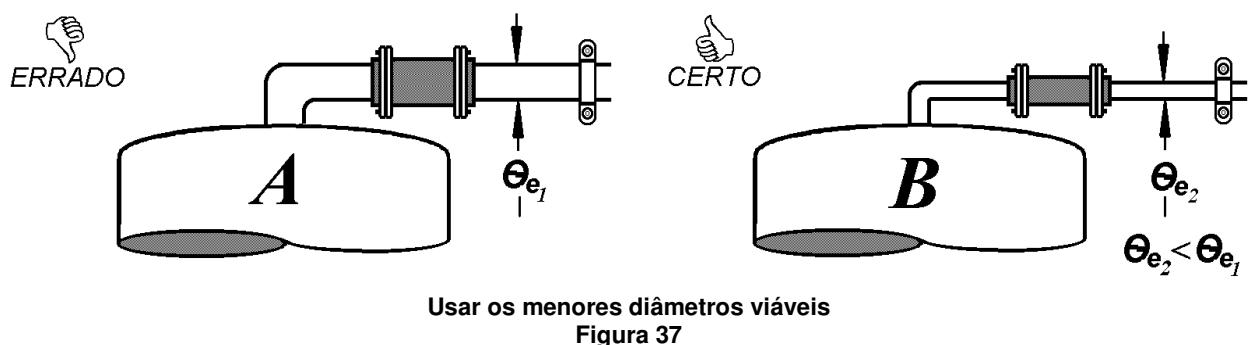
O mesmo se aplica às ligações elétricas. Fazer com que não venham a sustentar o tanque. (figura 35B).



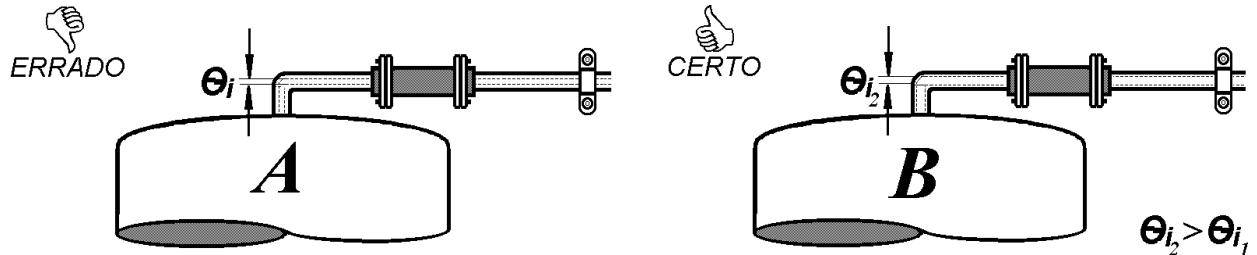
Sempre que possível, procurar efetuar a tubulação em nível com o tanque (figura 36B).



Quanto menor o diâmetro da tubulação, menor será a sua interferência (figura 37B).

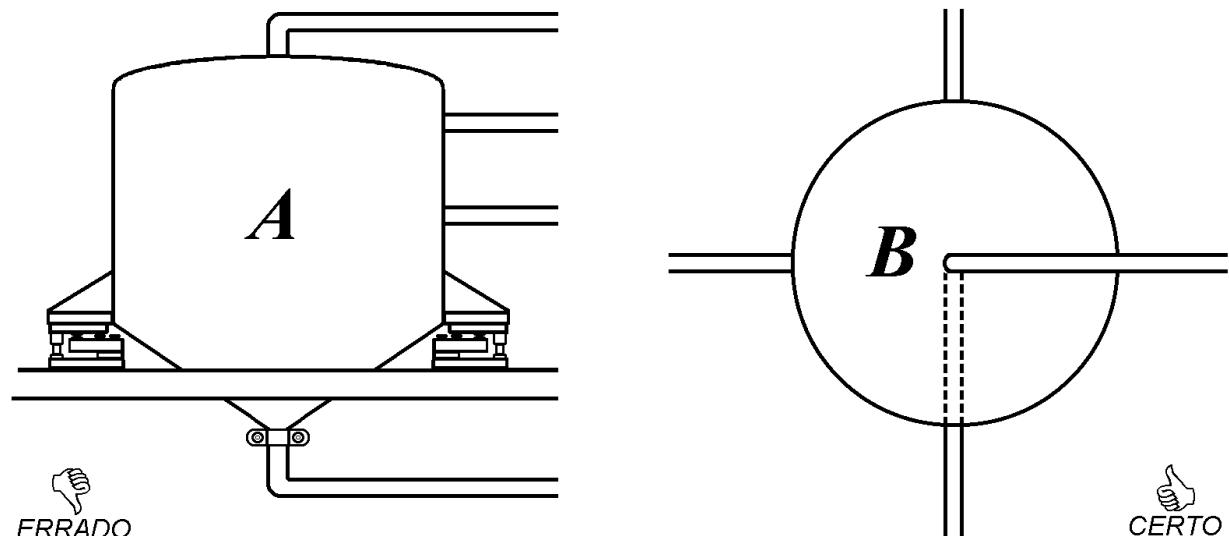


Procure escolher a espessura da parede da tubulação a mais fina possível (figura 38B).



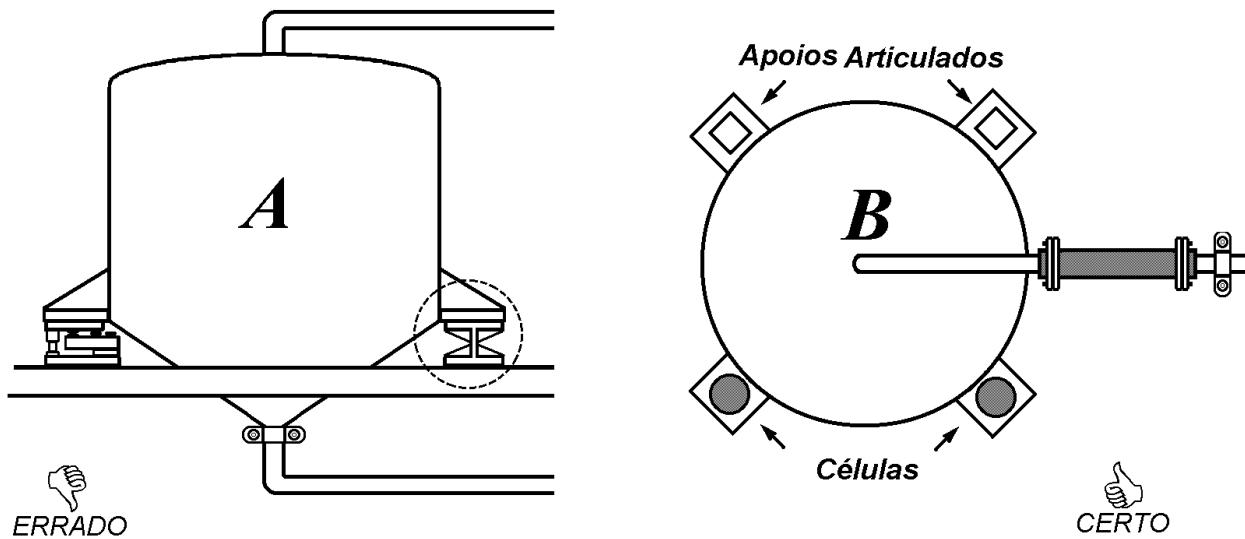
Usar as menores espessuras viáveis  
Figura 38

Quando houver mais de uma tubulação de admissão, procure distribuí-las em torno do tanque (figura 39B).



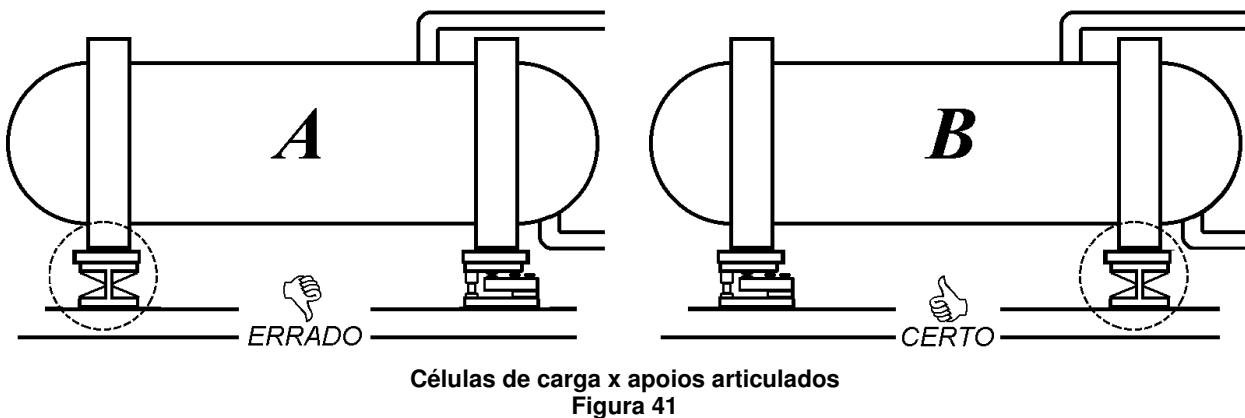
Distribuição de tubulações  
Figura 39

Quando usar células de carga em conjunto com apoios articulados para a medição de nível em tanques cilíndricos, usar a seguinte disposição para as tubulações (figura 40B).



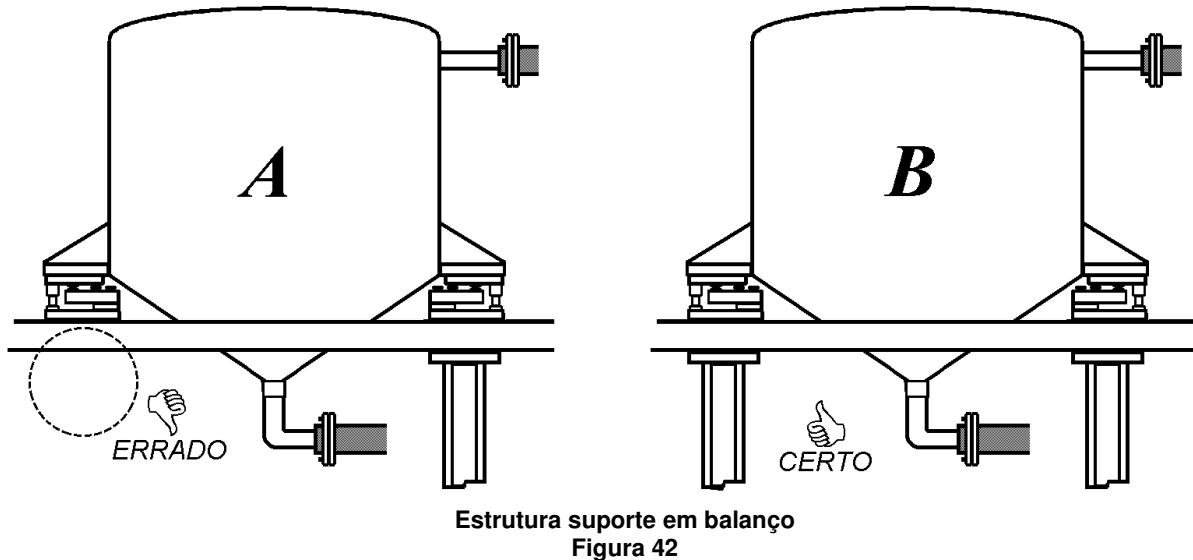
Células de carga x apoios articulados  
Figura 40

Quando usar células de carga em conjunto com apoios articulados para a medição de nível em tanques longos, usar a seguinte disposição para as tubulações (figura 41B).

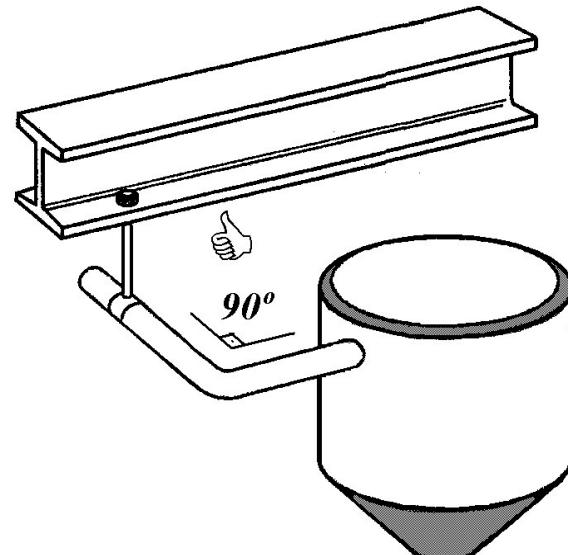


Células de carga x apoios articulados  
Figura 41

Estruturas em balanço promovem instabilidade no sistema (figura 42A).

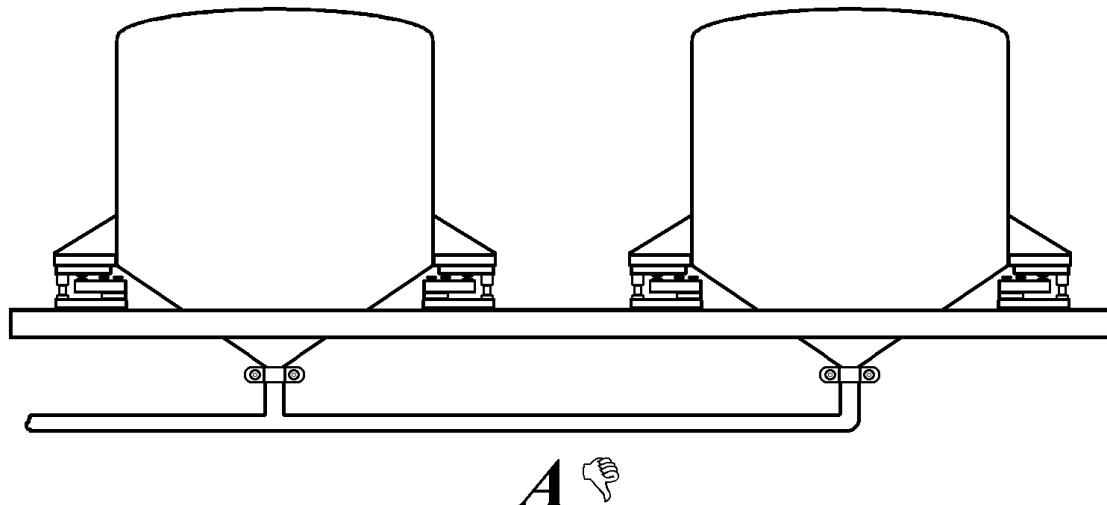


Uma curva de 90° em um lance de tubulação horizontal torna a tubulação mais flexível (figura 43).



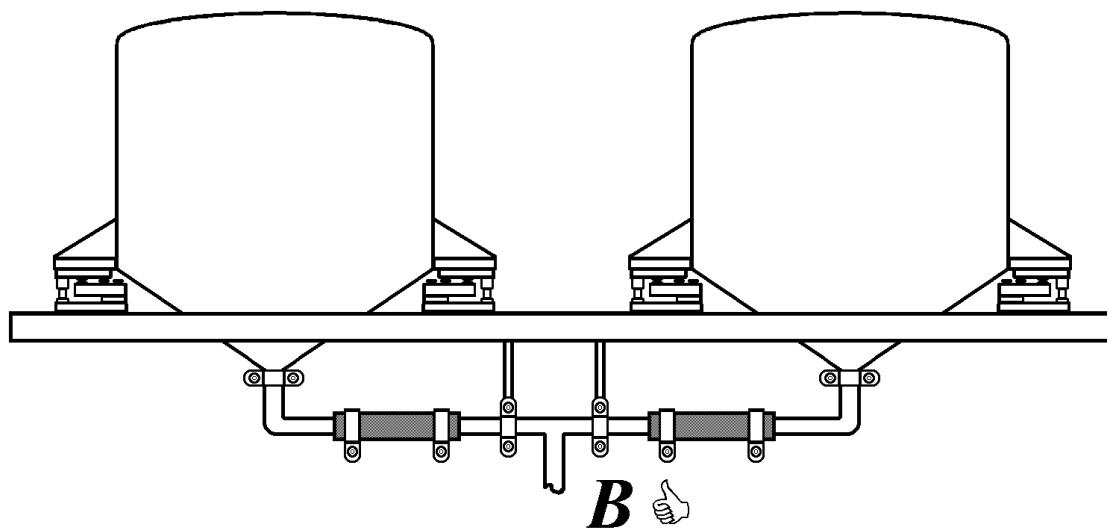
Curva a 90°  
Figura 43

Quando uma tubulação de descarga é utilizada por tanques adjacentes (figura 44A), o peso do material sendo descarregado por um dos tanques pode exercer uma força para baixo no outro tanque. Por isto devemos projetar um sistema de modo que a tubulação de descarga de cada tanque seja suportada independente e não interaja com o outro tanque (figura 44B).



**A**

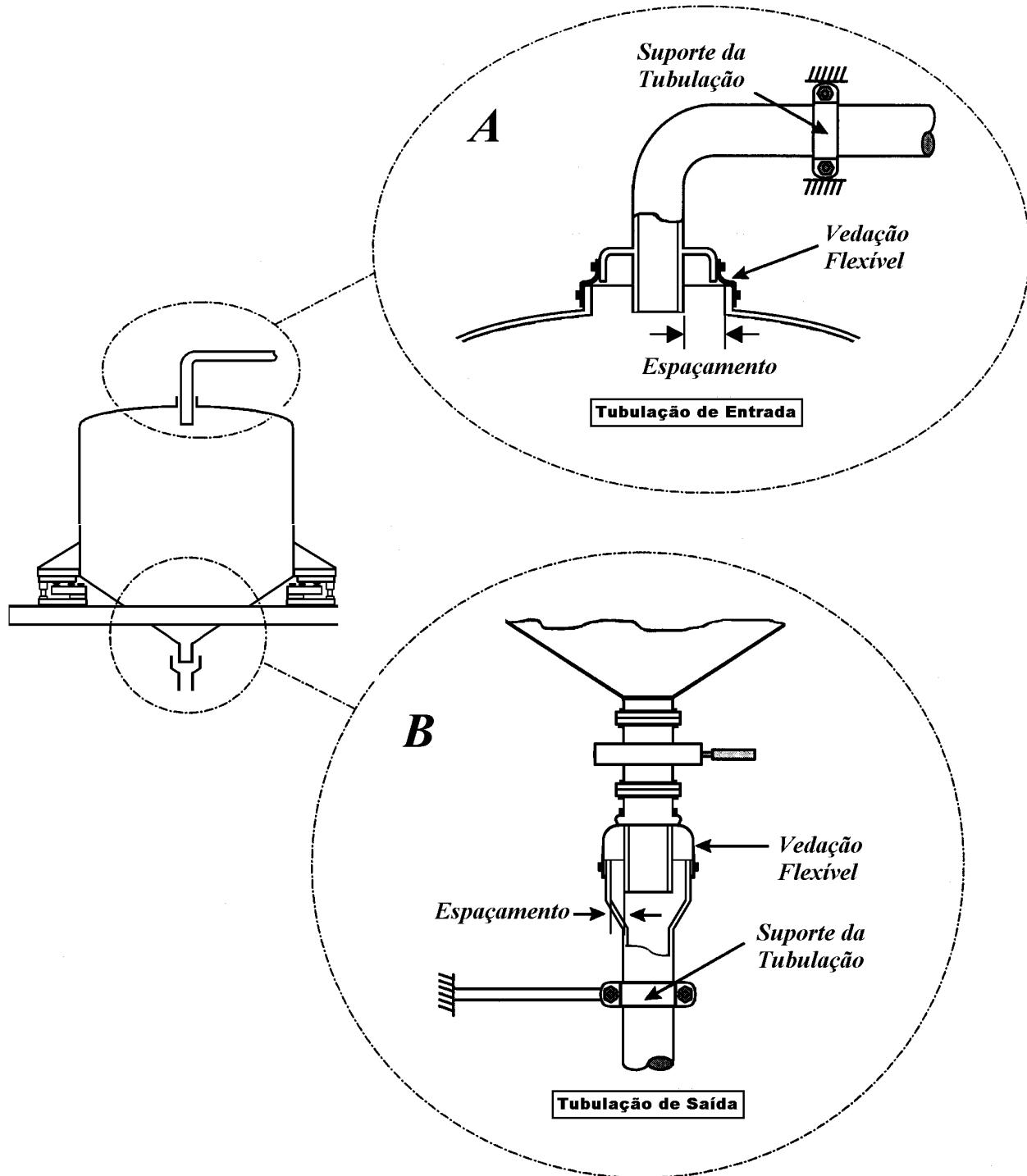
**Interação entre tanques**  
**Figura 44**



**B**

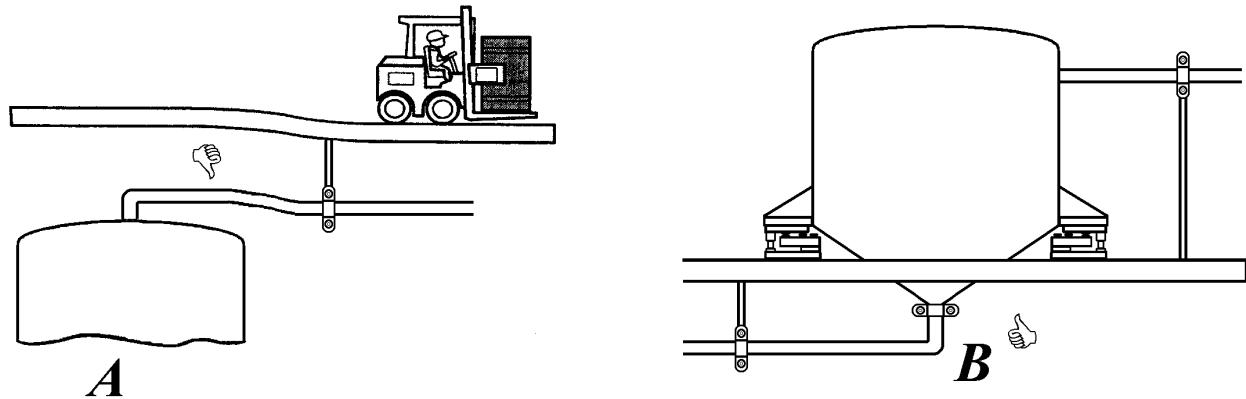
**Tanques sem interação**  
**Figura 44**

Quando possível, evitar conexões rígidas entre as tubulações e os tanques. Notar os espaçamentos entre o tanque e as tubulações de entrada e saída na figura. Uma vedação flexível deve ser prevista para cada conexão (figura45).



Conexões com as tubulações livres de interferência  
Figura 45

Não fixar tubulações em suportes presos em mezanino, piso superior, ou outras estruturas que deflitam independentes do tanque (figura 46A). Por isto, fixar as tubulações ao suporte dos tanques de modo que a tubulação siga os movimentos do tanque (figura 46B).

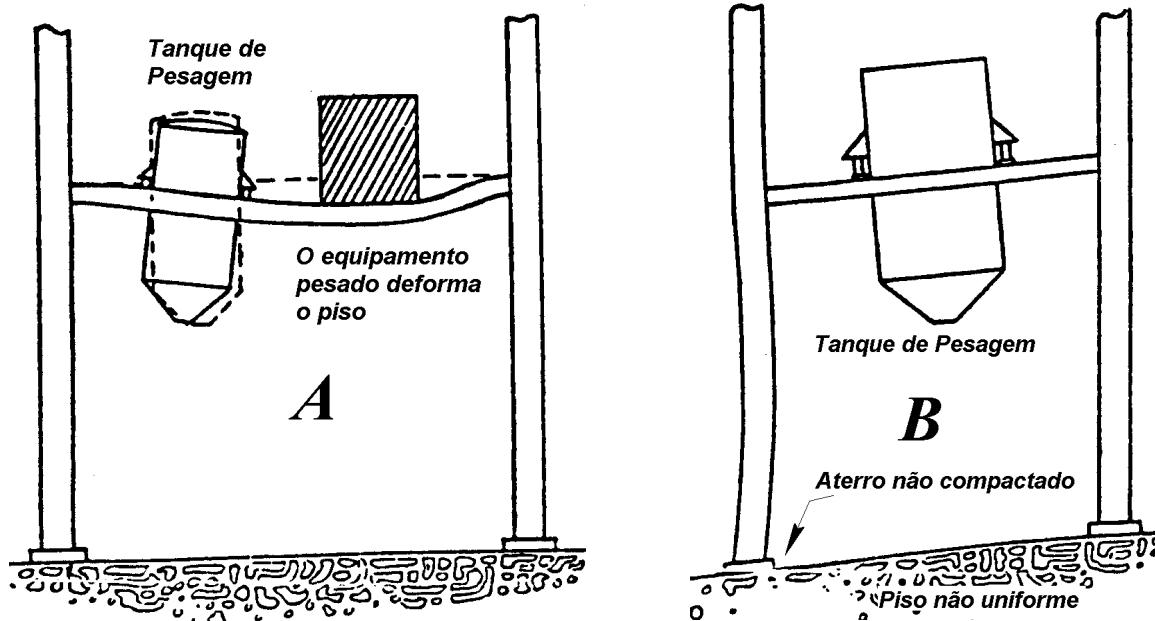


Interação entre tanques e estruturas

Figura 46

## 24. Projetando a estrutura suporte

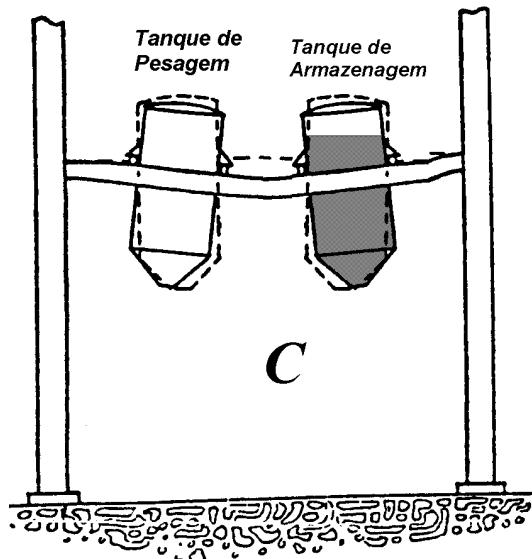
Esta seção mostra os cuidados que devem ser tomados para evitar problemas de deflexões em projeto novos ou solucionar problemas existentes.



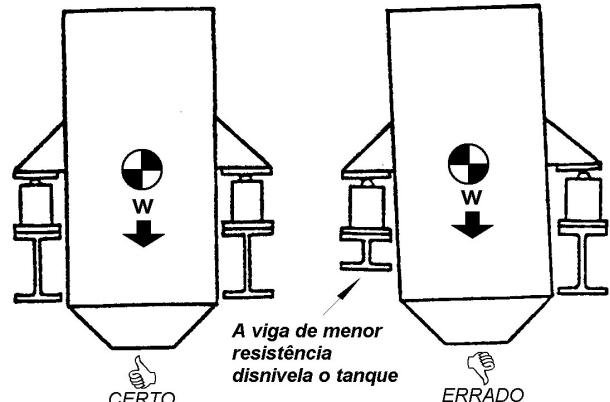
Interação entre tanques e estruturas

Figura 47

A viga de menor resistência desnivela o tanque (figura 49).



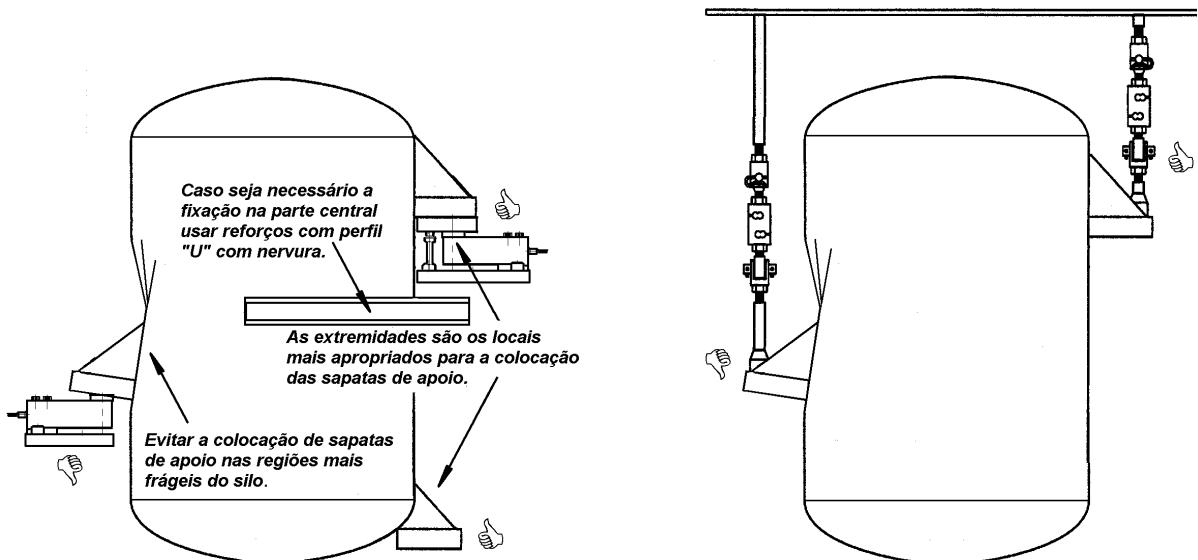
Interação entre tanques e estruturas  
Figura 48



Interação entre tanques e estruturas  
Figura 49

## 25. Localização de células de carga

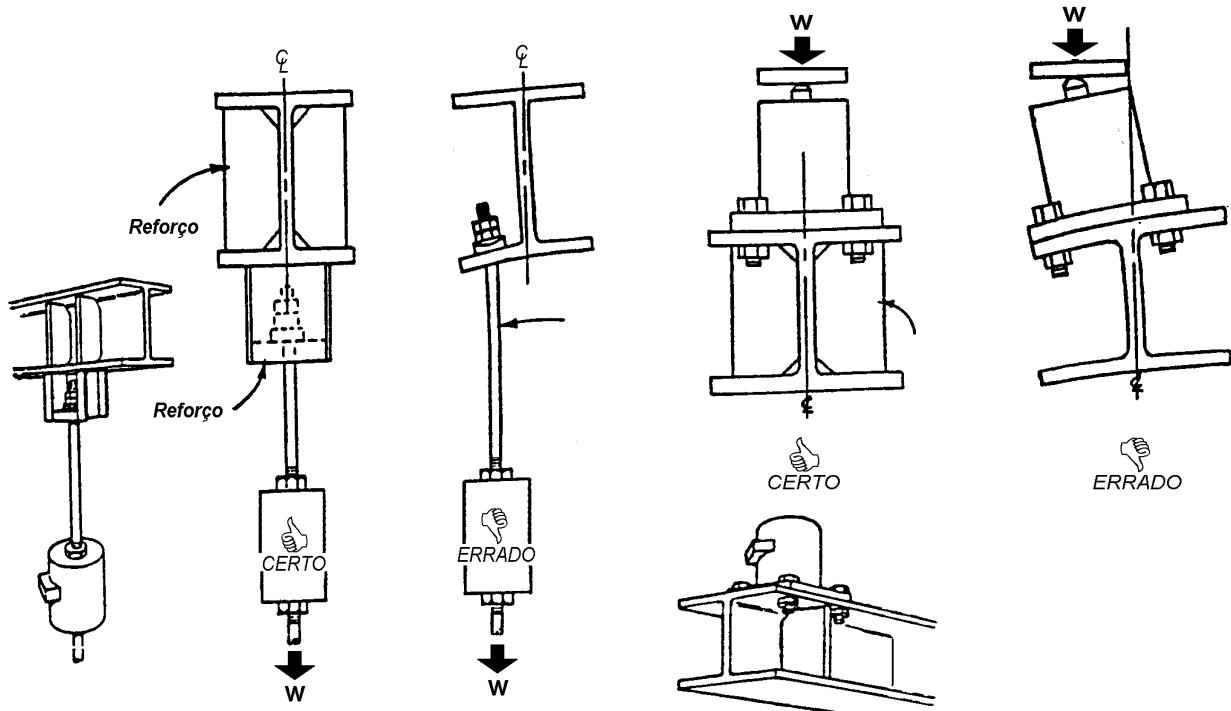
Esta seção mostra os cuidados que devem ser tomados na instalação das células de carga em projeto novos ou solucionar problemas existentes.



Localização das células de carga  
Figura 50

## 26. Referência Estável

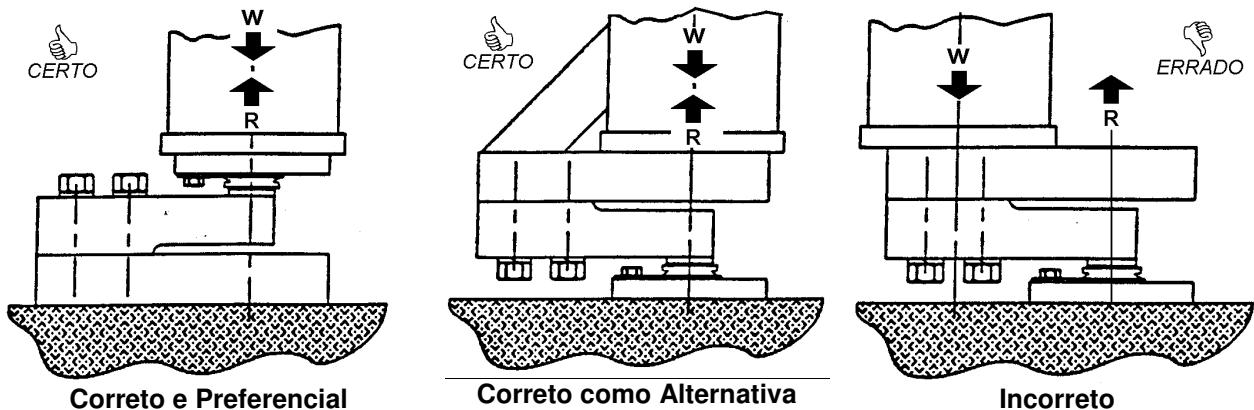
Devemos garantir que as células de carga tenham uma referência estável.



Cuidados nas fixações das células de carga  
Figura 51

## 27. Posicionamento correto

Fixação das células Flexmount em baixo de pés de tanques (figura 52).

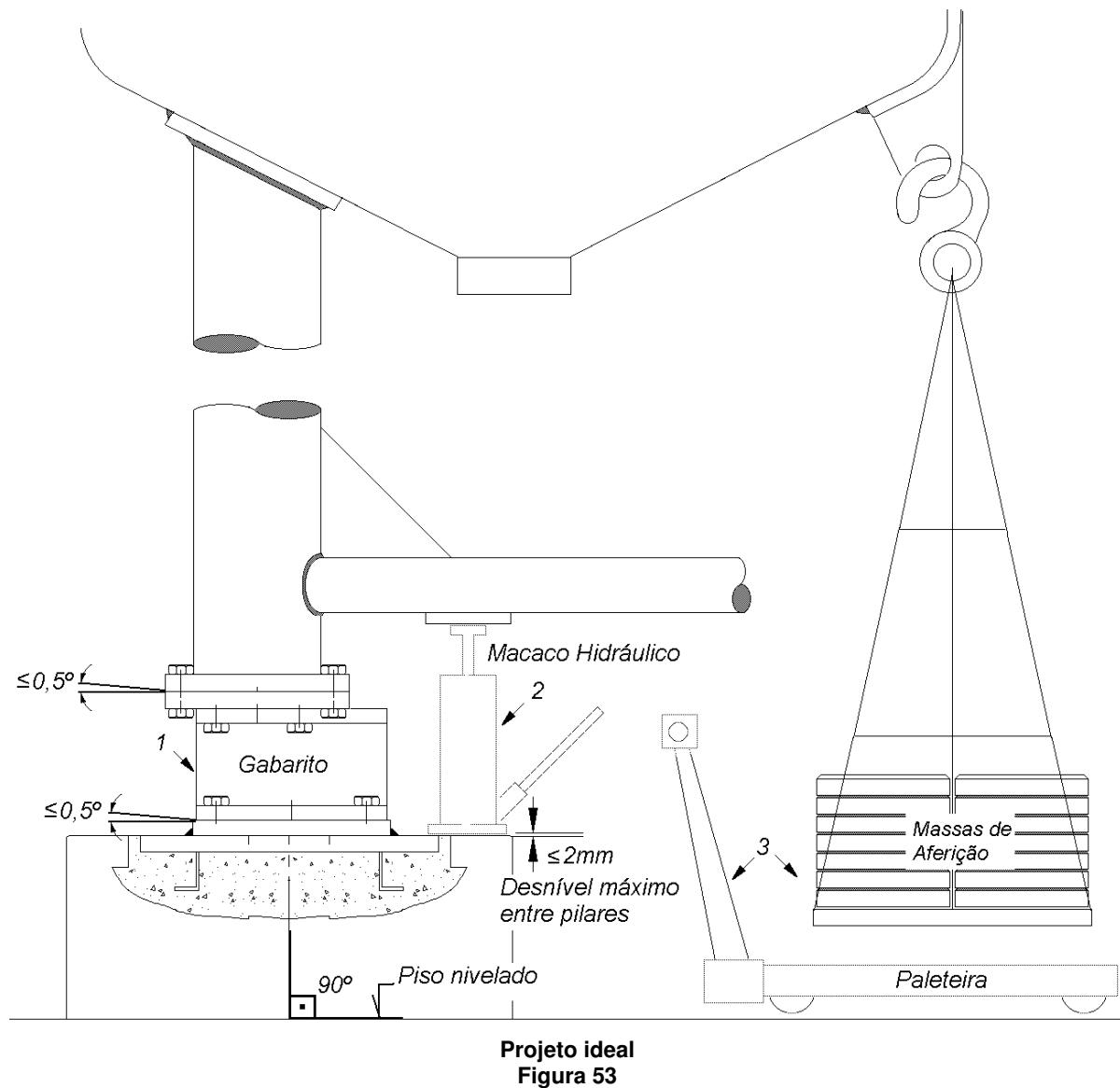


Posicionando as células Flexmount corretamente  
Figura 52

## VI SUGESTÕES DE MONTAGEM E CALIBRAÇÃO

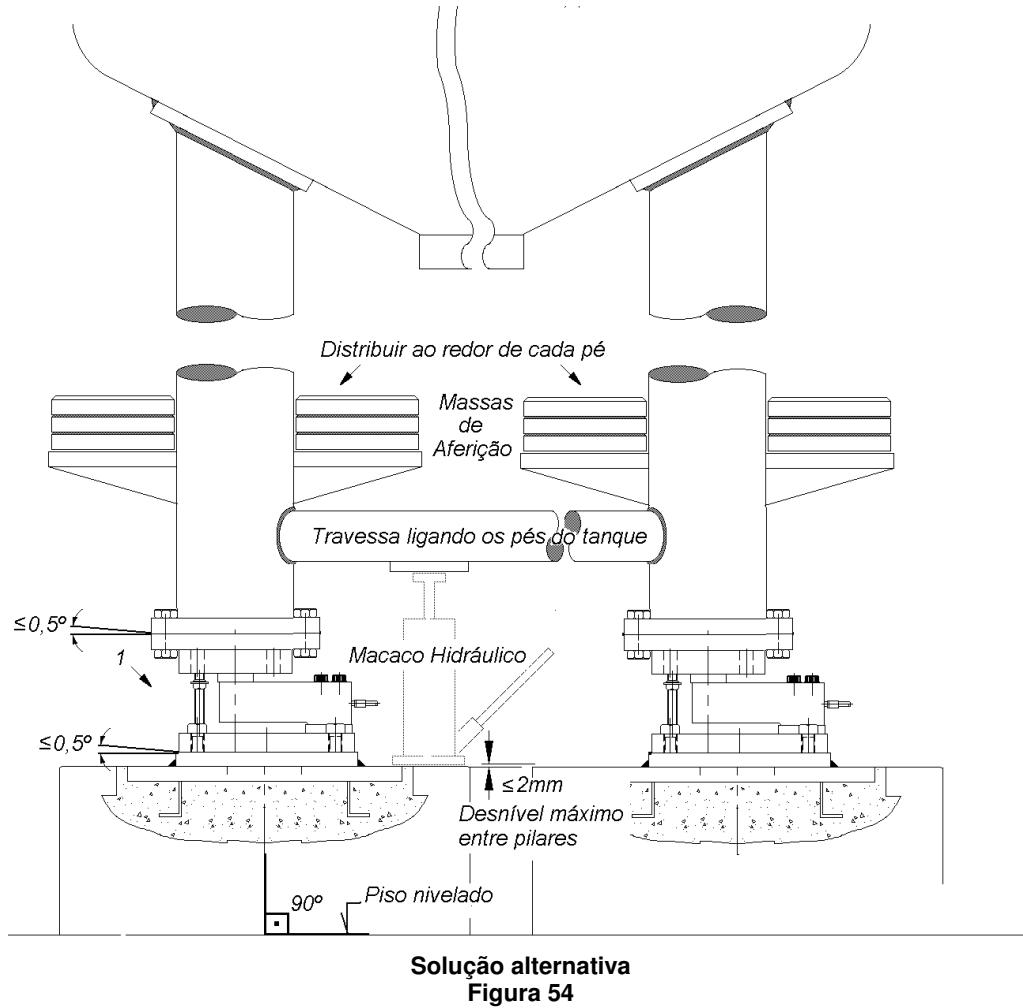
### 28. Montagem Ideal

1. Quando da montagem do tanque, utilizar um suporte (gabarito) com as dimensões da célula em seu lugar, evitando assim danos nesta por pancadas ou por correntes elétricas oriundas de soldagens.
2. Prever espaço tanto no pilar como no tanque para a colocação de macaco hidráulico para a manutenção, troca de células e etc.
3. Para a calibração é necessário prever um olhal no tanque e espaço entre os pilares para a chegada da paleteira com as massas de aferição.



## 29. Montagem Alternativa

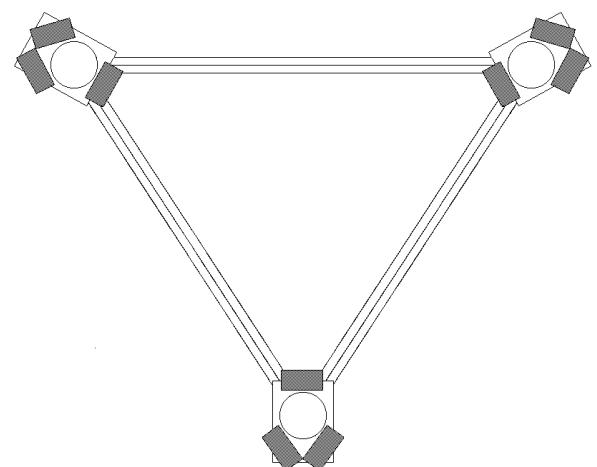
Caso não possamos ter a montagem anterior podemos ter a seguinte alternativa:



Alternativa para a colocação de massas de aferição quando o tanque não possuir alças próprias.

**ATENÇÃO**  
Concentrar as massas ao redor de cada pé.

Evitar colocar as massas sobre as travessas.

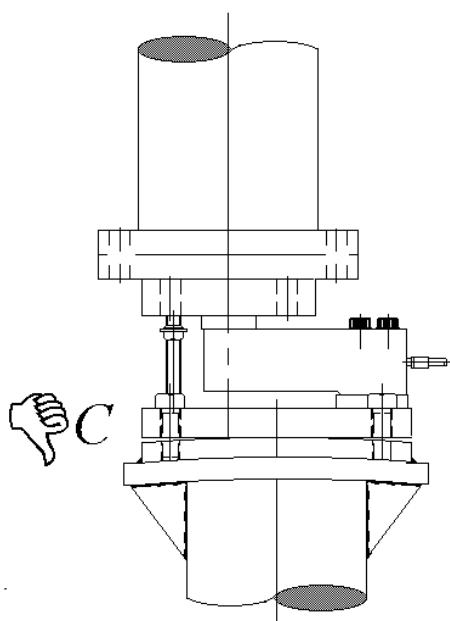
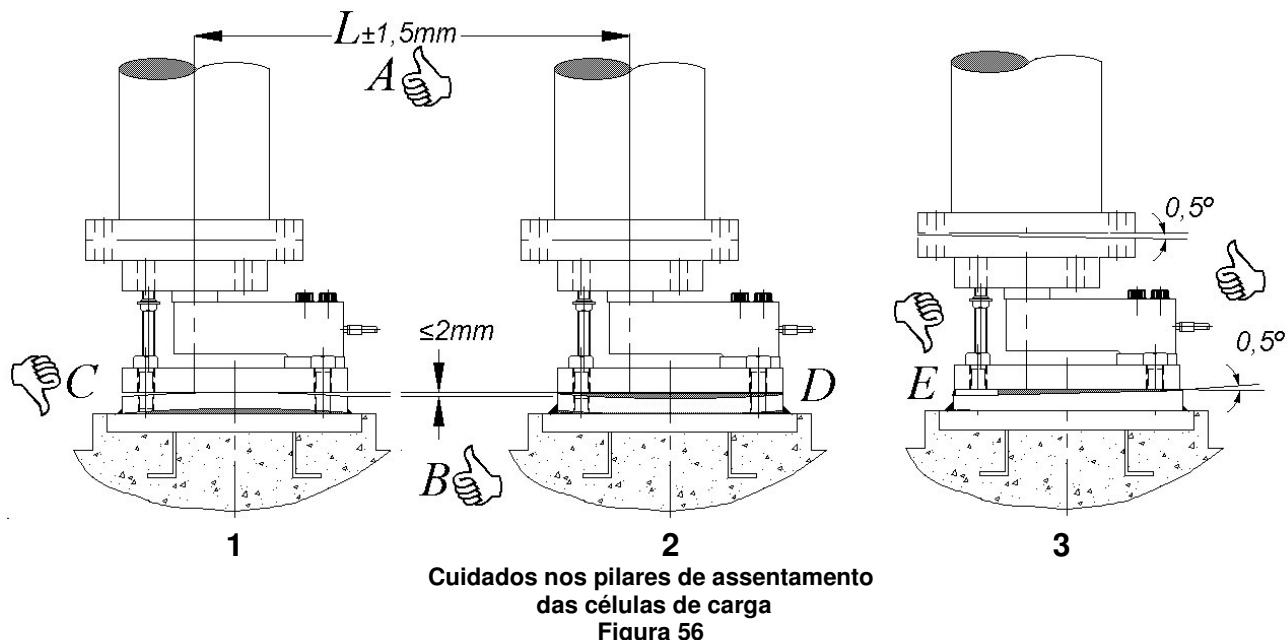


**Alternativa para a colocação de massas de aferição**  
**Figura 55**

### 30. Cuidados no assentamento de células de carga

Situações indesejáveis na montagem de tanques onde o assentamento da placa inferior da célula encontra superfícies de contato côncava, convexa ou desnívelada, provocando flexões no ato de fixação da célula de carga. Nestes casos as leituras de peso sofrerão estas interferências na medida que a carga for sendo adicionada.

O assentamento das células deve ser o mais nivelado possível.



**A:** - A variação máxima de nível entre os pés do tanque deve ser de  $\pm 1,5\text{mm}$ .

**B:** - O nivelamento entre os pilares deve ser no máximo  $\leq 2\text{mm}$ .

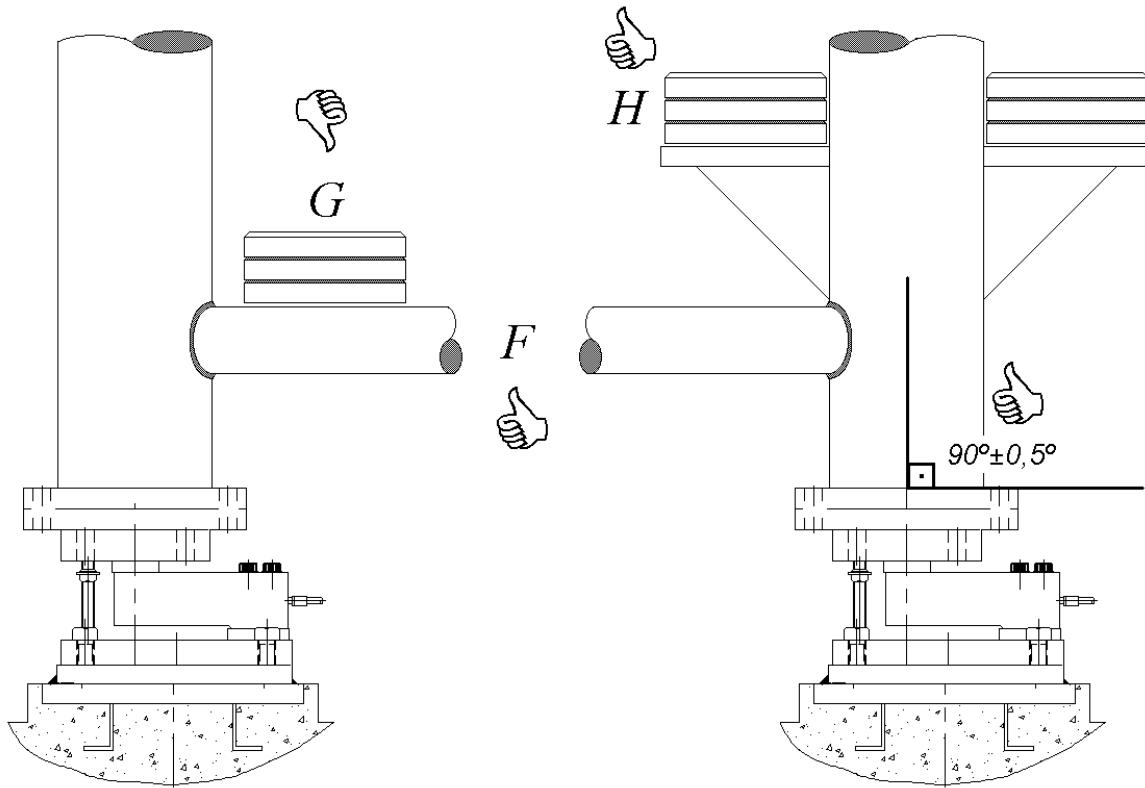
**C:** - O apoio provoca flexão na base e na célula.

**D:** - O apoio provoca flexão na base e na célula.

**E:** - O calço para o nivelamento da base provoca flexão na base e na célula.

### 31. Cuidados na colocação das massas de aferição

Atenção na colocação das massas de aferição



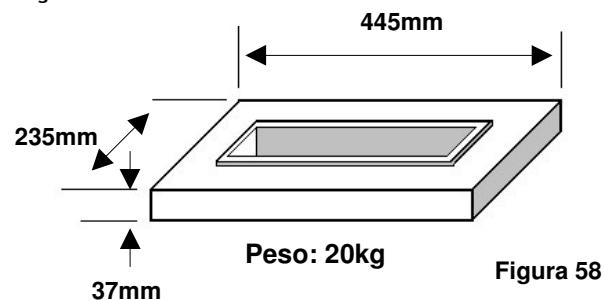
Cuidados na colocação de massas de aferição  
**Figura 57**

**F:** - Barras de travamento dos pés do tanque.

**G:** - A colocação das massas de aferição deve ser sempre sobre as células de carga.

**H:** - Nunca colocar as massas de aferição sobre as barras de travamento dos pés do tanque.

### 32. Dimensões da massa de aferição



**Figura 58**

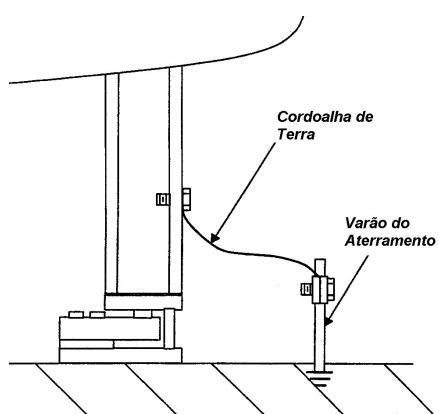
## VII CUIDADOS ADICIONAIS

### 33. Umidade e Corrosão

Umidade e materiais corrosivos atingindo os módulos de pesagem podem afetar a vida útil das células de carga. Detritos, tais como folhas de árvores e sujeira acumuladas em torno dos módulos de pesagem podem também causar problemas. Para minimizar o potencial de umidade e corrosão, sugerimos:

1. Prover drenagem adequada ao redor dos módulos de pesagem.
2. Manter os módulos de pesagem livre de água e detritos que possam acumular umidade.
3. Não utilizar tanque com o topo plano que reter água, folhas e quaisquer outros detritos que possam adicionar peso não compensado ao sistema.
4. Lavar regularmente os tanques para se livrar dos detritos acumulados.
5. Manter os cabos limpos e em boas condições. Cabos rompidos ou com a isolação gasta podem permitir a entrada de água e sofrer corrosão.
6. Proteger os cabos colocando-os em conduites.
7. Localizar os tanques (e os módulos de pesagem) distantes de materiais corrosivos químicos. Os efeitos combinados de temperatura, água, e ar podem corroer os módulos de pesagem. Se os tanques estiverem próximos à substância corrosivas, usar pintura protetora e blindagens. Fluxo de ar positivo pode também ajudar a prevenir danos por corrosão.

### 34. Descargas atmosféricas e proteção contra surtos de tensão



Sistema de aterramento para  
módulos de pesagem  
Figura 59

Dispositivos de proteção devem ser instalados para proteger a balança contra danos por descargas atmosféricas. Usar dispositivos que sejam projetados para impedir que a corrente produzida pela descarga passe através da célula de carga. E por outro lado devem prover um caminho de baixa resistência para terra perto de cada módulo de pesagem (figura 59).

1. Verificar a integridade dos sistemas de aterrramento existentes.
2. Usar um sistema de ponto único de aterramento.

Surtos de tensão são variações instantâneas de tensão ou correntes. Elas podem ser causadas por descargas atmosféricas ou por equipamentos com grandes cargas de motores. Variações pequenas podem ser eliminadas por meio de UPS ou estabilizadores de tensão. Deve ser providenciada proteção contra surtos de tensão para impedir danos aos módulos de pesagem.

## VIII Pontos a considerar (check-list)

Para se obter sucesso na execução de qualquer projeto envolvendo células de carga, as seguintes perguntas devem estar respondidas previamente:

1. Qual é a precisão requerida para o sistema de pesagem?
2. Qual é o peso morto do tanque, silo, vaso, estrutura?
3. Qual é o peso do produto contido/confinado?
4. Que tipo de produto é manuseado (sólido, líquido, granulado)?
5. O tanque, silo, vaso, estrutura serão apoiados ou suspensos?
6. Quantos são os pontos de apoio ou suporte?
7. Existirão tubulações conectadas?
8. Quando o produto adentra ao tanque, silo, vaso, estrutura causam choques contra as paredes?
9. Onde será instalado (interno ou externo)? Se externo: - Qual os requisitos para ventos?
10. Qual a classificação sísmica da área?
11. Quais é faixa de variação de temperatura do local e de operação da célula de carga (mínima, máxima, de operação)?
12. Qual é a temperatura do processo? Se as temperaturas forem maiores que 50º C, isolamento térmico deve ser considerada.
13. Existe agitador, vibrador ou misturador acoplado?
14. A área externa está sujeita a lavagens periódicas?
15. A célula de carga necessita ser de aço inoxidável?
16. Existe a possibilidade de contato com produtos químicos / corrosivos externamente?
17. Qual a classificação da área local?
18. Qual a classificação da área onde estará o indicador de peso?
19. Que tipo de indicador será necessário (cego/indicação)
20. Onde será instalado o indicador de peso?
21. Qual é a distância entre as células e o indicador de peso?
22. O indicador de peso será conectado em quê equipamento (PC, PLC, DCS, outros)?
23. Será necessário saída analógica? (4-20mA, 0-20mA, 0-10VCC)
24. Qual os requisitos elétricos de interfaceamento? (RS-485, RS-422, ModBus, ProfiBus, AB RIO, DeviceNet, Ethernet)
25. Qual é o protocolo a ser utilizado?
26. É necessário o controle de Rede/Gateway?
27. É necessário o controle de setpoints via indicador?
28. É necessário indicação remota?
29. O serviço de calibração será necessário?
30. Estão previstos pontos de apoio para as massas de calibração?

## **IX CONTATOS**

Em caso de dúvidas ou consultas entrar em contato com a Engenharia de Soluções, Rua Galeno de Castro, 730, São Paulo, SP, CEP 04696-916, tel.: (11) 5547-1800, fax.: (11)5524-4167, e-mail: [sis@toledobrasil.com.br](mailto:sis@toledobrasil.com.br) ou com a filial da Toledo do Brasil mais próxima:

Filial	Endereço	Tel.	Fax	e-mail
Belém, PA	Av. Senador Lemos,3501 CEP 66120-000	(91)233-5633	(91)244-0871	bel@toledobrasil.com.br
B. Horizonte, MG	Av. Portugal, 5011 CEP 31710-400	(31)3491-2770	(31)3491-5776	bhz@toledobrasil.com.br
Campinas, SP	R. Eldorado,60 CEP 13054-100		(19)3225-8666	cpq@toledobrasil.com.br
Campo Grande, MS	Av. Eduardo Elias Zahran, 2473 CEP 79004-000	(67)341-1300	(67)741-1302	cgr@toledobrasil.com.br
Curitiba, PR	R. 24 de Maio, 1666 CEP 80220-060		(41)332-1010	cwb@toledobrasil.com.br
Fortaleza, CE	R. Padre Mororó, 915 CEP 60015-220	(85)283-4050	(85)283-3183	for@toledobrasil.com.br
Goiânia, GO	Av. Laurício P. Rasmussem,357 CEP 74620-030		(62)202-0344	gyn@toledobrasil.com.br
Manaus, AM	R. Ajuricaba, 999 CEP 69065-110	(92) 635-0441	(92)233-0787	mao@toledobrasil.com.br
Porto Alegre, RS	R. Augusto Severo, 36 CEP 92110-390		(51)427-4822	poa@toledobrasil.com.br
Recife, PE	R. D. Arcelina de Oliveira, 48 CEP 51200-200	(81)3339-4774	(81)3339-6200	rec@toledobrasil.com.br
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Rio de Janeiro, RJ	R. Proclamação, 574 CEP 21040-282		(21)3867-1393/1395/1399	rio@toledobrasil.com.br
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Santos, SP	R. Prudente de Moraes, 75-A cj44, 4º andar CEP 11075-251	(13)222-2365	(13)222-3854	ssz@toledobrasil.com.br
S. J. dos Campos, SP	R. Dr. Mário Galvão, 161 CEP 12209-400		(12) 3934-9211	sjc@toledobrasil.com.br
São Paulo, SP	R. do Manifesto, 1183 CEP 04209-901	(11)6160-9000	(11)6160-0183	sao@toledobrasil.com.br

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31

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# SISTEMA ELETRÔNICO DE PESAGEM

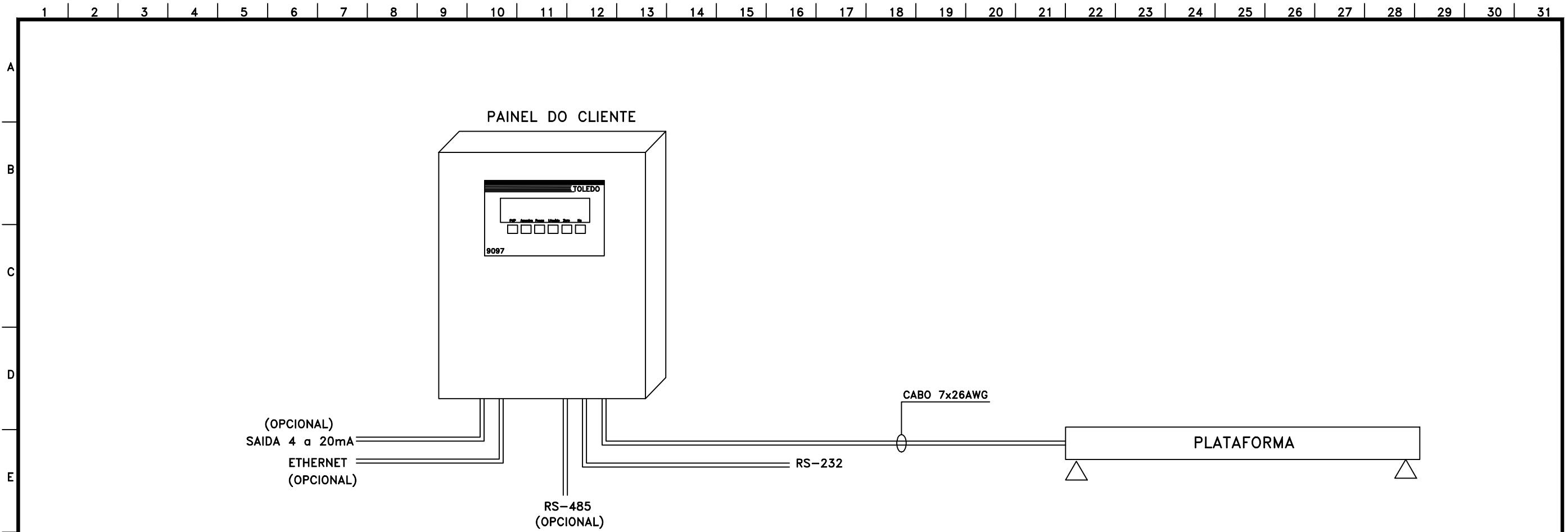
— 9097 INDICAÇÃO COM MODBUS —

CLIENTE: STANDARD

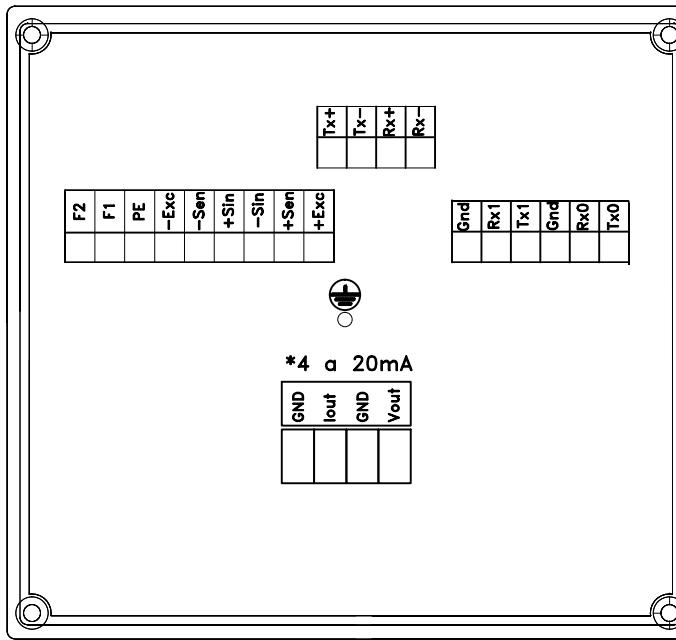
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TOLEDO DO BRASIL INDÚSTRIA DE BALANÇAS LTDA.	
DOCUMENTO E OU/ DESENHO	
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<input checked="" type="checkbox"/>	CERTIFICADO
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DATA: 23/11/10	ASSINATURA: FABIO MACHADO

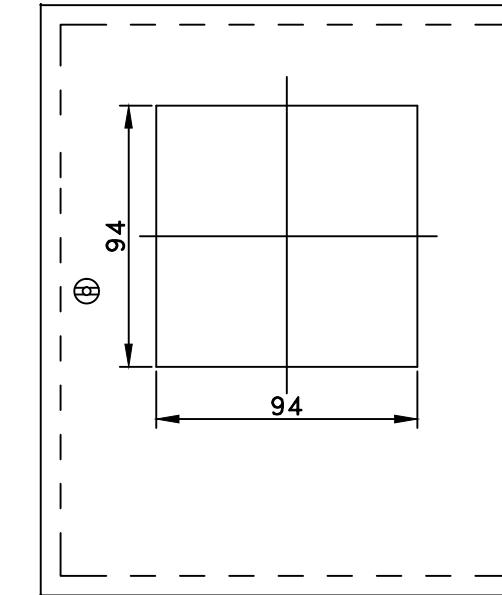
02	INCLUSÃO DAS DIMENSÕES PARA 9097 VERSÃO PAREDE	FABIO	31/07/12	DESENHADO: FABIO MACHADO	PROJETADO: FABIO MACHADO	VERIFICADO:	ARQUIVO: 7008923-02	TÍTULO: CAPA	TOLEDO DO BRASIL ALTA TECNOLOGIA EM PESAGEM	FOLHA N°: 01/06	REVISÃO: 02
01	ALTERAÇÃO DA TOPOLOGIA MODBUS TCP	FABIO	26/01/12	DATA:	DATA:	DATA:	CT.:		CLIENTE: STANDARD	DESENHO N°: V3E-7008923	
REV.:	MOTIVO:	POR:	DATA:	23/11/10	23/11/10						



VISÃO TRASEIRA DO MÓD. 9097 (NOTA 1)

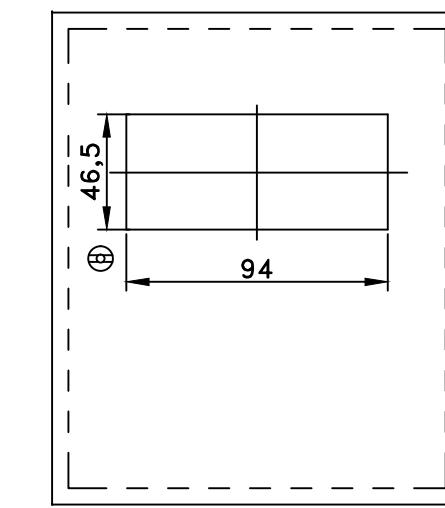


Rasgo p/ 9097 com OPCIONAL

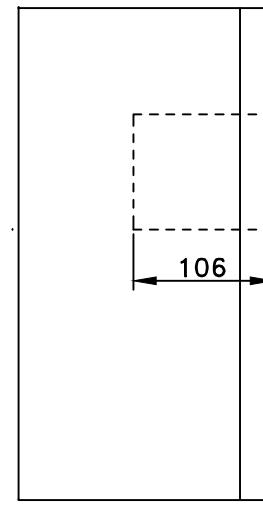


VISÃO FRONTAL

Rasgo p/ 9097 Standard



VISÃO FRONTAL



VISÃO LATERAL

NOTA 1: O CLIENTE DEVE SE ATENTAR AO FORNECIMENTO PARA DEFINIR SUA CONFIGURAÇÃO DE HARDWARE E PROGRAMAÇÃO.

ARQUIVO:  
7008923-02

TÍTULO:

ARQUITETURA GERAL  
E DIMENSÕES

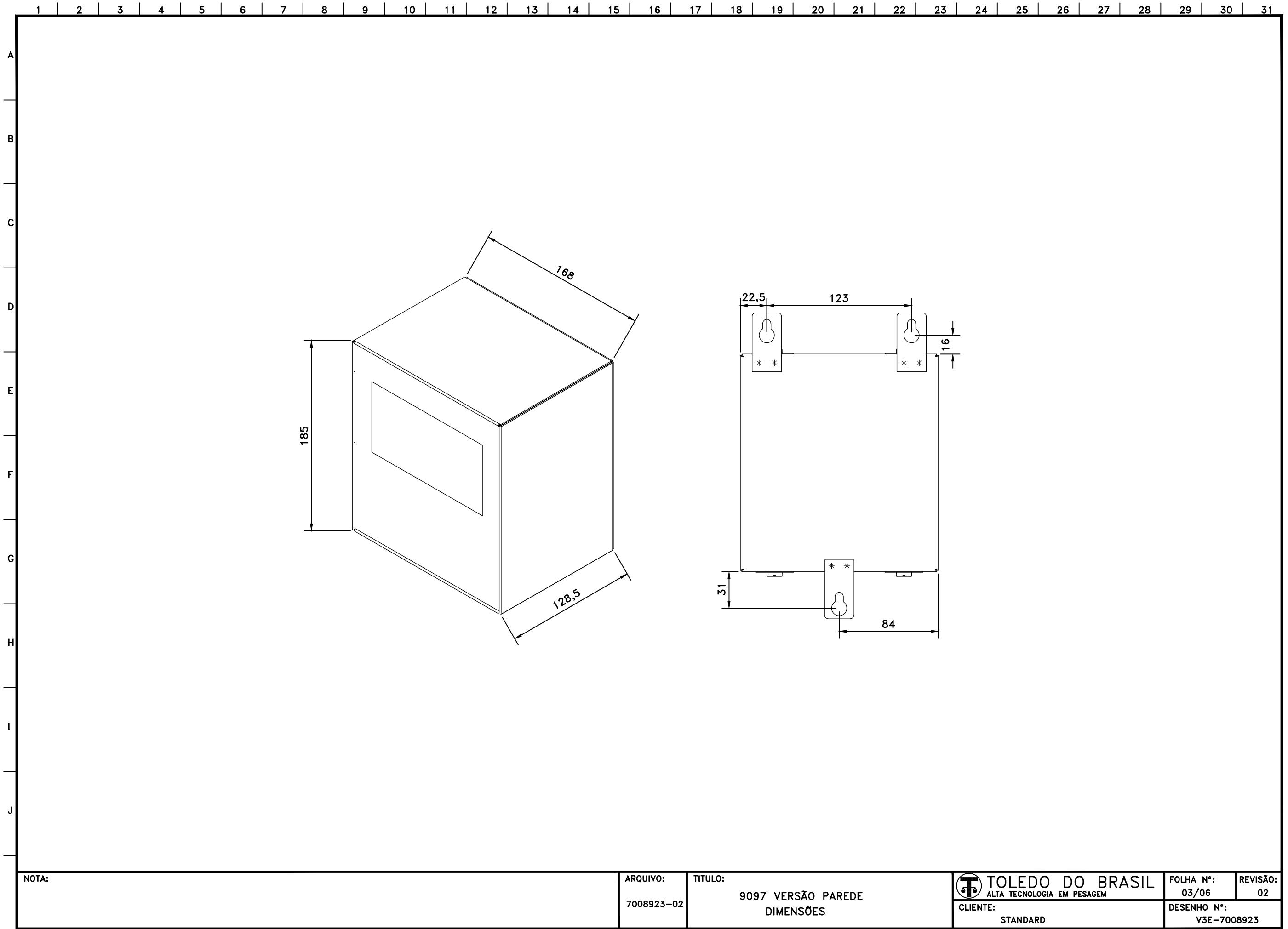
**TOLEDO DO BRASIL**  
ALTA TECNOLOGIA EM PESAGEM

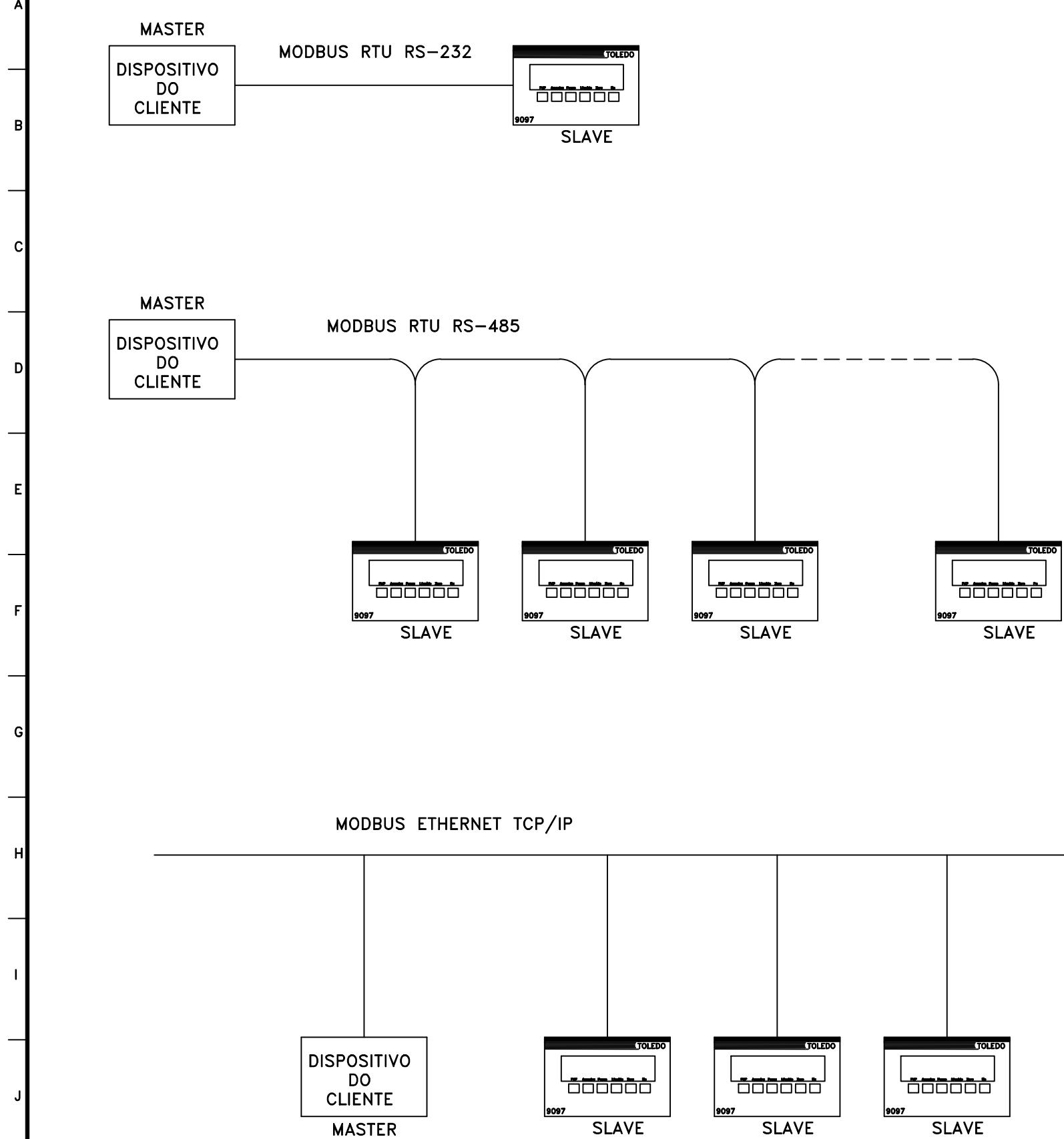
CLIENTE:  
STANDARD

FOLHA N°:  
02/06

REVISÃO:  
02

DESENHO N°:  
V3E-7008923





#### CONFIGURAÇÃO DO 9097:

OS PARÂMETROS QUE ATUAM NO FUNCIONAMENTO DO MODBUS RTU (RS232 E RS485) SÃO:

- C4.0 – SELEÇÃO DO PROTOCOLO DE COMUNICAÇÃO = Prtu
- C4.1 – BAUD RATE = CLIENTE
- C4.2 – NÚMERO DE BITS DE DADOS = CLIENTE
- C4.3 – PARIDADE = CLIENTE
- C4.4 – STOP BITS = CLIENTE
- C4.22 – ENDEREÇO DO TERMINAL NA REDE = CLIENTE

OS PARÂMETROS QUE ATUAM NO FUNCIONAMENTO DO MODBUS TCP/IP SÃO:

- C4.0 – SELEÇÃO DO PROTOCOLO DE COMUNICAÇÃO = Pet1
- C4.11 – ENDEREÇO IP DO INDICADOR = CLIENTE
- C4.12 – MÁSCARA DE REDE = CLIENTE
- C4.13 – GATEWAY = CLIENTE
- C4.20 – HABILITA O PROTOCOLO MODBUS TCP = L
- C4.21 – PORTA DE COMUNICAÇÃO PARA O PROTOCOLO MODBUS TCP = CLIENTE
- C4.22 – ENDEREÇO DO TERMINAL NA REDE = CLIENTE

#### JUMPERS PCA PRINCIPAL:

JP1 E JP2 1-2 HABILITA INTERFACE RS232 DA CPU  
2-3 HABILITA INTERFACE RS232 DA PCA FIRE

JP3 E JP4 SEM FUNÇÃO

CAL1 ABERTO HABILITA MODO PESAGEM  
FECHADO HABILITA MODO PROGRAMAÇÃO

#### JUMPERS PCA COMUNICAÇÃO:

JP1 E JP2 1-2 HABILITA INTERFACE DE COMUNICAÇÃO LOOP DE CORRENTE  
2-3 HABILITA INTERFACE DE COMUNICAÇÃO RS422 / 485

JP3 E JP4 1-2 HABILITA INTERFACE DE COMUNICAÇÃO USB S/ PCA FIRE  
2-3 HABILITA INTERFACE DE COMUNICAÇÃO USB C/ PCA FIRE

JP5 1-2 E 3-4  
(JP6 E JP7 ABERTOS) TTL P/ RX / TX-D0 (INTERFACE ETHERNET)

JP6 1-2 E 3-4  
(JP5 E JP7 ABERTOS) TTL P/ RX / TX-D1 (INTERFACE USB)

JP7 1-2 E 3-4  
(JP5 E JP6 ABERTOS) TTL P/ RX / TX-D2 (INTERFACE RS422 / 485)

#### JUMPERS DA PCA SAÍDA ANALÓGICA:

JP1 ABERTO OPERAÇÃO NORMAL.  
FECHADO PERmite o AJUSTE DA PCA (ZERO E FUNDO DE ESCALA).

JP2 1-2 SAÍDA ANALÓGICA EM NÍVEIS DE CORRENTE.  
2-3 SAÍDA ANALÓGICA EM NÍVEIS DE TENSÃO.

NOTA:

ARQUIVO:

TÍTULO:

DIAGRAMA DE INTERLIGAÇÃO  
MODBUS



TOLEDO DO BRASIL  
ALTA TECNOLOGIA EM PESAGEM

FOLHA N°: 04/06  
REVISÃO: 02

CLIENTE:

STANDARD

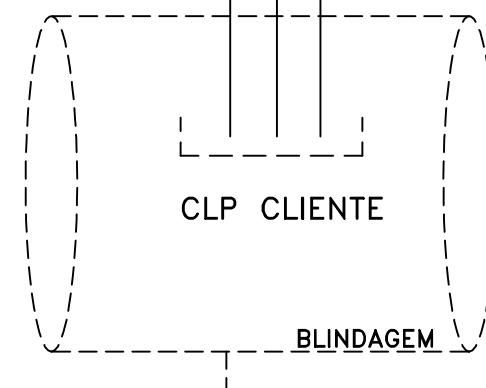
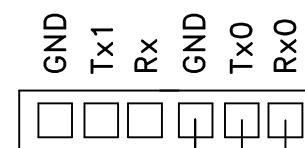
DESENHO N°: V3E-7008923

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31

A  
B  
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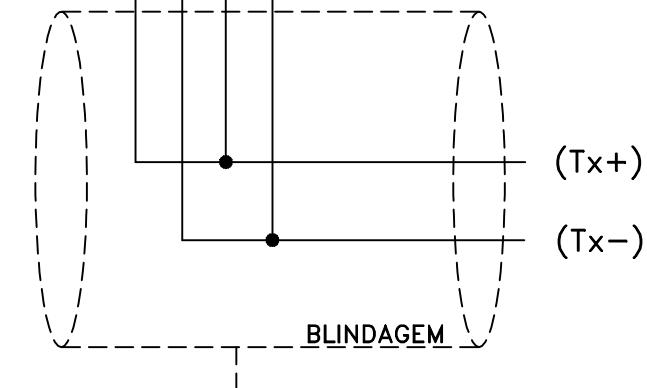
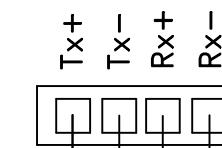
## INTERLIGAÇÃO EM RS-232

MÓD. 9097



## INTERLIGAÇÃO EM RS-485

MÓD. 9097



NOTA:  
1 - O cabo deve ser aterrado conforme condições do cliente.

ARQUIVO:  
7008923-02

TÍTULO:  
9097 / COMUNICAÇÃO SERIAL

TOLEDO DO BRASIL  
ALTA TECNOLOGIA EM PESAGEM

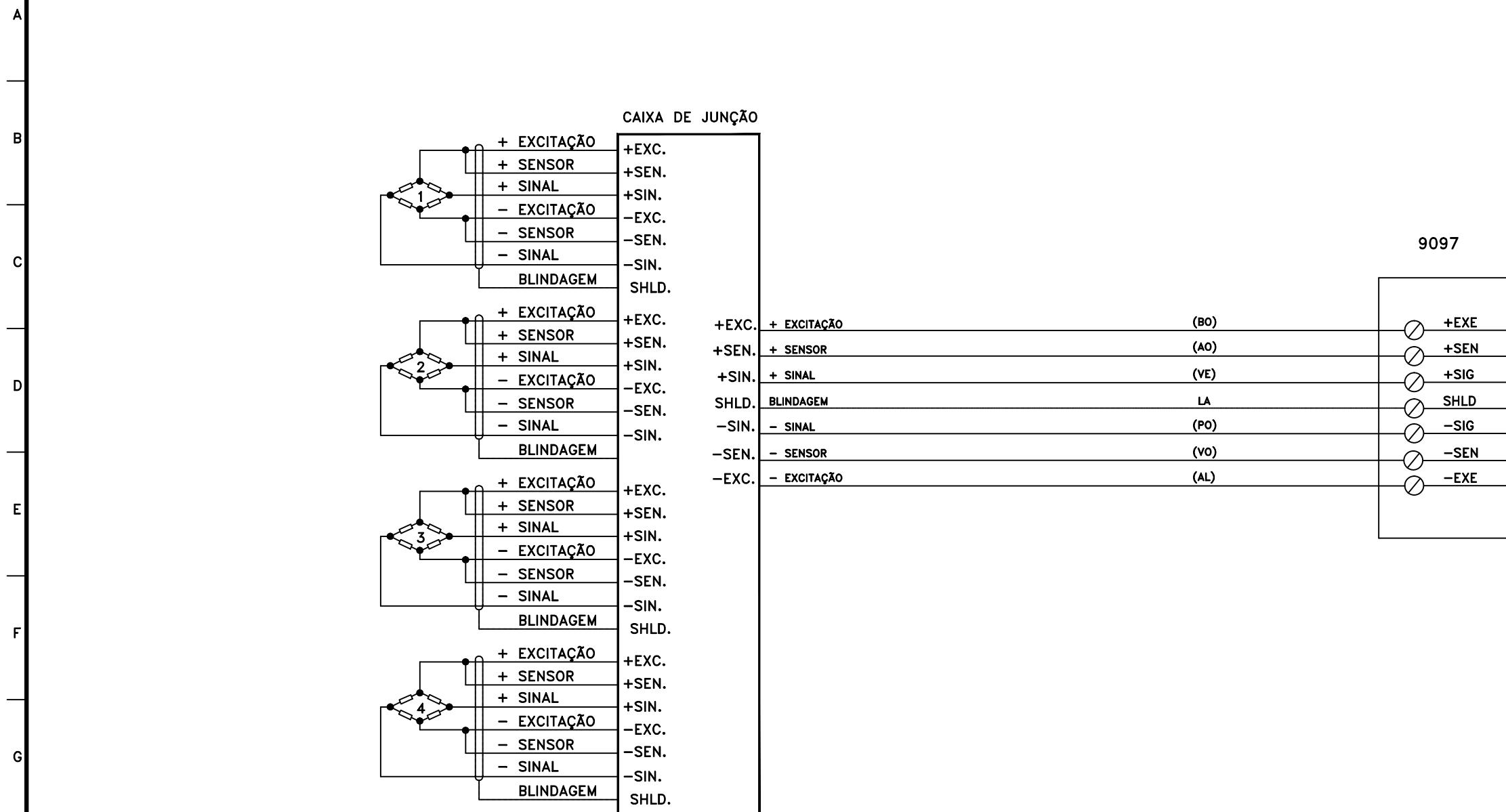
FOLHA N°:  
05/06

REVISÃO:  
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CLIENTE:  
STANDARD

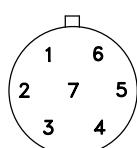
DESENHO N°:  
V3E-7008923

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31



#### INTERLIGAÇÃO DE 9097 PARA 2180

CONEC. CIRC. 7 VIAS -FRANZ BINDER-  
VISTO DO LADO DA SOLDA



- 1 - +SINAL
- 2 - -SINAL
- 3 - +EXCIT.
- 4 - -EXCIT.
- 5 - +SENS.
- 6 - -SENS.
- 7 - BLIND.

PADRÃO DE CORES DAS CELULAS				
CELULA ALFA	CELULA HBM	CELULA TEDEA	CELULA TOLEDO	CELULA KELI IMPORTADA (CAPA PRETA)
+EXC. - VO -EXC. - PO +SIG. - VE -SIG. - BO	+EXC./+SEN. - VE -EXC./-SEN. - PO +SIG. - BO -SIG. - VO SHLD - AO	+SENSE - AL -EXC. - VE +SIG. - VO -SIG. - PO -SEN. - AO -SIG. - BO	+EXC. - BO -EXC. - AL +SIG. - VE -SIG. - PO +SEN. - AO -SIG. - BO SHIELD - LA	+EXC. - VO -EXC. - PO +SIG. - VE -SIG. - BO SHIELD - PO
CELULA KELI IMPORTADA (CAPA LARANJA)				
				+EXC. - AL -EXC. - PO +SIG. - BO -SIG. - VO SHIELD - AO

NOTA:

ARQUIVO:  
7008923-02

TÍTULO:

9097 / BALANÇA



TOLEDO DO BRASIL  
ALTA TECNOLOGIA EM PESAGEM

FOLHA N°:  
06/06

REVISÃO:  
02

CLIENTE:  
STANDARD

DESENHO N°:  
V3E-7008923

# Instructions – Parts List



# Husky™ 205 Air–Operated Diaphragm Pumps

308652Y  
ENG

100 psi (0.7 MPa, 7 bar) Maximum Incoming Air Pressure  
100 psi (0.7 MPa, 7 bar) Maximum Fluid Working Pressure



## Important Safety Instructions.

Read all warnings and instructions in this manual.  
Save these instructions.

### Part No. D120XX

Polypropylene Pump with Air–Operated Motor

### Part No. D110XX and DM10XX

Acetal Pump with Air–Operated Motor



### Part No. D150XX and DM50XX

PVDF Pump with Air–Operated Motor

### Part No. D220XX

Polypropylene Pump with Solenoid Ports

### Part No. D210XX

Acetal Pump with Solenoid Ports



### Part No. D250XX

PVDF Pump with Solenoid Ports

#### Patent No.

CH ZL01113998.6

EU 0942171

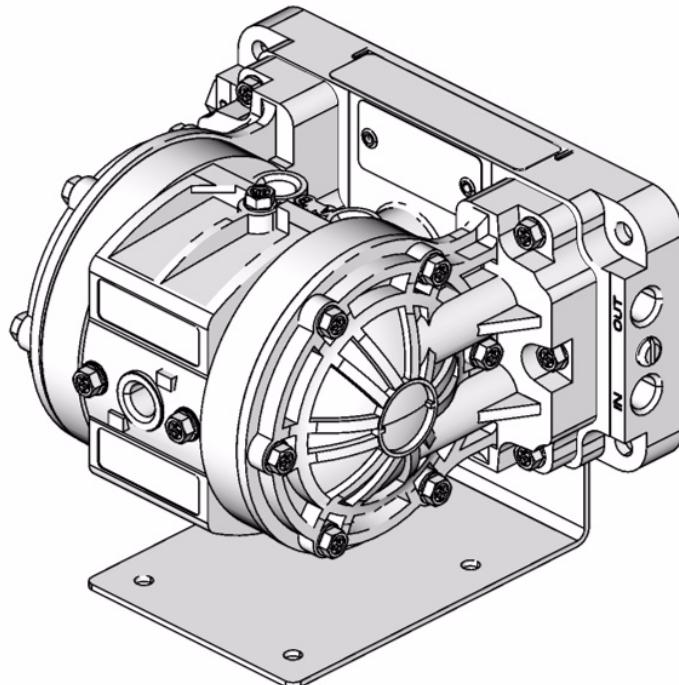
US 5,860,794

AR AR006617B1

KP 461707

CH ZL01124998.6

BR PI9701779\_5



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PROVEN QUALITY. LEADING TECHNOLOGY.



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## Warning Symbol



**WARNING**

This symbol alerts you to the possibility of serious injury or death if you do not follow the instructions.

## Caution Symbol



**CAUTION**

This symbol alerts you to the possibility of damage to or destruction of equipment if you do not follow the instructions.



**WARNING**



INSTRUCTIONS

## EQUIPMENT MISUSE HAZARD

Any misuse of the equipment or accessories, such as overpressurizing, modifying parts, using incompatible chemicals and fluids, or using worn or damaged parts, can cause them to rupture and result in splashing in the eyes or on the skin, other serious injury, or fire, explosion or property damage.

- This equipment is for professional use only. Observe all warnings. Read and understand all instruction manuals, warning labels, and tags before you operate this equipment. If you are not sure, or if you have questions about installation or operation, call your Graco distributor.
- Never alter or modify any part of this equipment; doing so could cause it to malfunction. Use only genuine Graco part numbers and accessories.
- Check all equipment regularly and repair or replace worn or damaged parts immediately.
- Never exceed the recommended working pressure or the maximum air inlet pressure stated on your pump or in the **Technical Data** on page 19.
- Do not exceed the maximum working pressure of the lowest rated component in your system. This equipment has a **100 psi (0.7 MPa, 7 bar) maximum working pressure at 100 psi (0.7 MPa, 7 bar, ) maximum incoming air pressure.**
- Be sure that all fluids and solvents used are chemically compatible with the wetted parts shown in the **Technical Data** on page 19. Always read the manufacturer's literature before you use fluid or solvent in the pump.
- Never move or lift a pump under pressure. If dropped, the fluid section may rupture. Always follow the **Pressure Relief Procedure** on page 8 before you move or lift the pump.
- **Never** use a polypropylene or PVDF pump with non-conductive flammable fluids as specified by your local fire protection code. Refer to **Grounding** on page 4 for additional information. Consult your fluid supplier to determine the conductivity or resistivity of your fluid.
- Provide fresh air ventilation to avoid the buildup of flammable fumes from solvents or the fluid being pumped.

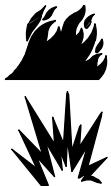
# **WARNING**



## **HAZARDOUS FLUIDS**

Improper handling of hazardous fluids or inhaling toxic vapors can cause extremely serious injury or death from splashing in the eyes, ingestion, or bodily contamination. Observe all the following precautions when you handle hazardous or potentially hazardous fluids.

- Know what fluid you are pumping and its specific hazards. Take precautions to avoid a toxic fluid spill.
- Always wear appropriate clothing and equipment, such as eye protection and breathing apparatus, to protect yourself.
- Store hazardous fluid in an appropriate, approved container. Dispose of it according to all Local, State, and Federal guidelines for hazardous fluids.
- Secure the fluid outlet hose tightly into the receiving container to prevent it from coming loose and improperly draining the fluid.
- Pipe and dispose of the exhaust air safely, away from people, animals, and food handling areas. If the diaphragm fails, the fluid is exhausted along with the air. See **Air Exhaust Ventilation** on page 5.



## **FIRE AND EXPLOSION HAZARD**

Static electricity is created by the flow of fluid through the pump and hose. If the equipment is not properly grounded, sparking may occur. Sparks can ignite fumes from solvents and the fluid being pumped, dust particles, and other flammable substances, whether you are pumping indoors or outdoors, and can cause a fire or explosion and serious injury and property damage.

- To reduce the risk of static sparking, ground the pump and all other equipment used or located in the work area. Check your local electrical code for detailed grounding instructions for your area and type of equipment. See **Grounding** on page 4.
- If you experience any static sparking or even a slight shock while using this equipment, **stop pumping immediately**. Check the entire system for proper grounding. Do not use the system again until you have identified and corrected the problem.
- Pipe and dispose of the exhaust air safely, away from all sources of ignition. If the diaphragm fails, the fluid is exhausted along with the air. See **Air Exhaust Ventilation** on page 5.
- Do not smoke in the work area. Do not operate the equipment near a source of ignition or an open flame, such as a pilot light.

United States Government safety standards have been adopted under the Occupational Safety and Health Act. You should consult these standards—particularly the General Standards, Part 1910, and the Construction Standards, Part 1926.

# Installation

## Tightening Threaded Fasteners Before First Use

Before using the pump for the first time, check and retorque all external fasteners. See **Torque Sequence**, page 18. After the first day of operation, retorque the fasteners. Although pump use varies, a general guideline is to retorque fasteners every two months.

Use a compatible thread sealant on all male threads. Tighten all connections firmly to avoid air or fluid leaks.

### ⚠ CAUTION

To avoid pump damage, do not overtighten the fittings to the pump.

## Grounding

### ⚠ WARNING



#### FIRE AND EXPLOSION HAZARD

This pump must be grounded. Before you operate the pump, ground the system as explained below. Also read the section **FIRE AND EXPLOSION HAZARD** on page 3.

The acetal pump contains stainless steel fibers which make the wetted parts conductive. Attaching the ground wire to one of the grounding locations grounds the wetted parts.

The polypropylene and PVDF pumps are **not** conductive. When you pump conductive flammable fluids, **always** ground the entire fluid system by making sure the fluid has an electrical path to a true earth ground. See Fig. 1. **Never** use a polypropylene or PVDF pump with non-conductive flammable fluids as specified by your local fire protection code. Consult your fluid supplier to determine the conductivity or resistivity of your fluid.

US Code (NFPA 77 Static Electricity) recommends a conductivity greater than  $50 \times 10^{-12}$  Siemens/meter (mhos/meter) over your operating temperature range to reduce the hazard of fire. Consult your fluid supplier to determine the conductivity or resistivity of your fluid. The resistivity must be less than  $2 \times 10^{12}$  ohm-centimeters.

To reduce the risk of static sparking, ground the pump and all other equipment used or located in the pumping area. Check your local electrical code for detailed grounding instructions for your area and type of equipment.

#### Acetal Pump Grounding Instructions

For polypropylene and PVDF pumps, see the warning above.

**Ground all of this equipment.**

**Pump:** Connect a ground wire (A) and clamp, Part No. 222011. See Fig. 1. The pump grounding locations are on the manifold between the inlet and outlet ports. Use the nut (B) and bolt (C) that are provided with the pump, and install as follows:

1. Place the nut in the nut catcher on the underside of the manifold.
2. Insert the bolt through the loop end of the ground wire.
3. Insert the bolt through the hole on the pump manifold and tighten it into the nut that you positioned in step 1.
4. Connect the clamp end of the ground wire to a true earth ground.

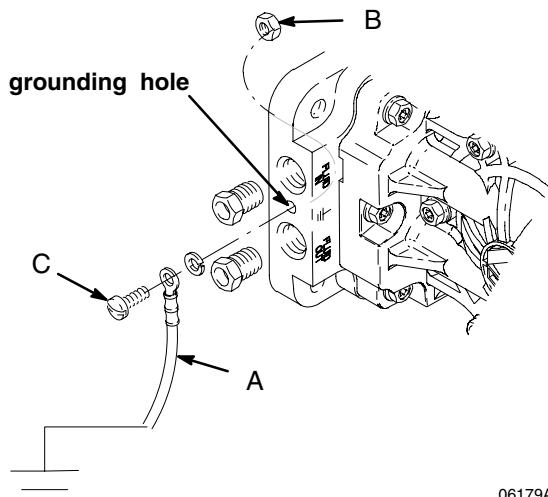


Fig. 1

06179A

- **Air and fluid hoses:** Use only grounded hoses with a maximum of 500 ft (150 m) combined hose length to ensure grounding continuity.
- **Air compressor:** Follow the manufacturer's recommendations.
- **All solvent pails used when flushing:** Follow the local code. Use only grounded metal pails, which are conductive. Do not place the pail on a non-conductive surface, such as paper or cardboard, which interrupts the grounding continuity.
- **Fluid supply container:** Follow the local code.

# Installation

## Air Exhaust Ventilation

### ! WARNING



#### TOXIC FLUID HAZARD

Read the **USING HAZARDOUS FLUIDS** and **FIRE AND EXPLOSION HAZARD** sections on page 3 before you operate this pump.



Be sure the system is properly ventilated for your type of installation. You must vent the exhaust to a safe place, away from people, animals or food handling areas when pumping flammable or hazardous fluids.

If the diaphragm ruptures, the fluid being pumped is exhausted with the air. Place a container at the end of the air exhaust line to catch fluid in case the diaphragm ruptures, and disconnect the pump.

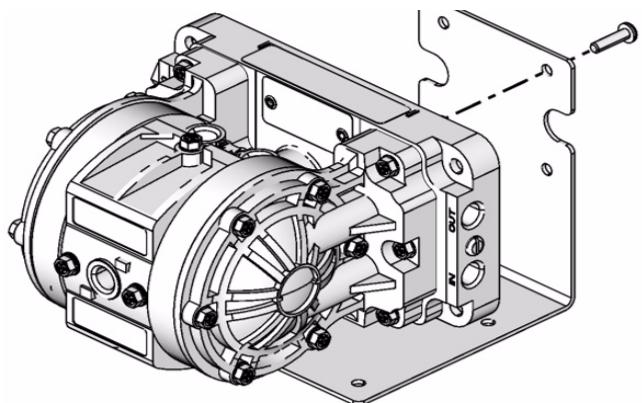
## Mountings

### ! CAUTION

The pump exhaust air may contain contaminants. If needed, ventilate to a remote area to reduce possible fluid contamination. See **Air Exhaust Ventilation** on page 5.

- **Mounting Bracket:**

The pump is shipped with a 90 degree mounting bracket (60). Mount the pump to the bracket using the four screws (61) provided. Secure the opposite portion of the mounting bracket to a horizontal surface. The mounting bracket must be used for proper pump performance.



ti10662a

Fig. 2

- Be sure the mounting can support the weight of the pump, hoses, and accessories, as well as the stress caused during operation.
- For all mountings, be sure the pump is secured with screws and nuts.

### ! WARNING

To reduce the risk of serious injury, splashing in the eyes or on the skin, and toxic fluid spills, **never** move or lift a pump under pressure. If dropped, the fluid section may rupture. Always follow the **Pressure Relief Procedure** on page 8 before you move or lift the pump.

# Installation

## Air Lines

### ⚠ WARNING

#### Bleed-Type Master Air Valve and Fluid Drain Valve

A bleed-type master air valve and a fluid drain valve are required on your system.

The bleed-type master air valve relieves air trapped between itself and the pump. Trapped air can cause the pump to cycle unexpectedly, which could result in serious bodily injury, including splashing in the eyes, injury from moving parts, or contamination from hazardous fluids.

The fluid drain valve reduces the risk of serious bodily injury, including splashing in the eyes or on the skin, or contamination from hazardous fluids. Install the fluid drain valve close to the pump's fluid outlet to relieve pressure in the hose if the hose becomes plugged.

1. Mount the air line accessories on the wall or on a bracket. Be sure the air line supplying the accessories is grounded.
  - a. The pump speed can be controlled in one of two ways: To control it on the air side, install an air regulator. To control it on the fluid side, install a fluid valve near the outlet.
  - b. Install a bleed-type master air valve downstream from the air regulator, and use it to relieve trapped air. See the **Bleed-Type Master Air Valve and Fluid Drain Valve** warning above. Locate another bleed-type master air valve upstream from all air line accessories, and use it to isolate the accessories during cleaning and repair.
  - c. The air line filter removes harmful dirt and moisture from the compressed air supply.
2. Install a flexible air hose between the accessories and the pump air inlet. Screw the air line fitting into the air inlet.
3. Do not restrict the exhaust port. Excessive exhaust restriction can cause erratic pump operation.

## Fluid Lines

Fig. 3. On each end of the fluid manifold are a fluid IN port and a fluid OUT port. **NOTE: Make sure the fluid OUT port on the fluid manifold is mounted up.** This will assure proper pump priming. **Fluid-in** and **fluid-out** lines can be connected on the same end, or opposite ends of the manifold. Plug ports that are not used (plugs provided).

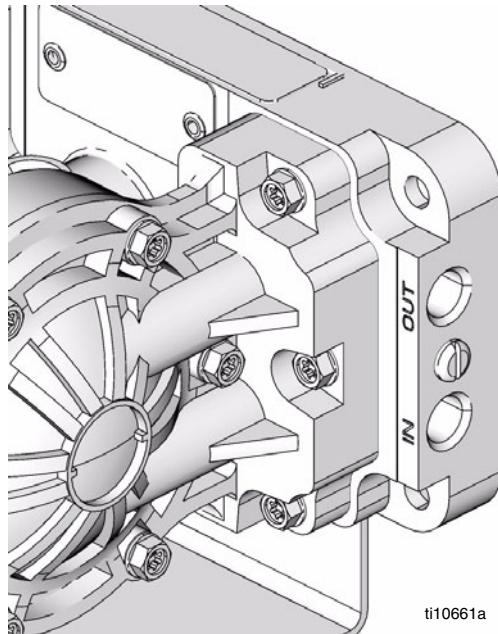


Fig. 3

ti10661a

## Typical Installation

The installations shown in Fig. 4 are only a guide to help select and install a pump; they are not actual system designs.

Typical installation includes (not supplied by Graco):

- For solenoid operation: a four-way, 5-port, 3-position solenoid valve with 1/4-in. ports, or two 3-position 3-way valves. Mac series 44 (4-way), or series 35 (3-way). Either way, air pressure should be released if not cycling.
- PLC or timer. Consult your local industrial controls distributor.

### ⚠ CAUTION

For solenoid operation, the pump must exhaust through the solenoid. Failure to exhaust through solenoid could cause the diaphragms to fail.

# Installation

## KEY

- A Husky 205 pump
- B Bleed-type master air valve (required for pump)
- C Air line(s)
- E Master air valve (for accessories)
- F Air line filter
- G Muffler
- H Pump air regulator
- J Fluid drain valve (required on fluid outlet side of pump)
- L Fluid suction line
- N Fluid supply hose
- T Bung adapter
- U 4-way solenoid
- Y Ground wire (required)

*See page 4 for installation instructions.*

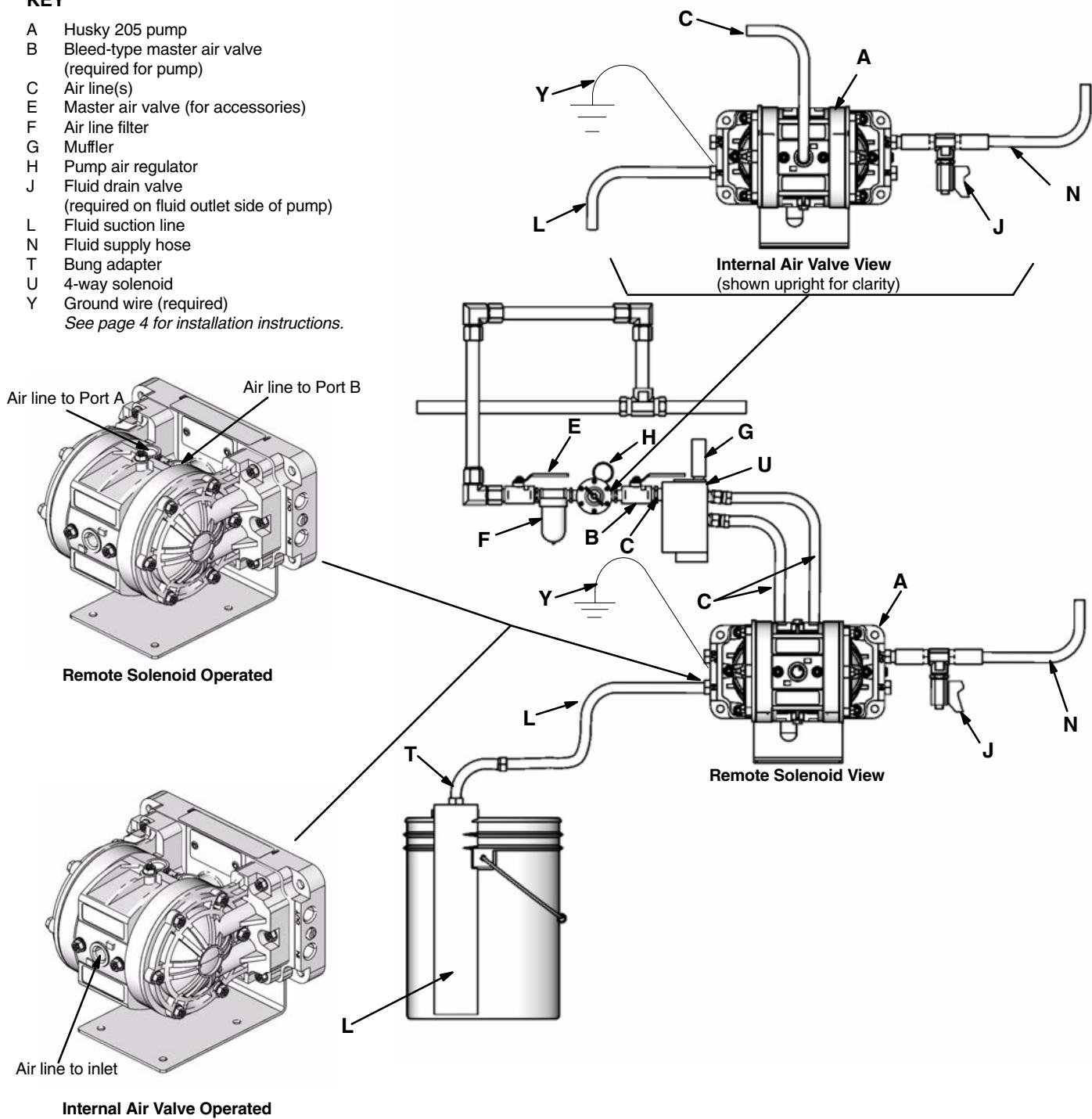


Fig. 4

ti10663a

# Operation

## Pressure Relief Procedure

### ⚠ WARNING

To reduce the risk of serious injury, including splashing fluid in the eyes or on the skin, follow this procedure whenever you are instructed to relieve pressure, when you shut off the pump, and before you check, adjust, clean, move, or repair any system equipment.

1. Shut off air and reserve air to the pump.
2. Open the dispensing valve if the system has one.
3. Open the fluid drain valve to relieve all system pressure, and have a container ready to catch the drainage.

## Flushing the Pump Before First Use

The pump was tested in water. If water could contaminate the fluid you are pumping, flush it thoroughly with a compatible solvent. Follow the procedure in **Starting and Adjusting the Pump**.

## Starting and Adjusting the Pump

### ⚠ WARNING

To reduce the risk of serious injury, splashing in the eyes or on the skin, and toxic fluid spills, **never** move or lift a pump under pressure. If the pump is dropped, the fluid section could rupture. Always follow the **Pressure Relief Procedure** above before you move or lift the pump.

1. Be sure the pump is properly grounded. Read and follow the instructions in **Grounding** on page 4.
2. Check all fittings to be sure they are tight. Be sure to use a compatible liquid thread sealant on all male threads. Tighten the fluid inlet and outlet fittings and plugs securely. Retorque all fasteners before start-up. See **Torque Sequence**, page 18.

3. Place the suction tube (if used) in the fluid to be pumped.
4. Place the end of the outlet hose into an appropriate container.
5. Close the fluid drain valve.
6. With the air regulator closed, open all bleed-type master air valves.
7. If the outlet hose has a dispensing device, hold it open while continuing with step 8.
8. Slowly open the air regulator until the pump starts to cycle. Allow the pump to cycle until all air is pushed out of the lines and the pump is primed.

**NOTE:** To prime a remote solenoid-operated **air valve**, operate the pump at a minimum 60 cpm rate until the pump is fully primed.

## Pump Shutdown

At the end of the work shift, and before you check, adjust, clean, or repair the system, **relieve air and fluid pressure**.

### ⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** at left.

# Maintenance

## Lubrication

The air valve is lubricated at the factory and designed to operate without additional lubrication.

If added lubrication is desired, every 500 hours of operation (or monthly), remove the hose from the pump air inlet and add two drops of machine oil to the air inlet.

### CAUTION

Do not over-lubricate the pump. Excess oil is exhausted through the muffler, which could contaminate your fluid supply or other equipment.

## Tightening Threaded Connections

Before each use, check all hoses for wear or damage, and replace as necessary. Be sure all threaded connections are tight and free of leaks.

Check fasteners. Tighten or retorque as necessary. Although pump use varies, a general guideline is to retorque fasteners every two months. See **Torque Sequence**, page 18.

## Flushing and Storage

Flush the pump to prevent the fluid from drying or freezing in the pump and damaging it. Always flush the pump and **relieve the pressure** before storing for any length of time. Use a compatible solvent.

### WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

*If you are flushing*, run the pump long enough to thoroughly clean the pump and hoses, close the air regulator, and remove the suction hose from the solvent and place it in the fluid to be pumped.

*If you are shutting down the pump*, remove the suction hose from the fluid container, run the pump until the fluid is forced out of the system, and shut off the air supply immediately.

# Troubleshooting

**Relieve the pressure** before you check or service the equipment.

Check all possible problems and causes before you disassemble the pump.

## ⚠ WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

### Internal Air Valve-Operated and Remote Solenoid-Operated Pumps

PROBLEM	CAUSE	SOLUTION
The pump cycles at stall, or it fails to hold pressure at stall.	The check valves (20) or o-rings (21) are leaking.	Replace the check valves and/or o-rings. See page 14.
	The check valves (20) are worn.	Replace the check valves. See page 14.
	Debris is stuck between the a check valve (20) and the seat.	Clean the check valve/seat area. See page 14.
The pump operates erratically.	The suction line is clogged.	Inspect and clear the line.
	The check valves (20) are sticking or leaking.	Replace the check valves, or clean and check the valve/seat area. See page 14.
	A diaphragm (30) is ruptured.	Replace the ruptured diaphragm. See page 13.
There are air bubbles in the fluid.	The suction line is loose.	Tighten the suction line.
	A diaphragm (30) is ruptured.	Replace the ruptured diaphragm. See page 13.
	The manifold (52) is loose, or the o-rings (21) are damaged.	Tighten the manifold screws (58). Replace the o-rings (21). See page 14.
	The fluid covers (51) are loose.	Tighten the fluid cover screws (58). See page 13.
There is fluid in the exhaust air.	A diaphragm (30) is ruptured.	Replace the ruptured diaphragm. See page 13.
	A diaphragm plate (50) is loose.	Tighten the diaphragm plate. See page 13.
The pump exhausts air near the fluid covers.	The fluid covers (51) are loose, or the o-rings (57) are damaged.	Tighten the fluid cover screws (58), or replace the o-rings. See page 13.
The pump exhausts air near the air valve.	The air valve cover screws (14) are loose.	Tighten the screws. See page 12.
	The top (5) and/or side (6) air valve o-rings are damaged.	Replace these o-rings. See the <b>Parts Drawing</b> on page 17.
The pump leaks fluid from the check valves.	The o-rings (21) are leaking, or the screws (58) are loose.	Replace these o-rings, and tighten the screws. See page 14.

# Troubleshooting

## Internal Air Valve-Operated Pumps Only

PROBLEM	CAUSE	SOLUTION
The pump will not cycle, or it cycles once and stops.	The air valve is stuck or dirty.	Disassemble and clean or repair the air valve. See page 12.  Use filtered air.
	Not enough air pressure supplied.	Increase air pressure supply. Do not exceed maximum input pressure.

## Remote Solenoid-Operated Pumps Only

PROBLEM	CAUSE	SOLUTION
The pump will not prime or loses prime.	The cycle rate is too low.	Increase cycle rate to 60 cpm.
	The check valves (20) are not sealing.	Inspect the check valves, and replace them if worn or damaged. See page 14.
	Fluid manifold not mounted with OUT port up.	Re-mount fluid manifold so OUT port is up.
The pump leaks air or does not operate.	Air is supplied to Port A and Port B at the same time.	Replace both diaphragms (30). See page 13.  Check your installation. See page 7.
	Solenoid exhaust is plugged.	Ensure that exhaust (G on page 7) is free of obstructions.

# Service

## Service Kits

Service Kits may be ordered separately.

To repair the air valve, order Part No. 238853. Parts included in the Air Valve Service Kit are marked with an asterisk in the **Parts Drawing** on page 17, for example (3\*).

For fluid section repair section parts, see the **Service Kit Matrix** on page 15. Parts included in the Fluid Section Service Kit are marked with a dagger in the **Parts Drawing** on page 17, for example (4†).

## Servicing the Air Valve

Service the air valve as follows. See Fig. 5.

1. **Relieve the fluid pressure**, and disconnect air line from the pump.

### ! WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

2. Remove the four screws (14) that hold the valve cover (7) on the center housing (1).
3. Remove the valve block (4) and valve carriage (2), and replace the u-cups (3). Replace the valve carriage and valve block. When you replace the valve carriage, position it all the way to one side or the other.

**NOTE:** The valve block shown in Fig. 5 is for pumps with an air-operated air motor. If your pump has a solenoid-operated air motor, this step does not pertain. Items 2, 3, 4, 16, and 17 are not required.
4. Clean any parts that are dirty.
5. To reinstall the valve cover (7), spread cover apart enough not to damage the square ring packings (6) and slide cover (7) into the center section.
6. Install the screws (14), and torque to 40 to 45 in-lb (4.5 to 5.0 N•m). See **Torque Sequence** on page 18.
7. Reconnect the pump.

 Lips of u-cups (3) must face toward each other (toward center of valve carriage (2)).

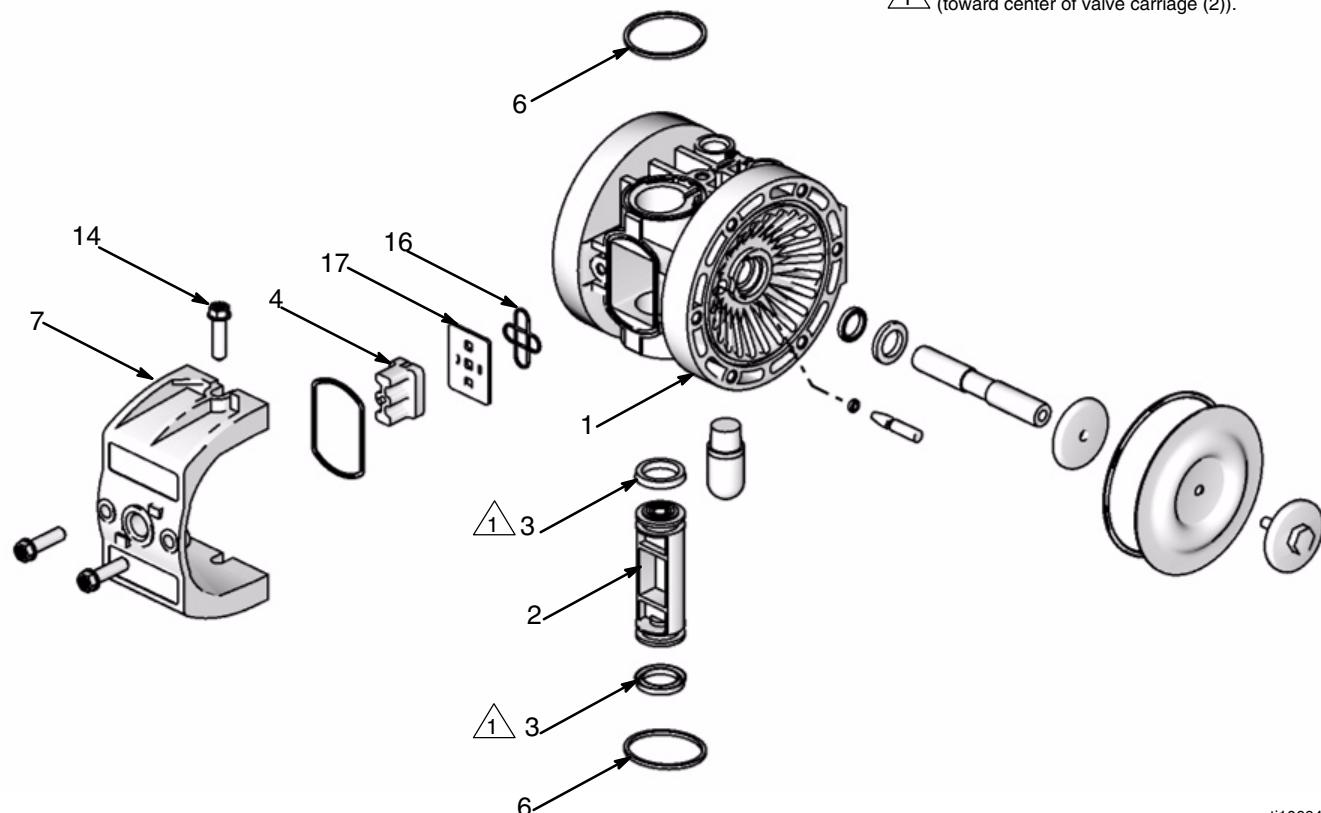


Fig. 5

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# Service

## Replacing Diaphragms

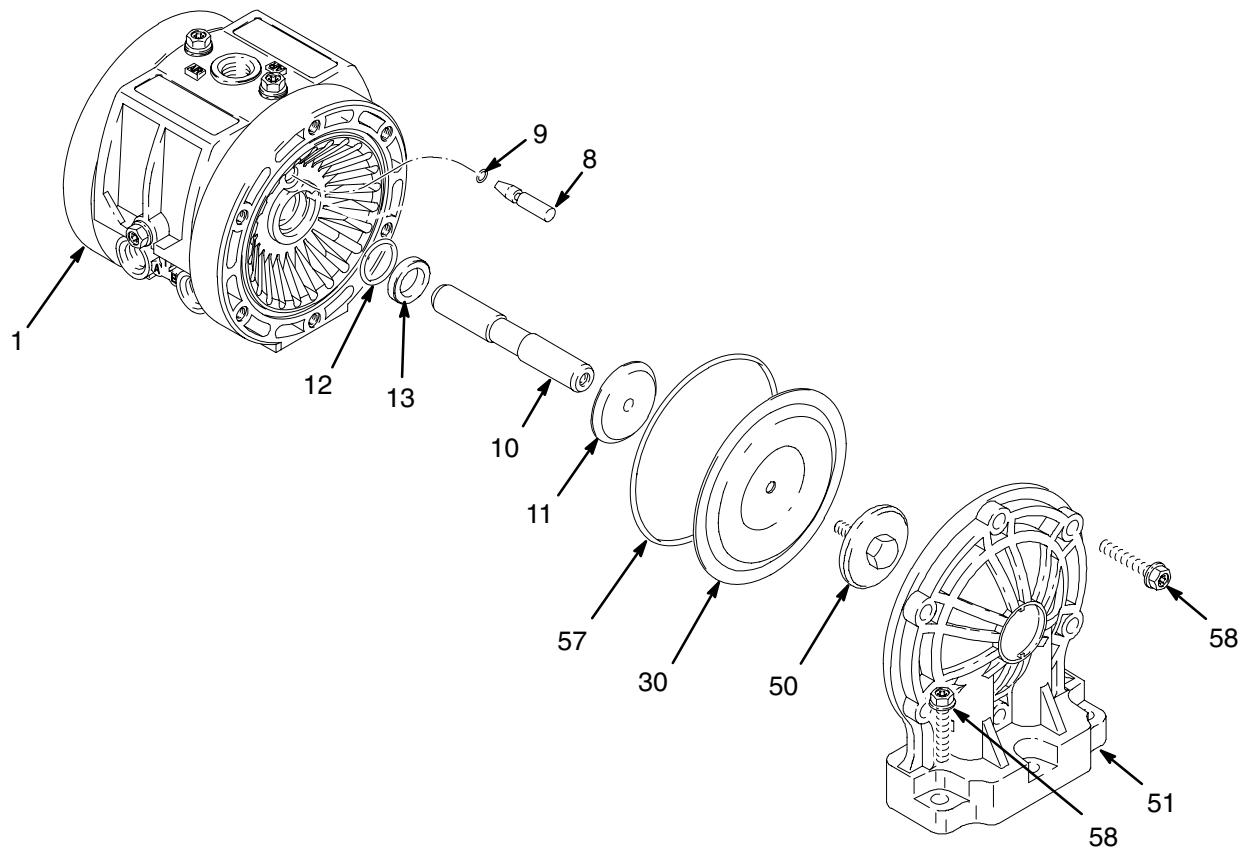
Replace the diaphragms as follows. See Fig. 6 and Fig 7.

1. **Relieve the pressure**, and disconnect the air line from the pump.

## **! WARNING**

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

1. **Relieve the pressure**, and disconnect the air line from the pump.
  2. Remove the eight screws (58) that fasten the two fluid covers (51) to manifold (52), and remove the fluid cover/center housing assembly from the manifold.
  3. Remove the six screws (58) that fasten each fluid cover (51) to the center housing (1), and pull the fluid covers off of the center housing.
  4. Remove the diaphragm plates (50) from the shaft (10), and remove the diaphragms (30), and air-side diaphragm plates (11).
  5. Remove the diaphragm pins (8), remove and replace the o-rings (9), and reinstall the diaphragm pins in the center housing (1).
  6. Reinstall the diaphragm shaft (10).
  7. Install the new diaphragms (30) with the concave side toward the center housing (1).
  8. Screw the diaphragm plates (50) onto the shaft (10), and torque to 28–33 in-lb (3.2–3.7 N•m).
  9. Reinstall the fluid covers (51) on the center housing (1), install the screws (58) that fasten the fluid covers to the center housing, and torque to 42–47 in-lb (4.7–5.3 N•m). See **Torque Sequence** on page 18.
  10. Reinstall the fluid covers/center housing assembly on the manifold (52), install the screws (58) that fasten the fluid covers/center housing assembly to the manifold, and torque to 42–47 in-lb (4.7–5.3 N•m). See **Torque Sequence** on page 18.
  11. Reconnect the pump.



**Fig. 6**

06180D

# Service

## Replacing Check Valves

Replace each pair of check valves as follows. See Fig. 7.

1. **Relieve the pressure**, and disconnect the air line from the pump.

### ! WARNING

To reduce the risk of serious injury whenever you are instructed to relieve pressure, always follow the **Pressure Relief Procedure** on page 8.

2. Remove the eight screws (58) that hold the fluid cover/center housing assembly on the manifold (52), and lift the manifold covers/center housing assembly off of the manifold (52).

3. Remove and replace the check valves (20), **being careful to orient each check valve exactly like the one it is replacing**. Make sure the check valve/seat area is clean.
4. Remove and replace the sealing o-rings (21). Once compressed, o-rings may not be reused. Make sure the check valve/seat area is clean.
5. Reinstall the fluid covers/center housing assembly on the manifold (52), install the screws (58) that fasten the fluid covers/center housing assembly to the manifold, and torque to 42–47 in-lb (4.5–5.0 N·m). See **Torque Sequence** on page 18.
6. Reconnect the pump.

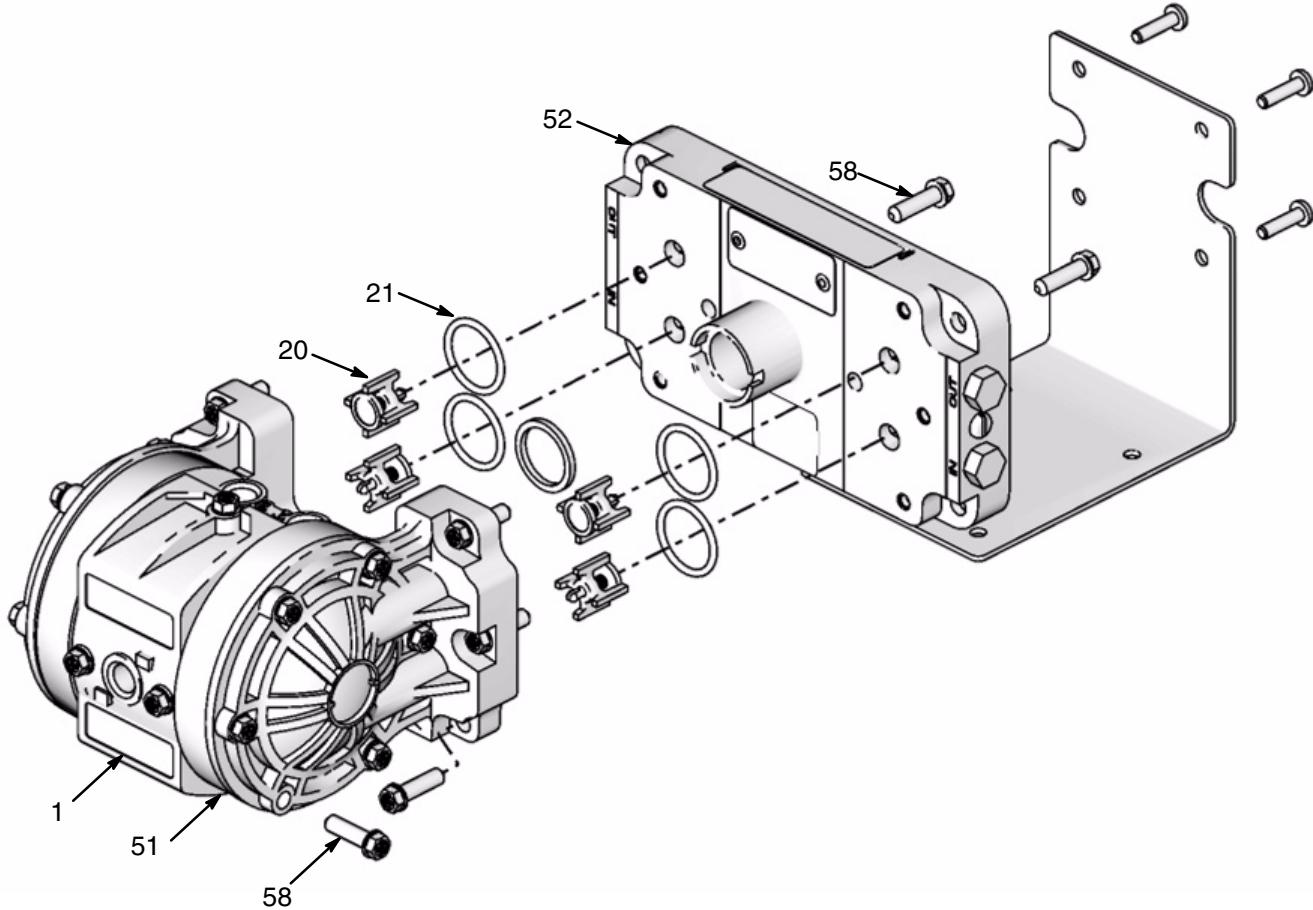


Fig. 7

ti10665a

# Parts Matrix

## Husky 205 Polypropylene, Acetal\*, and PVDF Pumps

The Model Number of your pump is marked on the pump's serial plate. To determine the Model Number of your pump from the following matrix, select the six digits that describe your pump, working from left to right. The first digit is always **D**, designating Husky diaphragm pumps. The remaining five digits define the materials of construction. For example, a pump with a Husky 205 polypropylene air motor, polypropylene fluid section, polypropylene check valves, and PTFE diaphragms is Model **D 1 2 0 9 1**. To order replacement parts, refer to the **Part Lists** on pages 16 and 17. *The digits in the matrix do not correspond to the reference numbers in text, Parts Drawings, or Parts Lists.*

Diaphragm Pump	Air Motor	Fluid Section	Seats and Guides	Checks	Diaphragms
D (for all pumps)	1 (Husky 205; polypropylene, standard) 2 (Husky 205; polypropylene, for solenoid operation) M (Husky 205; polypropylene, standard with fluoroelastomer o-rings on actuator pin)	1 (acetal)* 2 (polypropylene) 3 (not used) 4 (not used) 5 (PVDF)	0 (no seats/guides)	2 (acetal) A (PVDF) 9 (polypropylene)	1 (PTFE) 6 (Santoprene®)



II 2 G Certified

**Note:** Model 24E366 uses the same parts as D11021. The pump is packaged and sold as PN 24J001.

# Service Kit Matrix

## Air Valve and Fluid Section Service Kits for Husky 205 Pumps

To determine the Model Number of your service kit from the following matrix, select the six digits that describe your pump, working from left to right. The first digit is always **D**, designating Husky diaphragm pumps. The second digit is always 0 (zero), and the third digit is always 1 (one). The remaining five digits define the materials of construction. For example, if your pump has polypropylene checks and PTFE diaphragms, order Repair Kit **D 0 1 0 9 1**. If you only need to repair certain parts (for example, the diaphragms), use the 0 (null) digit for the balls, and order Repair Kit **D 0 1 0 0 1**. To order replacement parts, refer to the **Part Lists** on pages 16 and 17. *The digits in the matrix do not correspond to the reference numbers in text, Parts Drawings, or Parts Lists.*

Diaphragm Pump	Air Motor	O-rings	Seats	Checks	Diaphragms
D (for all pumps except DMXXXX)	0 (for all pumps except DMXXXX)	1 (for all pumps except DMXXXX)	0 (for all pumps except DMXXXX)	0 (null) A (PVDF) 2 (acetal) 9 (polypropylene)	0 (null) 1 (PTFE) 6 (Santoprene®)

# Parts

## Air Motor Section (matrix column 2)

Digit	Ref. No.	Part No.	Description	Qty.
1	1	240898	HOUSING, center, assembly (includes 12, 13, and 57)	1
	2	191157	CARRIAGE, valve	1
	3	113869	SEAL, u-cup	2
	4	194533	VALVE BLOCK <i>(for pump with air-operated air motor)</i>	1
	5	191160	GASKET, molded	1
	6	115056	O-RING, packing	2
	8	191021	PIN, actuator	2
	9	113565	O-RING, packing	2
		103557	O-RING, packing (DMXXXX pumps only)	2
	10	193778	SHAFT, diaphragm	1
	11	193775	PLATE, diaphragm, air side	2
	12	114710	O-RING, diaphragm shaft	2
	13	15J176	BEARING, retaining	2
	14	113341	SCREW, torx	4
	15	114174	MUFFLER, porous plastic	1
	16	194386	SEAL, valve plate	1
	17	194384	PLATE, valve	1
2	1	240899	HOUSING, center, assembly (includes 12, 13, and 57)	1
	10	193778	SHAFT, diaphragm	1
	11	193775	PLATE, diaphragm, air side	1
	12	114710	O-RING, diaphragm shaft	2
	13	15J176	BEARING, retaining	2
	14	113341	SCREW, torx	4
	15	114174	MUFFLER, porous plastic	1

## Fluid Section (matrix column 3)

Digit	Ref. No.	Part No.	Description	Qty.
1	7	191140	COVER, valve	1

49	290229	LABEL, warning	1	
50	191553	PLATE, diaphragm; acetal	2	
51	276474	COVER, fluid; acetal	2	
52	276471	MANIFOLD; acetal	1	
53	113576	PLUG, port; acetal	2	
54	100264	SCREW, grounding	2	
55	100179	NUT, hex , grounding	2	
57	113570	O-RING, packing	2	
58	113341	SCREW, torx	20	
59	115055	O-RING, exhaust	1	
60	194986	BRACKET, mounting	1	
61	111630	SCREW, machine, pn hd	4	
2	7	191140	COVER, valve	1
49	290229	LABEL, warning	1	
50	191141	PLATE, diaphragm; polypropylene	2	
51	276473	COVER, fluid; polypropylene	2	
52	276470	MANIFOLD; polypropylene	1	
53	113577	PLUG, port; polypropylene	2	
57	113570	O-RING, packing	2	
58	113341	SCREW, torx	20	
59	115055	O-RING, exhaust	1	
60	194986	BRACKET, mounting	1	
61	111630	SCREW, machine, pn hd	4	
5	7	191140	COVER, valve	1
49	290229	LABEL, warning	1	
50	191554	PLATE, diaphragm; PVDF	2	
51	276475	COVER, fluid; PVDF	2	
52	276472	MANIFOLD; PVDF	1	
53	113447	PLUG, port; PVDF	2	
57	113570	O-RING, packing	2	
58	113341	SCREW, torx	20	
59	111137	O-RING, exhaust	1	
60	194986	BRACKET, mounting	1	
61	111630	SCREW, machine, pn hd	4	

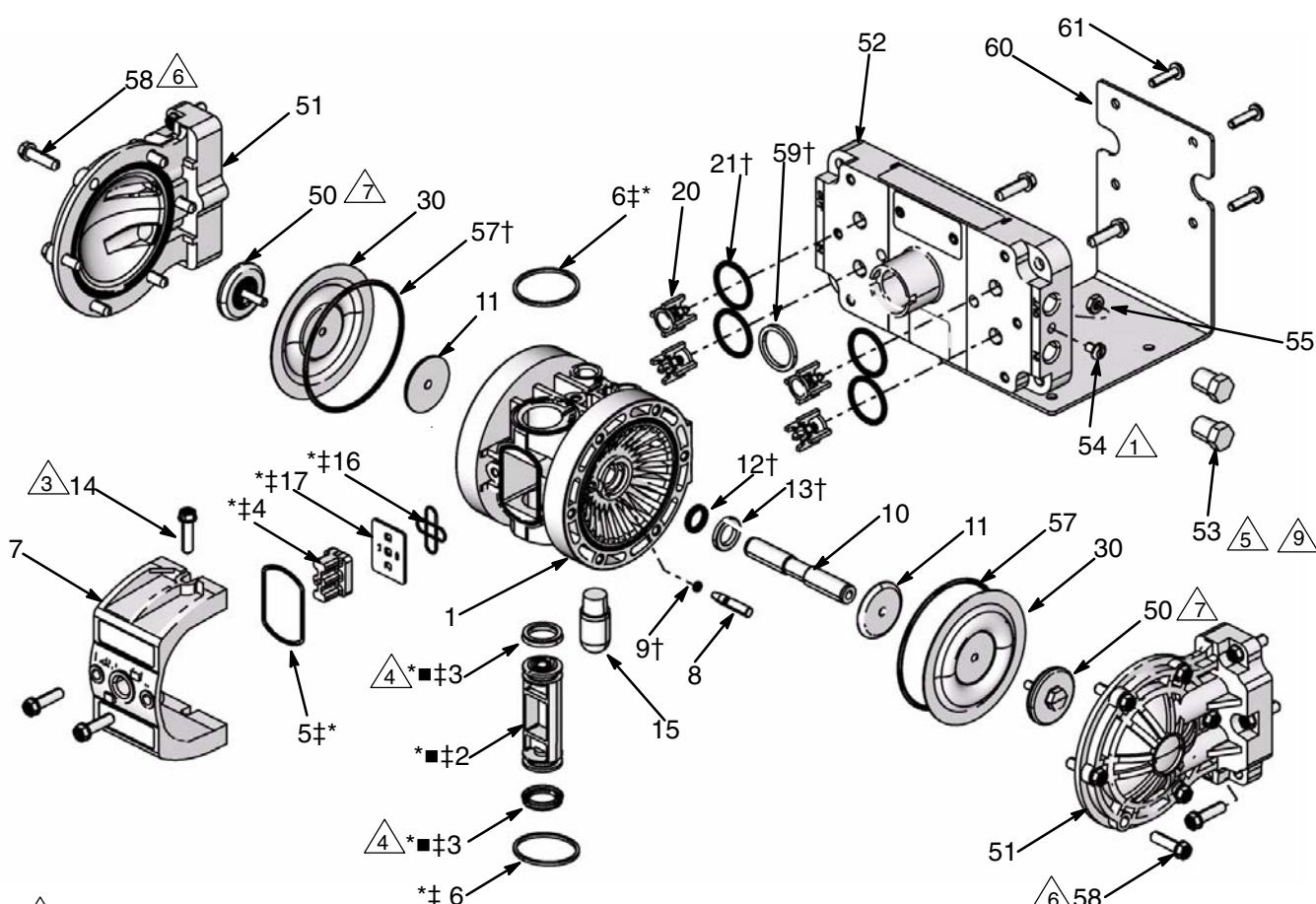
## Parts

## **Check Valve** (matrix column 5)

<b>Digit</b>	<b>Ref.</b>	<b>Part No.</b>	<b>Description</b>	<b>Qty.</b>
2	20	241134	VALVE, check; acetal	4
	21	113566	O-RING, packing	4
9	20	240896	VALVE, check; polypropylene	4
	21	113566	O-RING, packing	4
A	20	240897	VALVE, check; PVDF	4
	21	113566	O-RING, packing	4

## **Diaphragm** (matrix column 6)

<b>Digit</b>	<b>Ref.</b>	<b>Part No.</b>	<b>Description</b>	<b>Qty.</b>
1	30	191402	DIAPHRAGM; PTFE <i>(for all Husky 205 pumps)</i>	2
6	30	196385	DIAPHRAGM; Santoprene®	2



 1 Used on acetal models only.

 3 Torque to 40–45 in-lb (4.5–5.0 N·m). See **Torque Sequence** on page 18.

4 Lips of u-cups (3) must face toward each other, toward center of valve carriage (2).

### 5 Torque to 20 in. lb (2.2 N·m)

**6** Torque to 42–47 in-lb (4.7–5.3 N·m). See **Torque Sequence** on page 18.

 Torque to 28–33 in-lb (3.2–3.7 N·m). See **Torque Sequence** on page 18.

**9** Not assembled. These plugs are supplied to plug the two ports in the manifold.

The two parts of the plug are designed to fit into the two ports in the manifold that are not used.

\* These parts cannot be ordered separately. They come preassembled and are included as part of the Air Valve Service Kit 238853. These parts are included in Air Valve Service Kit 238853, which may be purchased separately.

† These parts are included in Fluid Section Service Kit, D010xx, which may be purchased separately.

‡ These parts are included in pump with integral air valve only.

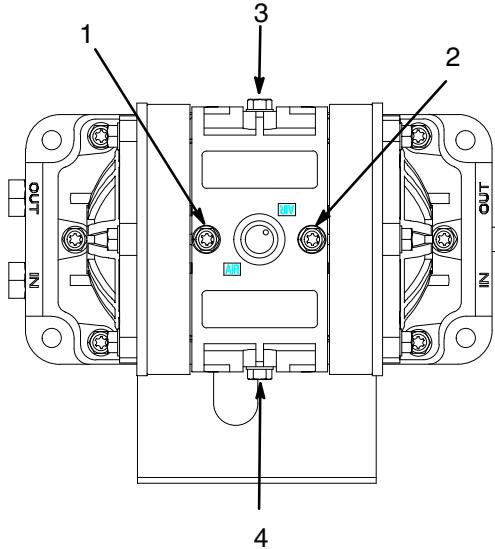
For more information about the project, visit [www.earthobservatory.nasa.gov](http://www.earthobservatory.nasa.gov).

# Torque Sequence

For proper installation, always follow torque sequence whenever you are instructed to torque screws.

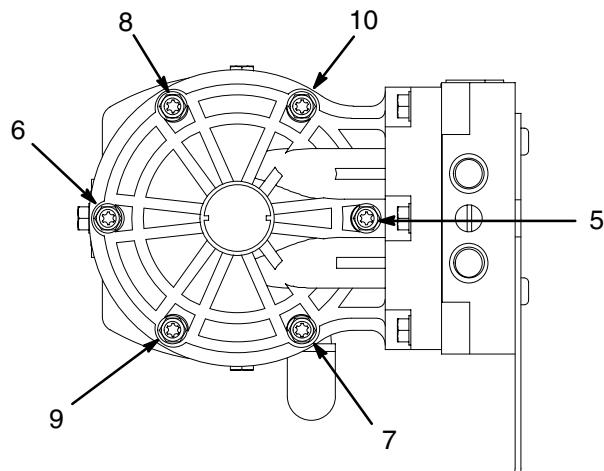
## 1. Valve Cover

Torque bolts to 40–45 in-lb (4.5–5.0 N•m)



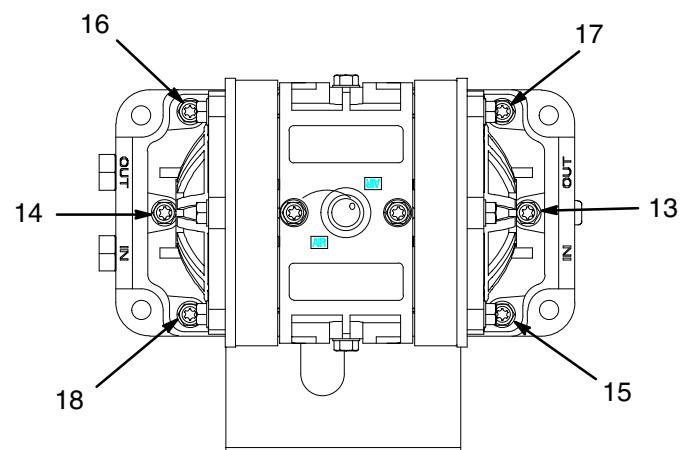
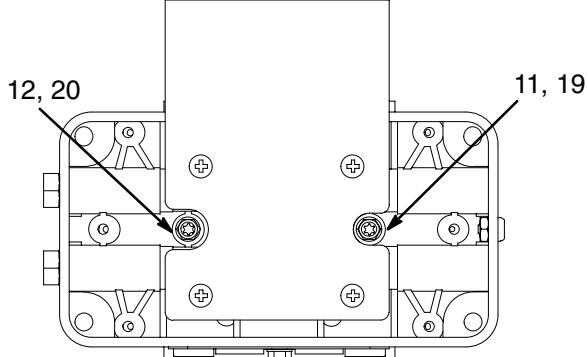
## 2. Left/Right Fluid Cover

Torque bolts to 42–47 in-lb (4.7–5.3 N•m)



## 3. Manifold to Center Section

Torque bolts to 42–47 in-lb (4.7–5.3 N•m)



Back View

Front View

# Technical Data

Maximum fluid working pressure .....	100 psi (0.7 MPa, 7 bar)	Weight
Maximum/minimum air pressure .....	100 psi/20psi (0.7 MPa, 7 bar)/(0.14 MPa, 1.4 bar)	Polypropylene pump ..... 2.0 lb (0.9 kg) Acetal pump ..... 2.5 lb (1.1 kg) PVDF pump ..... 2.8 lb (1.3 kg)
Maximum fluid flow .....	5.0 gpm (18.9 lpm)	Wetted parts (housings, diaphragms, check valves)
Maximum pump speed .....	320(dry) cycles per minute 250(wet) cycles per minute	Polypropylene pump: Glass-filled polypropylene, PTFE, polypropylene
Volume per stroke*	0.006 gal (23 cc)	Acetal pump: Acetal with SST fibers, PTFE, acetal
Volume per cycle*	0.012 gal (46 cc)	PVDF pump: PVDF, PTFE, PVDF
Maximum suction lift dry .....	8 to 10 ft (2.5 to 3 m)	Sound power level (pressure) (per ANSI STD S12.1) at 100 psi (0.7 MPa, 7 bar) ..... 75.5 dBA at 70 psi (0.49 MPa, 4.9 bar) ..... 72.0 dBA at 40 psi (0.28 MPa, 2.8 bar) ..... 68.2 dBA
Maximum size pumpable solids .....	0.06 in. (1.5 mm)	Sound power level (intensity) (per ANSI STD S12.1) at 100 psi (0.7 MPa, 7 bar) ..... 84.5 dBA at 70 psi (0.49 MPa, 4.9 bar) ..... 81.1 dBA at 40 psi (0.28 MPa, 2.8 bar) ..... 76.6 dBA
Maximum operating temperature .....	180° F (82° C)	
Maximum air consumption .....	9.0 scfm (0.252 m <sup>3</sup> /min.)	
Air inlet size** .....	1/4 npt(f) / 1/4 bsp(f)	
Fluid inlet size** .....	1/4 npt(f) / 1/4 bsp(f)	
Fluid outlet size** .....	1/4 npt(f) / 1/4 bsp(f)	
Air exhaust port size** .....	1/4 npt(f) / 1/4 bsp(f)	

\* Volume per cycle may vary based on suction condition, discharge head, air pressure, and fluid.

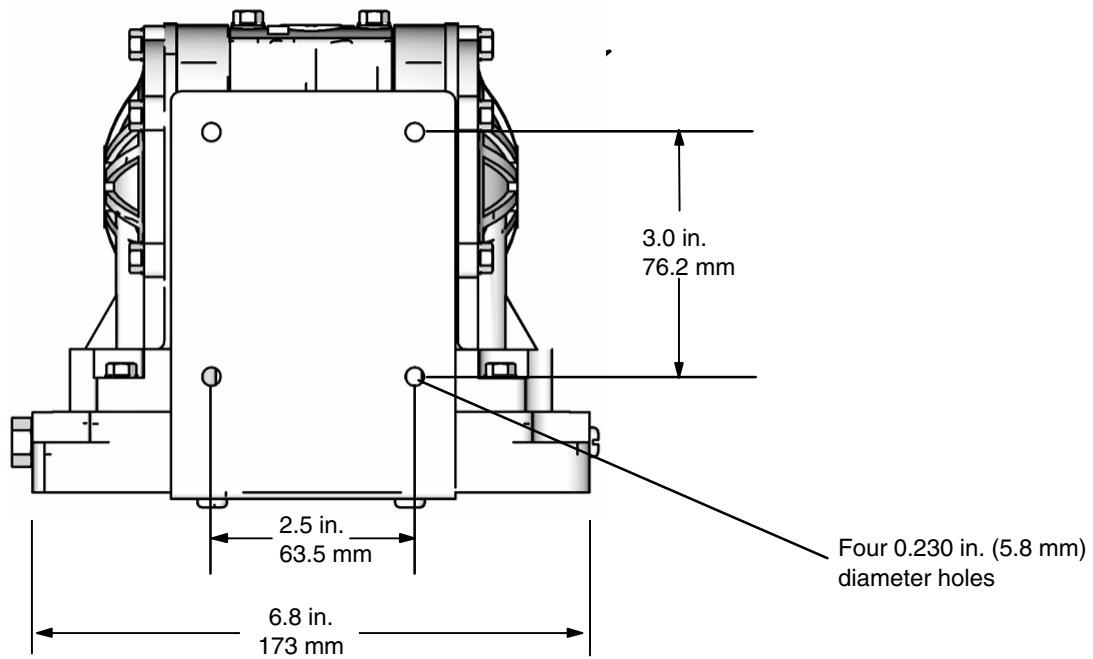
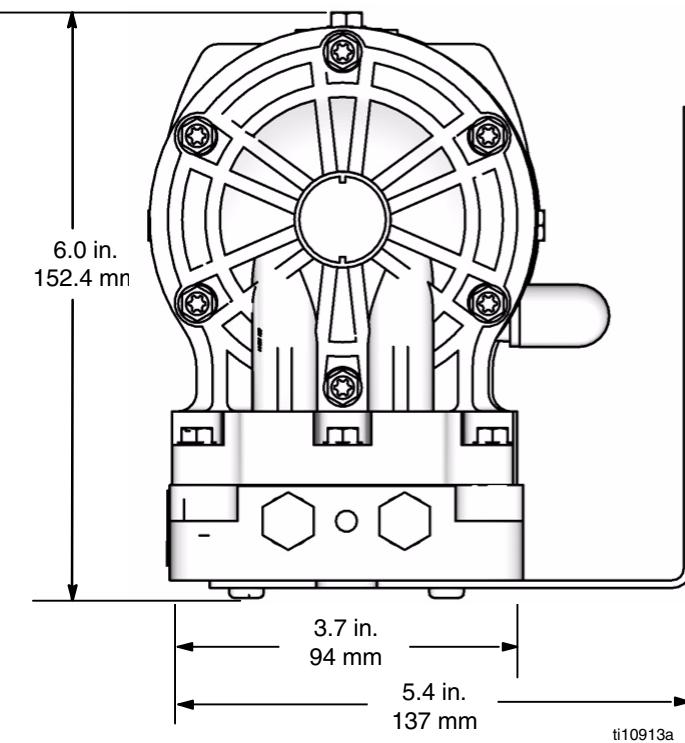
\*\* Hybrid thread allows for either 1/4 npt or 1/4 bsp fitting.

PVDF is a registered trademark of Atochem North America, Incorporated.

Schrader Bellows® is a registered trademark of Schrader Bellows.

Santoprene® is a registered trademark of the Monsanto Company.

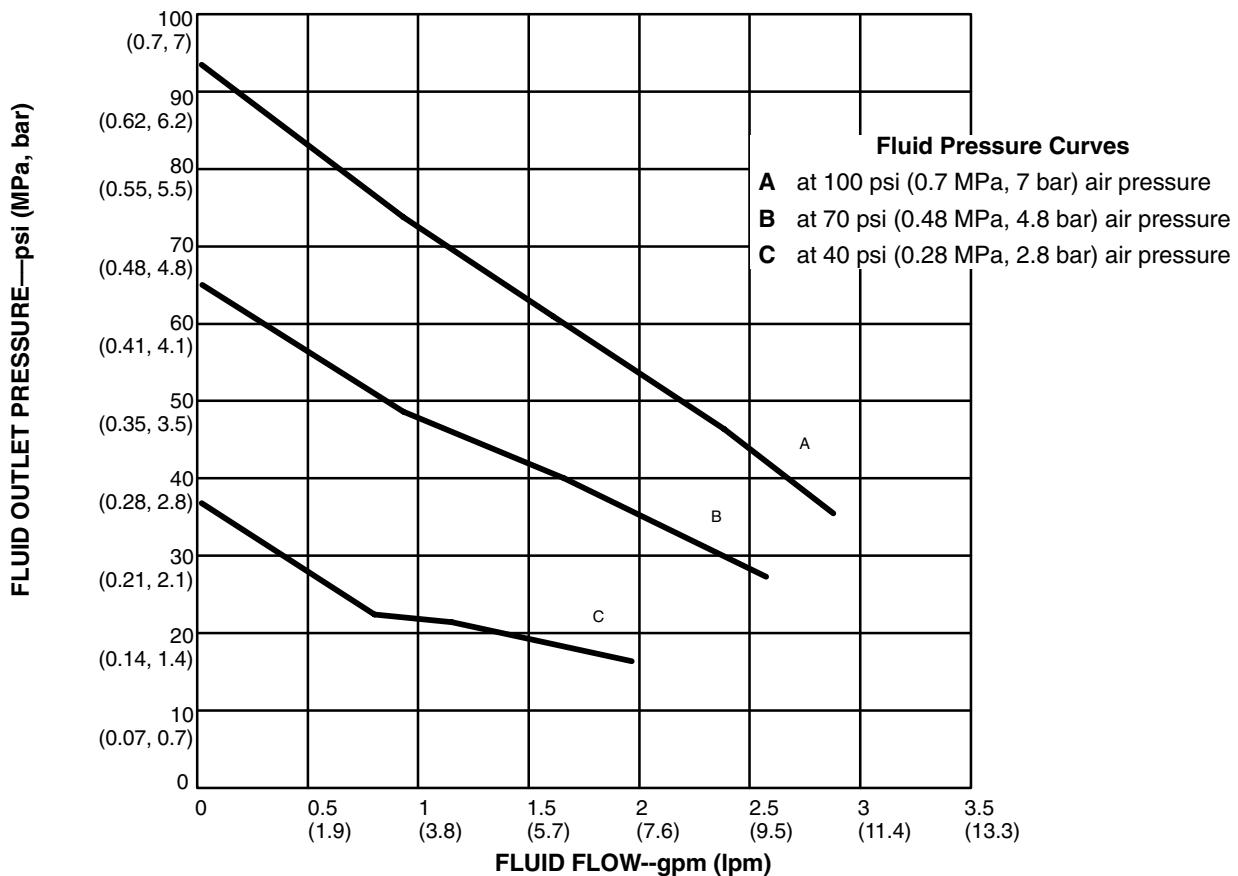
# Dimensions and Mounting Hole Layout



# Performance Charts

## Husky 205 Fluid Outlet Pressure

**Test Conditions:** Pump tested in water with inlet submerged.



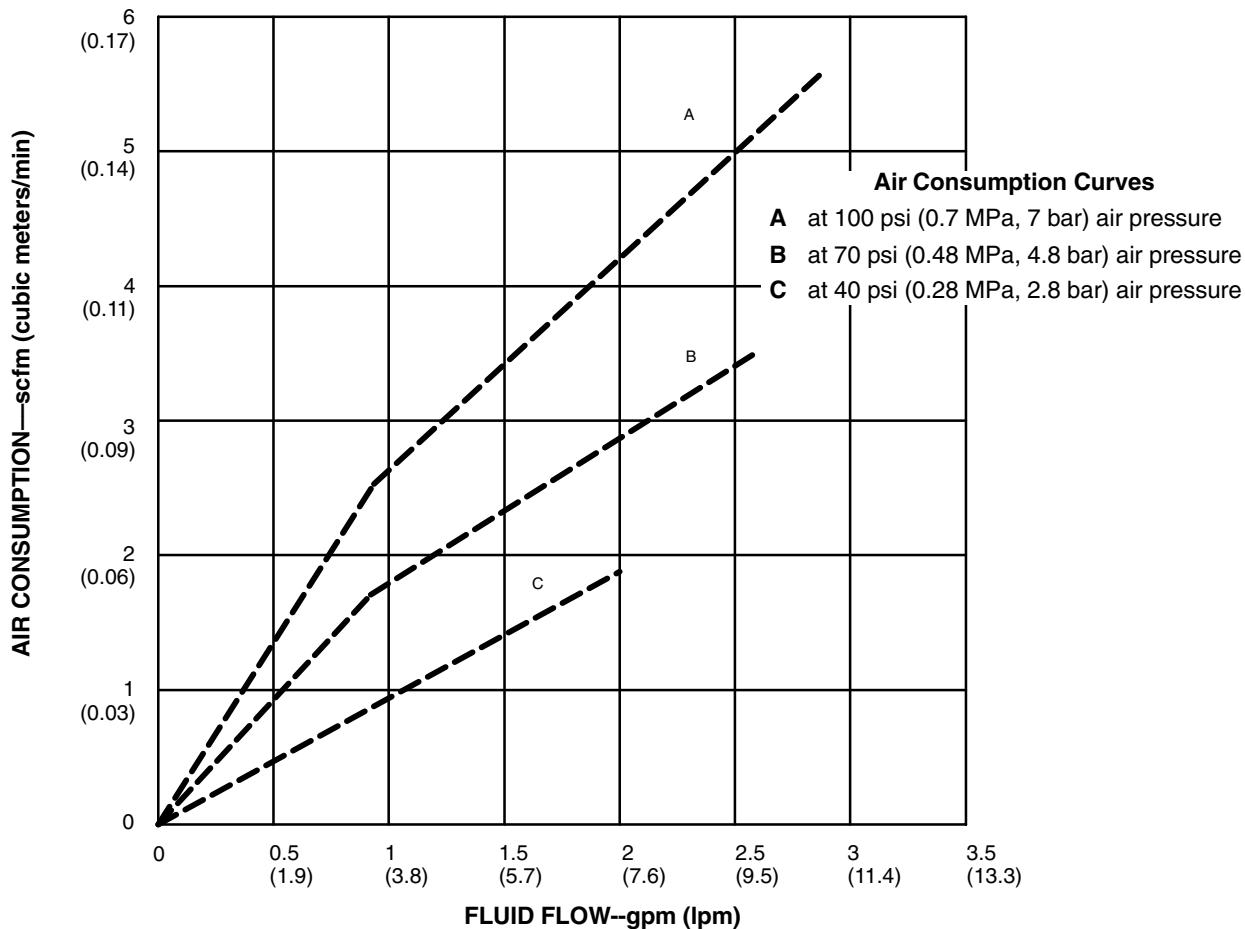
To find Fluid Outlet Pressure (psi/MPa/bar) at a specific fluid flow (gpm/lpm) and operating air pressure (psi/MPa/bar):

1. Locate fluid flow rate along bottom of chart.
2. Follow vertical line up to intersection with selected fluid outlet pressure curve.
3. Follow left to scale to read fluid outlet pressure.

# Performance Charts

## Husky 205 Air Consumption

**Test Conditions:** Pump tested in water with inlet submerged.



**To find Pump Air Consumption** (scfm or m<sup>3</sup>/min) at a specific fluid flow (gpm/lpm) and air pressure (psi/MPa/bar):

1. Locate fluid flow rate along bottom of chart.
2. Read vertical line up to intersection with selected air consumption curve.
3. Follow left to scale to read air consumption.

## Notes

# Graco Warranties

## Graco Standard Husky Pump Warranty

Graco warrants all equipment manufactured by Graco and bearing its name to be free from defects in material and workmanship on the date of sale to the original purchaser for use. With the exception of any special, extended, or limited warranty published by Graco, Graco will, for a period of five years from the date of sale, repair or replace any part of the equipment determined by Graco to be defective. This warranty applies only when the equipment is installed, operated and maintained in accordance with Graco's written recommendations.

This warranty does not cover, and Graco shall not be liable for general wear and tear, or any malfunction, damage or wear caused by faulty installation, misapplication, abrasion, corrosion, inadequate or improper maintenance, negligence, accident, tampering, or substitution of non-Graco component parts. Nor shall Graco be liable for malfunction, damage or wear caused by the incompatibility of Graco equipment with structures, accessories, equipment or materials not supplied by Graco, or the improper design, manufacture, installation, operation or maintenance of structures, accessories, equipment or materials not supplied by Graco.

This warranty is conditioned upon the prepaid return of the equipment claimed to be defective to an authorized Graco distributor for verification of the claimed defect. If the claimed defect is verified, Graco will repair or replace free of charge any defective parts. The equipment will be returned to the original purchaser transportation prepaid. If inspection of the equipment does not disclose any defect in material or workmanship, repairs will be made at a reasonable charge, which charges may include the costs of parts, labor, and transportation.

**THIS WARRANTY IS EXCLUSIVE, AND IS IN LIEU OF ANY OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO WARRANTY OF MERCHANTABILITY OR WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE.**

Graco's sole obligation and buyer's sole remedy for any breach of warranty shall be as set forth above. The buyer agrees that no other remedy (including, but not limited to, incidental or consequential damages for lost profits, lost sales, injury to person or property, or any other incidental or consequential loss) shall be available. Any action for breach of warranty must be brought within six years of the date of sale.

Graco makes no warranty, and disclaims all implied warranties of merchantability and fitness for a particular purpose in connection with accessories, equipment, materials or components sold but not manufactured by Graco. These items sold, but not manufactured by Graco (such as electric motors, switches, hose, etc.), are subject to the warranty, if any, of their manufacturer. Graco will provide purchaser with reasonable assistance in making any claim for breach of these warranties.

In no event will Graco be liable for indirect, incidental, special or consequential damages resulting from Graco supplying equipment hereunder, or the furnishing, performance, or use of any products or other goods sold hereto, whether due to a breach of contract, breach of warranty, the negligence of Graco, or otherwise.

### **FOR GRACO CANADA CUSTOMERS**

The parties acknowledge that they have required that the present document, as well as all documents, notices and legal proceedings entered into, given or instituted pursuant hereto or relating directly or indirectly hereto, be drawn up in English. Les parties reconnaissent avoir convenu que la rédaction du présent document sera en Anglais, ainsi que tous documents, avis et procédures judiciaires exécutés, donnés ou intentés à la suite de ou en rapport, directement ou indirectement, avec les procédures concernées.

## Extended Product Warranty

Graco warrants all Husky 205, 307, 515, 716, 1040, 1590, 2150, and 3275 air valve center sections to be free from defects in material and workmanship for a period of fifteen years from date installed in service by the original purchaser. Normal wear of items such as packings or seals are not considered to be defects in material and workmanship.

Five years	Graco will provide parts and labor.
Six to Fifteen years	Graco will replace defective parts only.

## Graco Information

**TO PLACE AN ORDER**, contact your Graco distributor, or call one of the following numbers  
to identify the distributor closest to you: **1-800-328-0211 Toll Free, 612-623-6921, 612-378-3505 Fax**

*All written and visual data contained in this document reflects the latest product information available at the time of publication.  
Graco reserves the right to make changes at any time without notice.*

Original instructions. This manual contains English. MM 308652

**Graco Headquarters:** Minneapolis  
**International Offices:** Belgium, China, Japan, Korea

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