Powersonic®

Ultrasonic Table Top Cleaners

Martin Walter
Ultraschalltechnik AG
A Crest Group Company

Common features off all POWERSONIC® Table Tops Type D/D-HF

Digital display is showing:

- Chosen operation time in standby mode
- Remaining operating time
- Operating time adjustable from 1 min up to 99 min
- Continuous operating mode
- Chosen liquid temerature in standby/operating mode
- Adjustable temp. from 1 degree up to 80 degrees
- Heaters protected against overheating
- Degas mode

Chosen ultrasonic power:

- power is adjustable from 10 % up to 100 % power
- Constant ultrasonic power independent of liquid level, liquid temperature and load
- Double wave ultrasonic for perfect cleaning results

- Power cord with mains plug for Europe (EU/F); plug für CH, DK, UK on request
- Housing and tank are made of stainless steel CN 18/10 EN 631
- Special heat and noise protection
- Model S to D have an ultrasonic frequency of 45 kHz
- Model D/HF has an ultrasonic frequency of 132 kHz
- Mains voltage 230 V 50/60 Hz single phase
- 24 month warranty from delivery date

Price list/Technical Data POWERSONIC® Table Top

Type	Capacity / Litres	Internal dims L / W / D mm	External dims L x W x D mm	Weight kg	Frequency kHz	Peak / eff. HF-Power-Watt	Connected load VA	Heating output Watt	Heating adjustable non-adjustable	Ball valves
P100 S	**0,8**	190 x 85 x 60	205 x 100 x 155	1,8	**45**	**60/30**	60	**none**	none	none
P100 S/H	**0,8**	190 x 85 x 60	205 x 100 x 155	1,8	**45**	**60/30**	120	**60**	none-adjustable 60°C	none
P200 S	**1,8**	148 x 134 x 100	175 x 165 x 270	2,7	**45**	**120/60**	100	**none**	none	none
P200 S/R	**1,8**	148 x 134 x 100	175 x 165 x 270	2,7	**45**	**120/60**	220	**120**	adjustable to 80°C	none
P230 S	**2,8**	240 x 137 x 100	265 x 162 x 235	3,7	**45**	**160/80**	120	**none**	none	none
P230 S/R	**2,8**	240 x 137 x 100	265 x 162 x 235	3,7	**45**	**160/80**	360	**240**	adjustable to 80°C	none
P230 D	**2,8**	240 x 137 x 100	265 x 162 x 235	3,7	**45**	**160/80**	360	**240**	adjustable to 80°C	none
P230 D/HF	**2,8**	240 x 137 x 100	265 x 162 x 235	3,7	**132**	**160/80**	360	**240**	adjustable to 80°C	none
P360 S	**4,2**	240 x 137 x 150	265 x 162 x 295	4,6	**45**	**200/100**	180	**none**	none	none
P360 S/R	**4,2**	240 x 137 x 150	265 x 162 x 295	4,6	**45**	**200/100**	420	**240**	adjustable to 80°C	none
P360 D	**4,2**	240 x 137 x 150	265 x 162 x 295	4,6	**45**	**200/100**	420	**240**	adjustable to 80°C	none
P500 S	**5,4**	300 x 151 x 150	325 x 176 x 295	5,8	**45**	**260/130**	210	**none**	none	none
P500 SR	**5,4**	300 x 151 x 150	325 x 176 x 295	5,8	**45**	**260/130**	450	**240**	adjustable to 80°C	none
P500 D	**5,4**	300 x 151 x 150	325 x 176 x 295	5,8	**45**	**260/130**	450	**240**	adjustable to 80°C	none
P500 D/HF	**5,4**	300 x 151 x 150	325 x 176 x 295	5,8	**132**	**260/130**	450	**240**	adjustable to 80°C	none
P1100 S/R	**12,3**	300 x 240 x 200	325 x 265 x 335	10,0	**45**	**400/200**	1450	**940**	adjustable to 80°C	3/8"
P1100 D	**12,3**	300 x 240 x 200	325 x 265 x 335	10,0	**45**	**400/200**	1450	**940**	adjustable to 80°C	3/8"
P1200 S/R	**9,2**	495 x 130 x 150	515 x 150 x 270	9,5	**45**	**400/200**	1450	**800**	adjustable to 80°C	3/8"
P1200 D	**9,2**	495 x 130 x 150	515 x 150 x 270	9,5	**45**	**400/200**	1450	**800**	adjustable to 80°C	3/8"
P1500 S/R	**16,8**	327 x 300 x 200	352 x 325 x 335	15,0	**45**	**480/240**	1600	**1200**	adjustable to 80°C	3/8"
P1500 D	**16,8**	327 x 300 x 200	352 x 325 x 335	15,0	**45**	**480/240**	1600	**1200**	adjustable to 80°C	3/8"
P1800 S/R	**19,6**	505 x 300 x 150	530 x 325 x 365	24,0	**45**	**480/240**	1200	**800**	adjustable to 80°C	3/8"
P1800 D	**19,6**	505 x 300 x 150	530 x 325 x 365	24,0	**45**	**480/240**	1200	**800**	adjustable to 80°C	3/8"
P2600 S/R	**26,1**	505 x 300 x 200	530 x 325 x 365	26,0	**45**	**660/330**	2800	**1880**	adjustable to 80°C	3/8"
P2600 D	**26,1**	505 x 300 x 200	530 x 325 x 365	26,0	**45**	**660/330**	2800	**1880**	adjustable to 80°C	3/8"

S = All models with mechanical Timer
S/R = All models with adjustable Heating up to approx. 80°C
D = All models digitally adjustable
D/HF = All models as D however with Frequency approx. 132 kHz
Price quotations are given on a basis without value-added tax ex factory Straubenhardt / Germany

Price list / Technical Data POWERSONIC®
Table Tops accessories

Type	Basket stainless steel Price in €	Basket dims L x W x D / mm	Mesh dims mm	Cover Price in €	Hole-Cover for Beaker Glass ∅ 70mm / 250 ml		Hole-Cover for Beaker-Glass ∅ 90mm / 600 ml		Beaker Glass 250 ml / 600ml Ø= 70mm/Ø= 90mm
					Hole	Price in €	Hole	Price in €	Price in € / Glass
P100	pls ask	170 x 65 x 50	8 x 8 x 1	pls ask	2	pls ask	on request	pls ask	pls ask
P200		115 x 115 x 75	8 x 8 x 1		2		1		
P230		210 x 110 x 85	8 x 8 x 1		2		2		
P360		210 x 110 x 130	8 x 8 x 1		2		2		
P500		260 x 120 x 130	8 x 8 x 1		2		2		
P1100		265 x 200 x 175	8 x 8 x 1		4		4		
P1200		475 x 110 x 125	8 x 8 x 1		4		4		
P1500		285 x 265 x 180	8 x 8 x 1		4		4		
P1800		465 x 265 x 135	8 x 8 x 1		8		8		
P2600		465 x 265 x 175	8 x 8 x 1		8		8		

Price quotations are given on a basis without value- added tax ex factory Straubenhardt / Germany

From Model P 230 the basket can be placed on the edge of the tank for draining by means of the mounting handles.

Powersonic® Industrial Line Ultrasonic – Cleaning - Baths

- Either side-wall mounting or bottom mounting of the ultrasound
- Digital adjustable cleaning time, heating and power
- Special heat isolation and noise protection
- External Generator
- Capacity from 40 to 360 l
- Frequency 25 kHz, 40 kHz
- Made out of stainless steel 1.4301 / 1.4435
- Rinsing bath with the same design
- Other capacities or frequencies on request

Common features of all POWERSONIC® Industrial Line Cleaners

Digital Display is showing:

- chosen operation time in standby mode
- Remaining operation time
- Operating time adjustable from 1 min up to 99 min
- Continuous operating mode
- Chosen liquid temprature in standby/operating mode
- Adjustable temp. from 1 degree up to 80 degrees
- Heaters protected against overheating with liquid sensor
- Degas mode

Chosen ultrasonic power:

- adjustable from 40% to 100% power
- Constant ultrasonic power independent of liquid lever, liquid temperature and load
- Double wave ultrasonic for perfect cleaning results
- Standart cable length between tank an external generator → 5 m

- Available with ultrasonic power from the bottom or the side walls
- All models have an external generator
- All models are available in a frequency of 25 kHz and 40 kHz, others on request
- Skimming on request
- Housing and tank made of stainless steel 1.4301 / 1.4435
- Units have special heat isolation and noise protection
- Main voltage: - Model 1218 and 1810 – AC 230V (1ph.L/N/PE)
  - Model 2210 up to 2446 – AC 230/400V (3ph.L/N/PE)

Waranty:

- 12 months from delivery for traders
- 24 months from delivery for end users

Technical Data Powersonic® Industrial-Line „Ultrasonic baths“

Type	Capacity litres	Bath Internal dims L x W x D mm	Bath External dims L x W x D mm	Weight kg	Frequency kHz	HF-Peak eff.- Power Watt	Heating output Watt	Tank Power supply	Dimensions Generator module WxHxD / mm	Weight / kg Generator module
1218 X	40	450 x 300 x 300	710 x 560 x 550	58	25/40	1000 / 500	2000	230/400V Cekon 16A	184 x 194 x 397	13,0
1810 XX	50	450 x 250 x 450	710 x 510 x 700	72	25/40	2000 / 1000	2000	230/400V Cekon 16A	184 x 194 x 397	13,0
2210 XX	75	550 x 250 x 550	810 x 510 x 800	79	25/40	2000 / 1000	3000	230/400V Cekon 16A	184 x 194 x 397	13,5
1524 X	80	600 x 380 x 350	860 x 640 x 600	83	25/40	2000 / 1000	4000	230/400V Cekon 16A	184 x 194 x 397	13,5
1622 X	90	560 x 400 x 400	820 x 660 x 650	89	25/40	2400 / 1200	4000	230/400V Cekon 16A	184 x 194 x 397	13,5
2020 X	125	500 x 500 x 500	760 x 760 x 750	95	25/40	3000 / 1500	6000	230/400V Cekon 16A	184 x 194 x 397	14,0
2810 XX	130	750 x 250 x 700	1010 x 510 x 950	98	25/40	3000 / 1500 4000 / 2000	6000	230/400V Cekon 16A	184 x 194 x 397	14,0
1826 X	130	660 x 450 x 450	920 x 710 x 700	110	25/40	3000 / 1500	6000	230/400V Cekon 16A	184 x 194 x 397	14,0
2426 X	200	660 x 600 x 500	920 x 860 x 750	116	25/40	4000 / 2000	9000	230/400V Cekon 16A	184 x 194 x 397	14,5
2436 X	270	900 x 600 x 500	1160 x 860 x 750	156	25/40	6000 / 3000	9000	230/400V Cekon 16A	236 x 222 x 411	26,0
2446 X	360	1160 x 600 x 500	1420 x 860 x 750	225	25/40	8000 / 4000	12000	230/400V Cekon 32A	449 x 222 x 411	30,5

XX = Two side sound **X = Base sound source**

- All models with external generator
- Controllable heating, digitally adjustable up to approx. 80°C
- Adjustable generator output 40%-100%
- Housing made of 1.4301 stainless steel
- Fluid level monitoring, protection against dry running for heating and ultrasound
- Degasing function to homogenize liquid in bath
- Vertically adjustable feet 80 mm / 5m bath generator connecting cable
- Digitally adjustable cleaning time, 1-99min. or continuous ultrasound
- Inlet and discharge via ball valves
- Different dimensions, extra equipment and external control on request

Martin Walter Ultraschalltechnik AG, Hardtstr. 13, D-75334 Straubenhardt
Ph. +49 (0) 7082 / 7915-17, Fax +49 (0) 7082 / 7915-84

http://www.walter-ultraschall.de
walleser@walter-ultraschall.de

BW/07.06 MW AG

Technical Data Powersonic® Industrial-Line
Rinsing bath without Ultrasonic

Type	Capacity litres	Bath Internal dims L x W x D / mm	Bath External dims L x W x D / mm	Heating Output Watt	Tank Power supply
1218	40	450 x 300 x 300	710 x 560 x 550	2000	230/400V Cekon 16A
1810	50	450 x 250 x 450	710 x 510 x 700	2000	230/400V Cekon 16A
2210	75	550 x 250 x 550	810 x 510 x 800	4000	230/400V Cekon 16A
1524	80	600 x 380 x 350	860 x 640 x 600	4000	230/400V Cekon 16A
1622	90	560 x 400 x 400	820 x 660 x 650	4000	230/400V Cekon 16A
2020	125	500 x 500 x 500	760 x 760 x 750	6000	230/400V Cekon 16A
2810	130	750 x 250 x 700	1010 x 510 x 950	6000	230/400V Cekon 16A
1826	130	660 x 450 x 450	920 x 710 x 700	6000	230/400V Cekon 16A
2426	200	660 x 600 x 500	920 x 860 x 750	8000	230/400V Cekon 16A
2436	270	900 x 600 x 500	1160 x 860 x 750	8000	230/400V Cekon 16A
2446	360	1160 x 600 x 500	1420 x 860 x 750	12000	230/400V Cekon 32A

- Controllable heating, digitally adjustable up to approx. 80℃
- Low liquid level control, protection against dry running for heating
- Thermally insulated bath
- Inlet and discharge via ball valves
- Bath made of 1.4435 stainless steel
- Housing made of 1.4301 stainless steel

Powersonic® Industrial-Line External Controll

Common features of all POWERSONIC® Tanks:

- operationg status output signals (Potential free relays contacts)

ULTRASOUND	ON	/	OFF
HEATING	ON	/	OFF
HEATING	ACTIVE	/	STAND-BY
LIQUID LEVEL	OK	/	LOW LEVEL

- Input signal binary, potential free optocoupler input, 24 V-logic for:
  → Ultrasonic on/off
  → Heating on/off

- Input signal analog (control signal 10V or 20 mA referring to GND) for:
  → Ultrasonic power adjustment 40% to 100%
  → Liquid temperature adjustment 20°C to 80°C

- Output signal analog (control signal 10V referring to GND for:
  → Actual value of liquid temerature

Common features of all POWERSONIC® heated rinsing tanks:

- Output signal analog for (Potential free relays contacts)

HEATING	on	/	off
HEATING	ACTIVE	/	STAND-BY
LIQUID LEVEL	OK	/	LOW LEVEL

- Input signal binary, Potential free optocoupler input, 24 V-logic for:
  → Heating on/off

- Input signal analog (Control signal 10V or 20 mA reffering to GND) for:
  → Liquid temerature adjustment 20°C to 80°C

- Output signal analog (control signal 10V referring to GND) for:
  → Actual value of liquid temerature

OPERATING MANUAL

Powersonic®

MW-GT/GTI/GPI/GPS

Ultrasonic Cleaning Systems

Ultrasonic Transducers and

Modular Ultrasonic Generators

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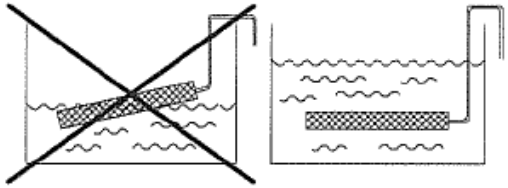
Saftey Information

Please read the following saftey information carefully before operating the Ultrasonic components

- The correct use and Technical Specification of the ultrasonic components are described in this documentation and must be followed
- Installation of the ultrasonic generator must be done by a skilled and qualified electrician. You have to comply with the relevant national standards for safety and mechanical and electrical installation.
- Operation ot he ultrasonic generator must be done by trained staff. Inadeqaute operation can result in non-repairable damages or injury.
- The technical details of the ultrasonic components must be respected.
- Adequate ventilation of the ultrasonic generator has to be guaranteed.
- The ultrasonic power supplied to the bath liquid ist transformed into heat. With insufficient heat dissipation, it can result in hot steam or ignition, depending on the cleaning agent.

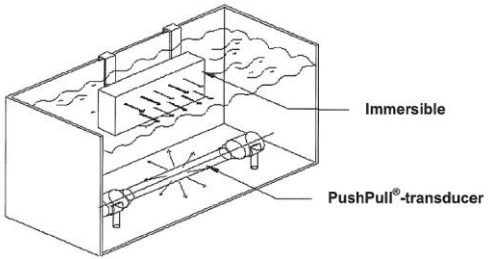
Danger of fire or explosion

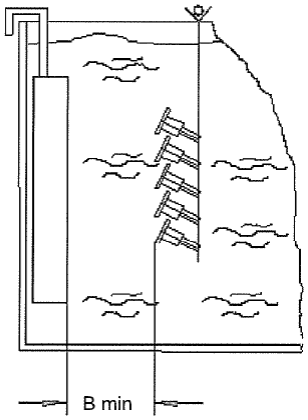
- Do never operate the ultrasonic generator and the transducer without bath liquid. The immersible transducer must be completely immersed also the membrane of the plate type transducer. The liquid must be able to absorb and dissipate the power (heat).



- Only use bath liquids permitted for use with ultrasonic technology, regarding their possible enviromental effects and their inflammability.
- Unplug and disconnect the system properly before maintenace or repair of the system. Mechanical shock or thermal displacement of the ultrasonic transducer can generate static voltages if not connected (>1000V). Before handling, short terminals.
- Follow the national standards and keep contact to your application manufacturer or/and cleaning agent supplier.

Installation





Direction of Power Dissipation:

Immersible- and plate type transducers are dissipating the ultrasonic power vertically to the surface, PushPull® transducers are dissipating the ultrasonic power radial from resonator rod.

Minimum distance to cleaning goods:

25 / 30 kHz – transducer: Bmin = 200mm

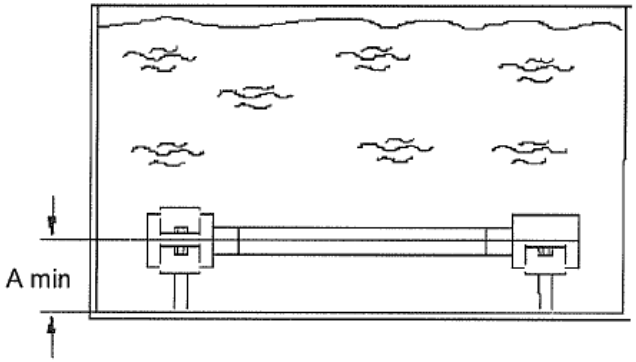
40 / 45 kHz – transducer: Bmin = 200mm

PushPull® and SinglePush Transducers

<u>Bottom Mounting:</u>

Min. distance to bottom:

For all frequencies: Amin = 120 mm

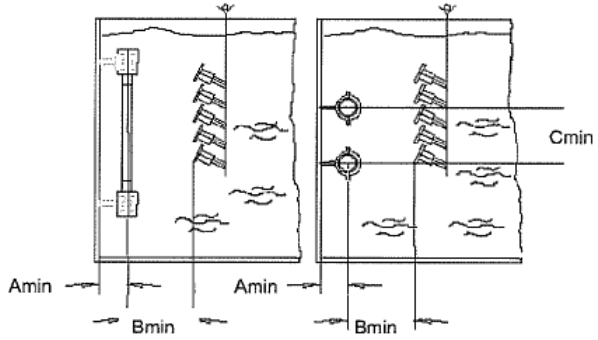


<u>Vertical, horizontal, wall Mounting:</u>

Min. distance to side walls: Amin = 120 mm

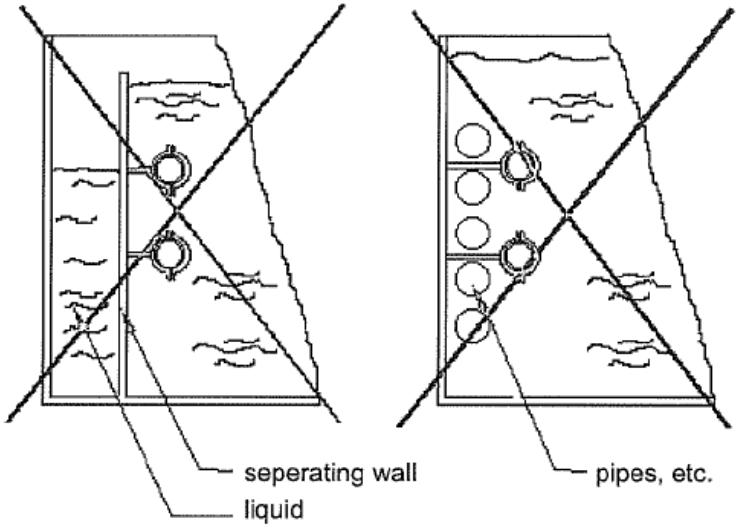
Min. distance to cleaning goods: Bmin = 200 mm

Min. distance to other transducers: Cmin = 120 mm

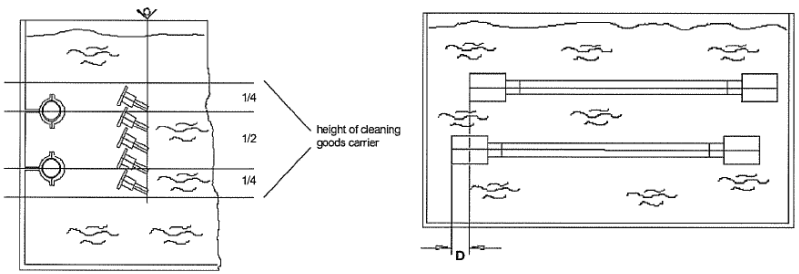


Free hanging installation possible. Transducer must be fixed at the driver heads with one fixed bearing and one moving bearing. SinglePush drivers only need to be fixed with one bearing.Please note that SinglePush transducer with a length of 495 mm and more must be mounted vertical.

Optimized Reflexion oh the Sonic Waves



- Max. reflexion of the sonic waves → expansion space
- Overflow tank, fittings or similar acoustic damping objects harm the ultrasonic effect



The transducers are to be installed staggered so that the individual waves can overlap

25 kHz – transducer: D = 50 mm

30 kHz – transducer: D = 40 mm

40 kHz – transducer: D = 30 mm

45 kHz – transducer: D = 30 mm

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Sample of documents

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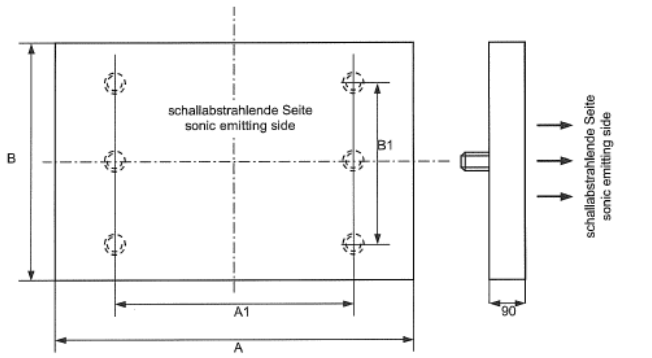
Kundenspezifikation / Customer Specification
Tauchschwinger mit Bolzen
Immersible Transducers with Bolts



Gehäuse / Body					
Werkstoff: Material:	☐ 1.4462 ☐ ____	Materialstärke: Thickness:	☐ 2mm ☐ 3mm ☐ ____	Zeichnung: Drawing:	____
Bolzen / Bolts					
Anzahl: Quantity:		Gewinde: Thread:		Länge: Lenght:	
Anschluß / Connection					
Kabelverschraubung durch Montagebolzen Cable gland through fixing bolt					
Maße / Dimensions					
A: ____	A1: ____				
B: ____	B1: ____				
Alle Maße in mm, Fertigungstoleranz +/- 5mm / all dimensions in mm, production tolerance +/- 5mm					

Angebots Nr. / Offer No.:		MW-Art. Nr. / part No.:	
Kunde / Customer			
Firma: Company:		Ansprechpartner: Contact Person:	
Kundenfreigabe: Confirmed and released by Customer:		Datum / Date	Unterschrift / Signature

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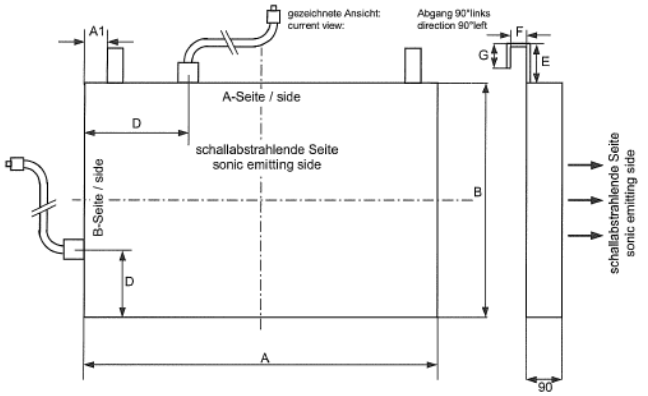
Kundenspezifikation / Customer Specification
Tauchschwinger mit Aufhängewinkel
Immersible Transducers with hanger brackets



Gehäuse / Body					
Werkstoff: Material:	☐ 1.4462 ☐ ____	Materialstärke: Thickness:	☐ 2mm ☐ 3mm ☐ ____	Zeichnung: Drawing:	____
Winkel / Brackets					
Dicke / Thickness:					
Anschluß / Connection					
☐ Schlauch / flexible hose ☐ Rohr / fixed tube		Länge: Lenght:		Zeichnung: Drawing:	____
Abgang / Directi-on:	☐ A-Seite/side ☐ B-Seite/side				
Maße / Dimensions					
A: ____		C: ____		E: ____	G: ____
B: ____		D: ____		F: ____	A1: ____
Alle Maße in mm, Fertigungstoleranz +/- 5mm / all dimensions in mm, production tolerance +/- 5mm					

Angebots Nr.: Offer No.:		MW-Art. Nr.: MW-part No.:	
Kunde / Customer			
Firma: Company:		Ansprechpartner: Contact Person:	
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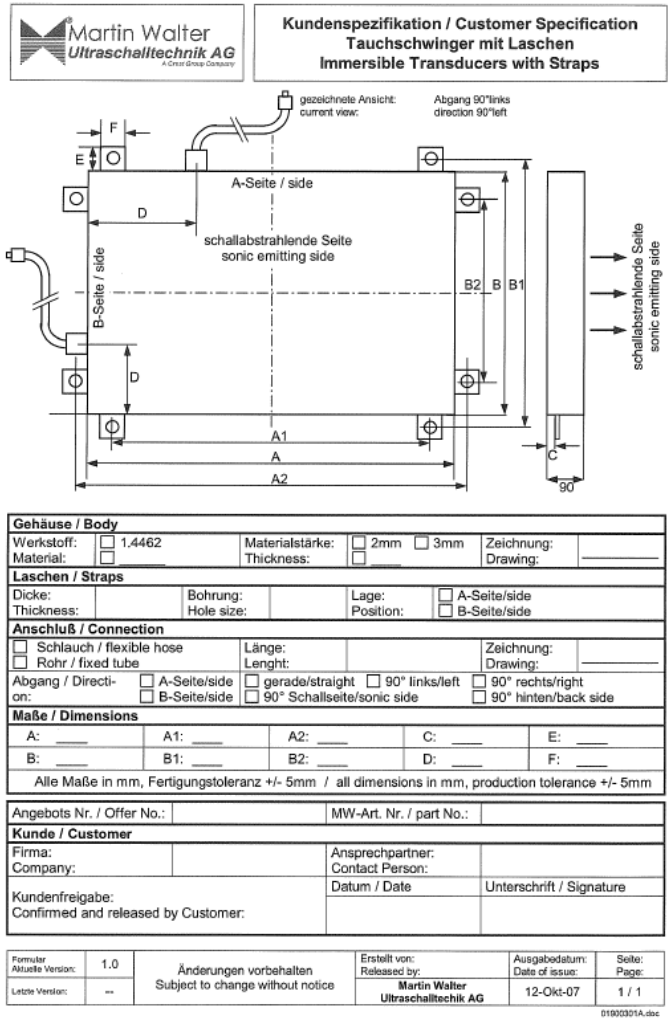
Sample of documents



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Kundenspezifikation / Customer Specification
Tauchschwinger mit Laschen
Immersible Transducers with Straps

Gehäuse / Body					
Werkstoff: Material:	☐ 1.4462 ☐ ____	Materialstärke: Thickness:	☐ 2mm ☐ 3mm ☐ ____	Zeichnung: Drawing:	____
Laschen / Straps					
Dicke: Thickness:		Bohrung: Hole size:		Lage: Position:	☐ A-Seite/side ☐ B-Seite/side
Anschluß / Connection					
☐ Schlauch / flexible hose ☐ Rohr / fixed tube		Länge: Lenght:		Zeichnung: Drawing:	____
Abgang / Direction:	☐ A-Seite/side ☐ B-Seite/side	☐ gerade/straight ☐ 90° Schallseite/sonic side	☐ 90° links/left	☐ 90° rechts/right ☐ 90° hinten/back side	
Maße / Dimensions					
A: ____	A1: ____	A2: ____	C: ____	E: ____	
B: ____	B1: ____	B2: ____	D: ____	F: ____	
Alle Maße in mm, Fertigungstoleranz +/- 5mm / all dimensions in mm, production tolerance +/- 5mm					

Angebots Nr. / Offer No.:		MW-Art. Nr. / part No.:	
Kunde / Customer			
Firma: Company:		Ansprechpartner: Contact Person:	
Kundenfreigabe: Confirmed and released by Customer:		Datum / Date	Unterschrift / Signature

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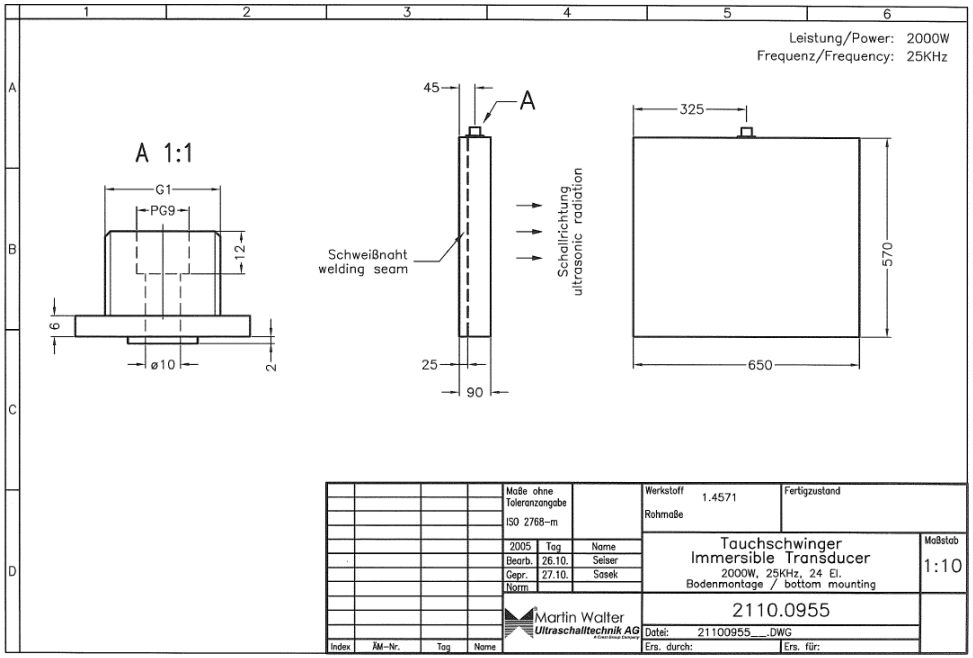
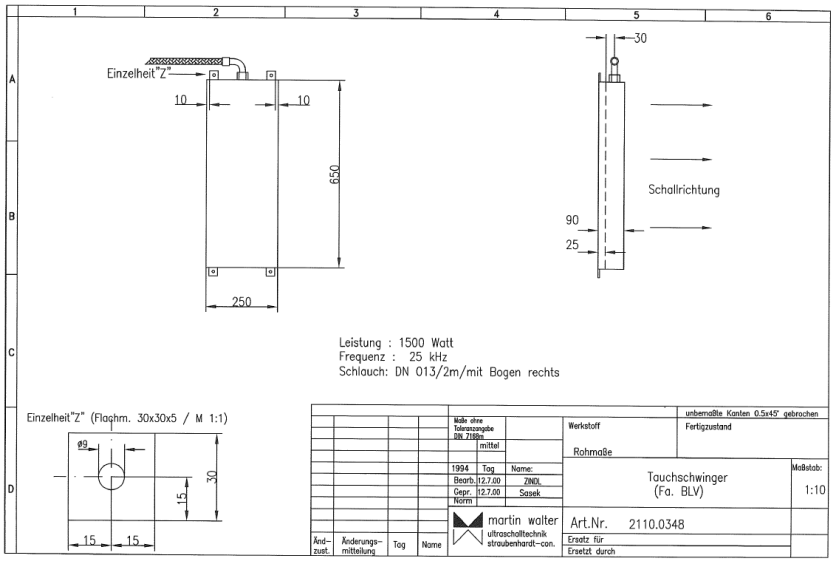
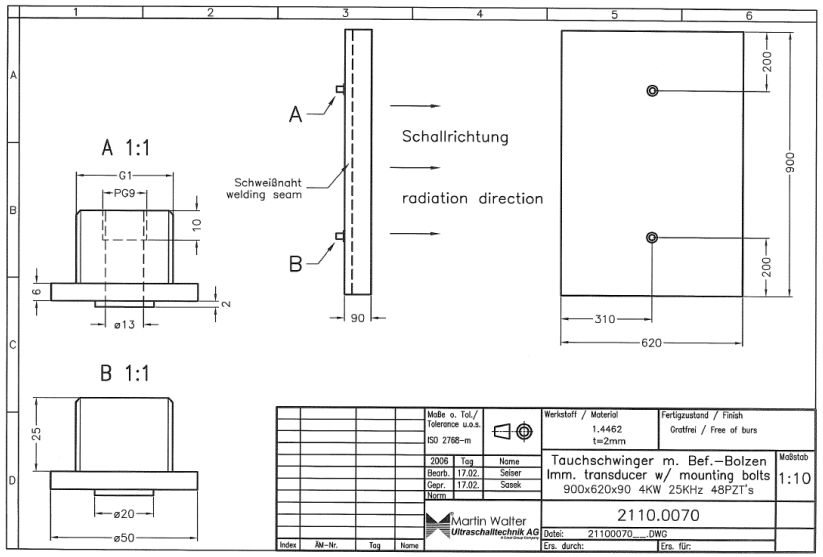
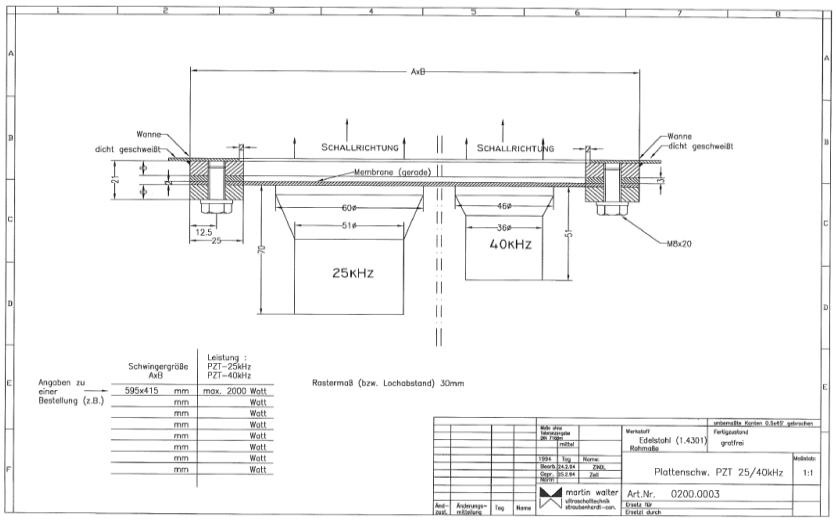
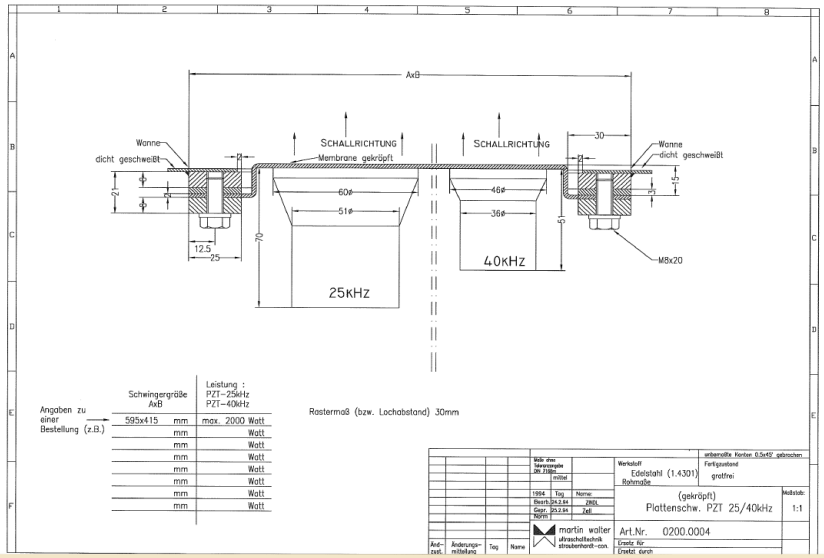


Sample of documents



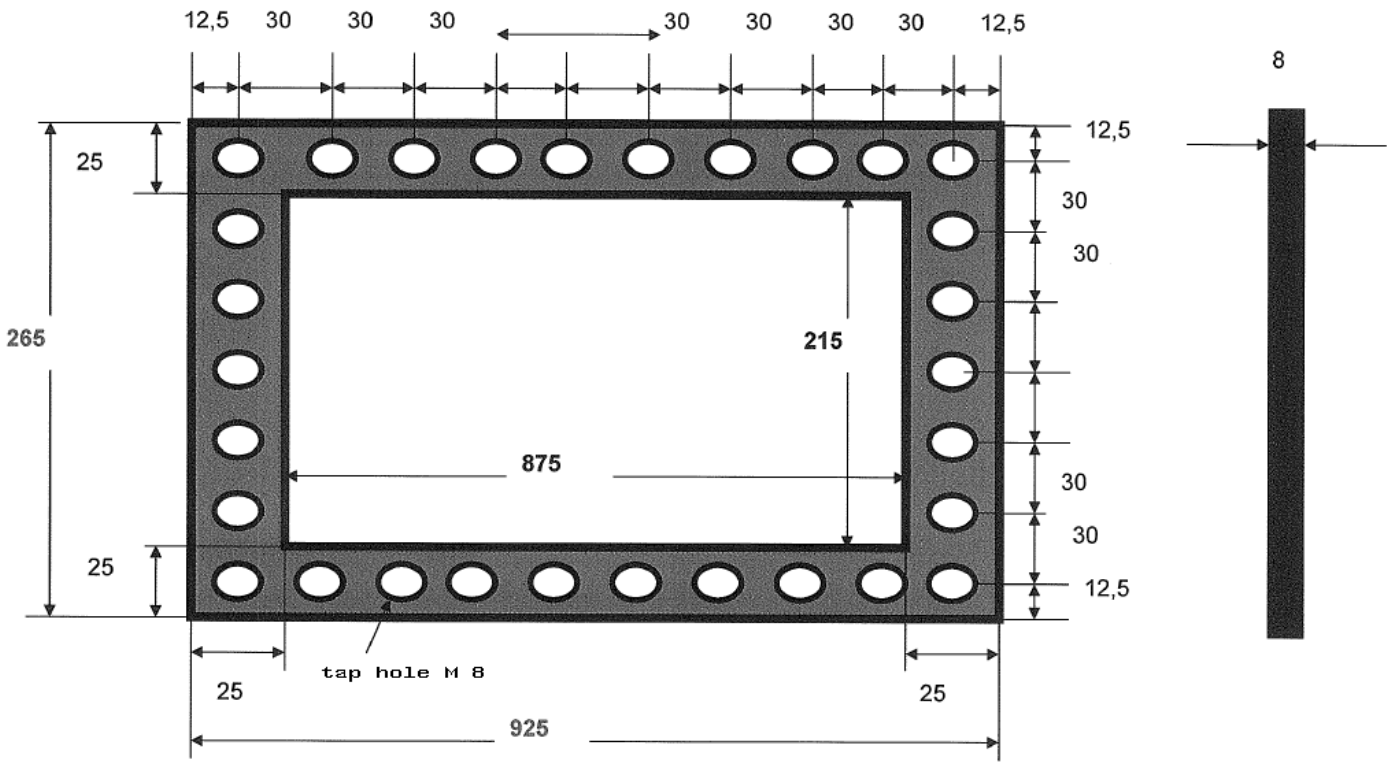






Martin Walter
Ultraschalltechnik AG
A Crest Group Company

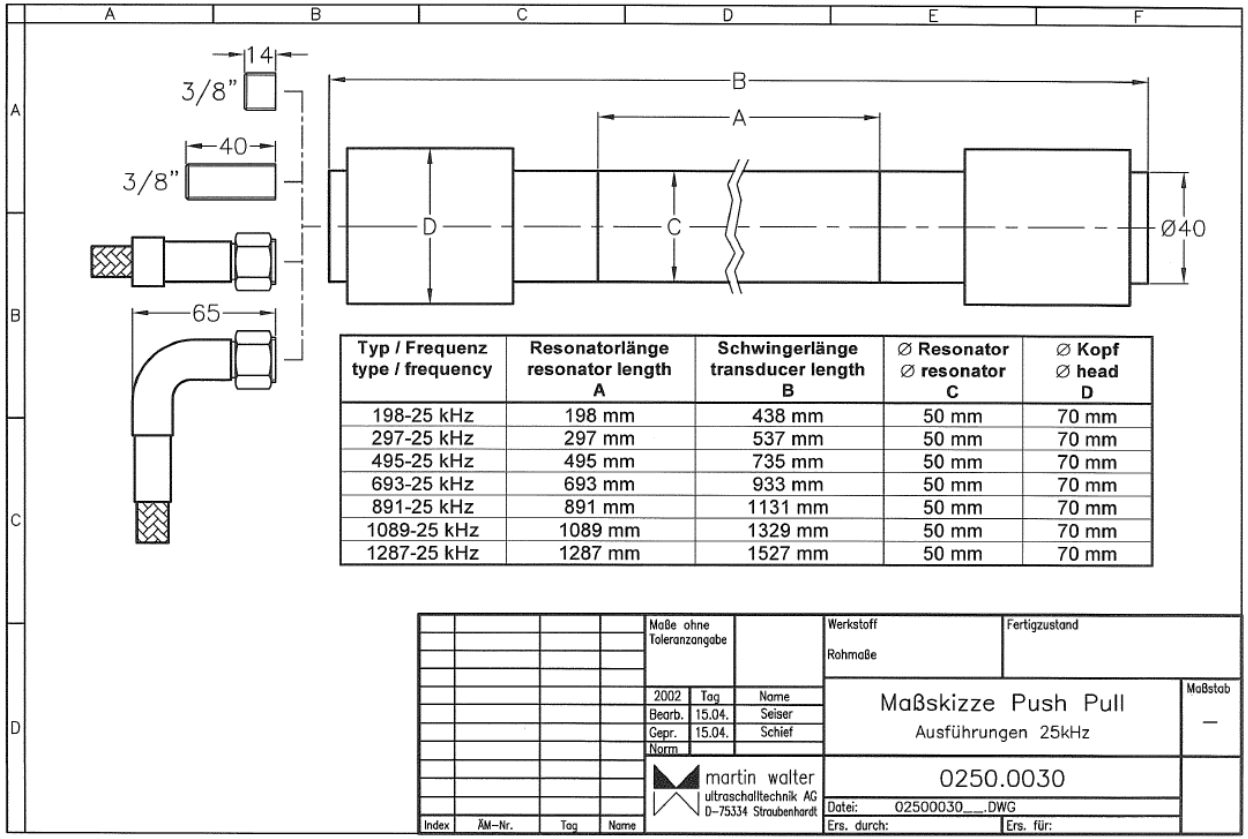
Sample of documents



welding frame 1.4571 / Realtrade Kft 18.11..09/BW-MW

The PushPull®

Dimensional drawing



Typ / Frequenz type / frequency	Resonatorlänge resonator length A	Schwingerlänge transducer length B	∅ Resonator ∅ resonator C	∅ Kopf ∅ head D
198-25 kHz	198 mm	438 mm	50 mm	70 mm
297-25 kHz	297 mm	537 mm	50 mm	70 mm
495-25 kHz	495 mm	735 mm	50 mm	70 mm
693-25 kHz	693 mm	933 mm	50 mm	70 mm
891-25 kHz	891 mm	1131 mm	50 mm	70 mm
1089-25 kHz	1089 mm	1329 mm	50 mm	70 mm
1287-25 kHz	1287 mm	1527 mm	50 mm	70 mm

Maße ohne Toleranzangabe

Werkstoff: Rohmaße

Fertigzustand

	Tag	Name
2002		
Bearb.	15.04.	Seiser
Gepr.	15.04.	Schief
Norm		

Maßskizze Push Pull
Ausführungen 25kHz

Maßstab: –

martin walter
ultraschalltechnik AG
D-75334 Straubenhardt

0250.0030

Datei: 02500030___.DWG

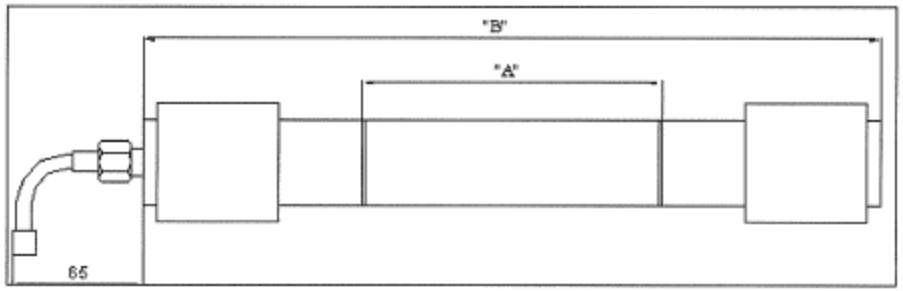
Ers. durch: Ers. für:

Index	ÄM-Nr.	Tag	Name

Martin Walter
Ultraschalltechnik AG
A Crest Group Company

Data scheet PushPull® – Transducer 25 kHz

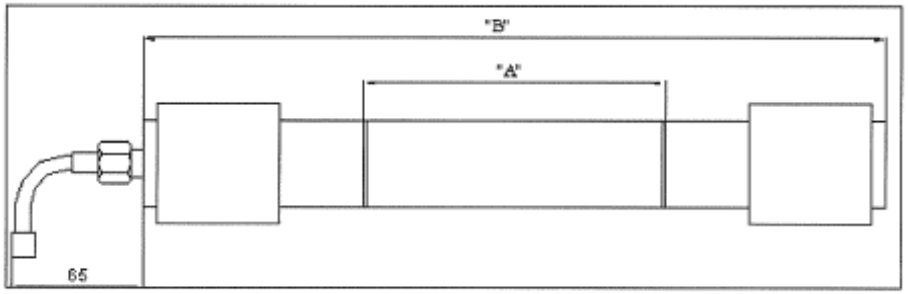
Transducer	Material	Description	Frequency	Length A/B
Push / Pull	TiAl	PP 06.25.198	25 kHz	198/438
Push / Pull	TiAl	PP 06.25.297	25 kHz	297/537
Push / Pull	TiAl	PP 10.25.297	25 kHz	297/537
Push / Pull	TiAl	PP 10.25.495	25 kHz	495/735
Push / Pull	TiAl	PP 15.25.495	25 kHz	495/735
Push / Pull	TiAl	PP 15.25.693	25 kHz	693/933
Push / Pull	TiAl	PP 15.25.891	25 kHz	891/1131
Push / Pull	TiAl	PP 20.25.891	25 kHz	891/1131
Push / Pull	TiAl	PP 20.25.1089	25 kHz	1089/1329
Push / Pull	TiAl	PP 20.25.1287	25 kHz	1287/1527
Push / Pull	TiAl	PP 20.25.1485	25 kHz	1485/1725
Push / Pull	TiAl	PP 25.25.2180	25 kHz	2180/2420
Push / Pull	VA	PP 06.25.198	25 kHz	198/438
Push / Pull	VA	PP 06.25.297	25 kHz	297/537
Push / Pull	VA	PP 10.25.297	25 kHz	297/537
Push / Pull	VA	PP 10.25.396	25 kHz	396/636
Push / Pull	VA	PP 10.25.495	25 kHz	495/735
Push / Pull	VA	PP 15.25.495	25 kHz	495/735
Push / Pull	VA	PP 15.25.693	25 kHz	693/933
Push / Pull	VA	PP 15.25.891	25 kHz	891/1131
Push / Pull	VA	PP 20.25.891	25 kHz	891/1131
Push / Pull	VA	PP 20.25.1089	25 kHz	1089/1329
Push / Pull	VA	PP 20.25.1287	25 kHz	1287/1527
Push / Pull	VA	PP 20.25.1485	25 kHz	1485/1725
Push / Pull	ReTi	PP 06.25.198	25 kHz	198/438
Push / Pull	ReTi	PP 06.25.297	25 kHz	297/537
Push / Pull	ReTi	PP 10.25.297	25 kHz	297/537
Push / Pull	ReTi	PP 10.25.396	25 kHz	396/636
Push / Pull	ReTi	PP 10.25.495	25 kHz	495/735
Push / Pull	ReTi	PP 15.25.495	25 kHz	495/735
Push / Pull	ReTi	PP 15.25.693	25 kHz	693/933
Push / Pull	ReTi	PP 15.25.891	25 kHz	891/1131
Push / Pull	ReTi	PP 20.25.891	25 kHz	891/1131
Push / Pull	ReTi	PP 20.25.1089	25 kHz	1089/1329
Push / Pull	ReTi	PP 20.25.1287	25 kHz	1287/1527



Martin Walter Ultraschalltechnik AG
A Crest Group Company

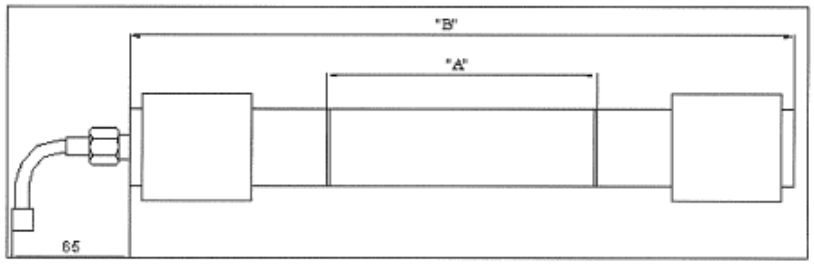
Data scheet PushPull® – Transducer 30 kHz

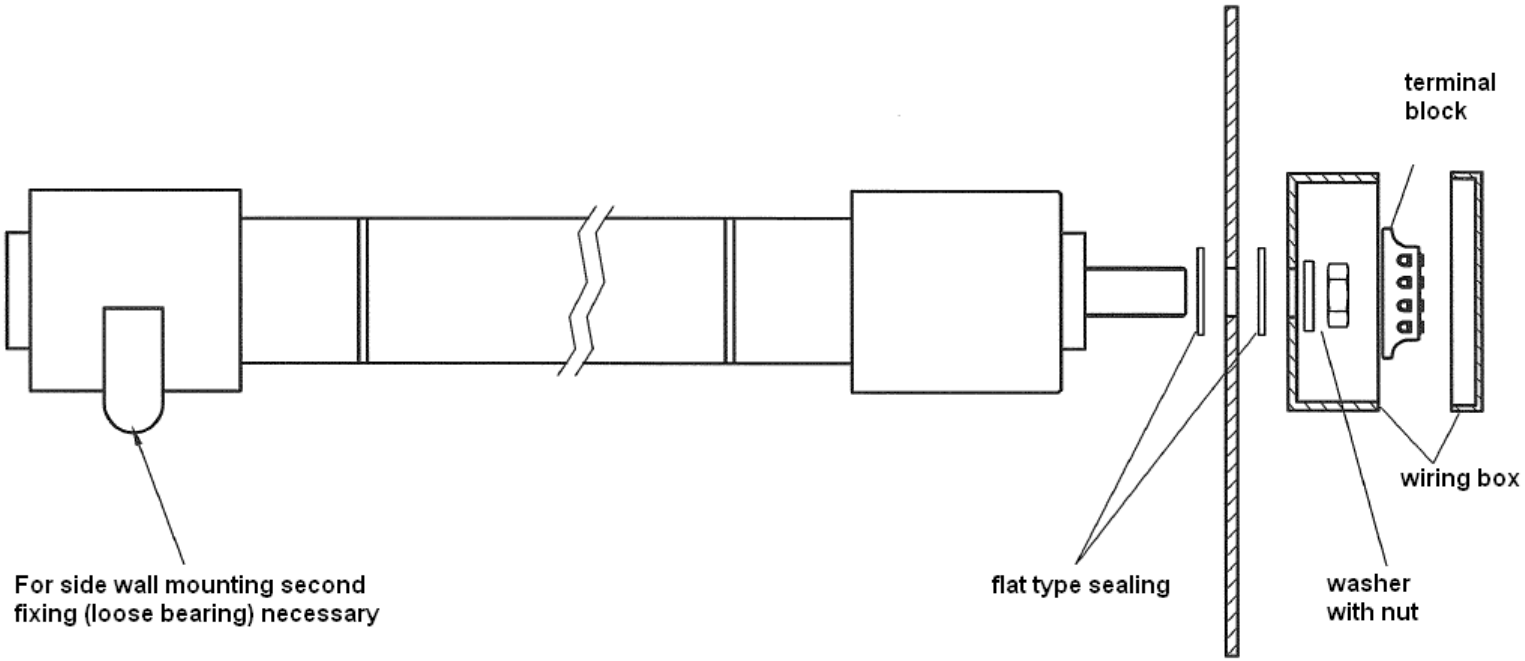
Transducer	Material	Description	Frequency	Length A/B
Push / Pull	TiAl	PP 06.30.240	30 kHz	240/420
Push / Pull	TiAl	PP 06.30.320	30 kHz	320/500
Push / Pull	TiAl	PP 10.30.400	30 kHz	400/580
Push / Pull	TiAl	PP 10.30.480	30 kHz	480/660
Push / Pull	TiAl	PP 10.30.560	30 kHz	560/740
Push / Pull	TiAl	PP 15.30.640	30 kHz	640/820
Push / Pull	TiAl	PP 15.30.720	30 kHz	720/900
Push / Pull	VA	PP 06.30.240	30 kHz	240/420
Push / Pull	VA	PP 06.30.320	30 kHz	320/500
Push / Pull	VA	PP 10.30.400	30 kHz	400/580
Push / Pull	VA	PP 10.30.480	30 kHz	480/660
Push / Pull	VA	PP 10.30.560	30 kHz	560/740
Push / Pull	VA	PP 15.30.640	30 kHz	640/820

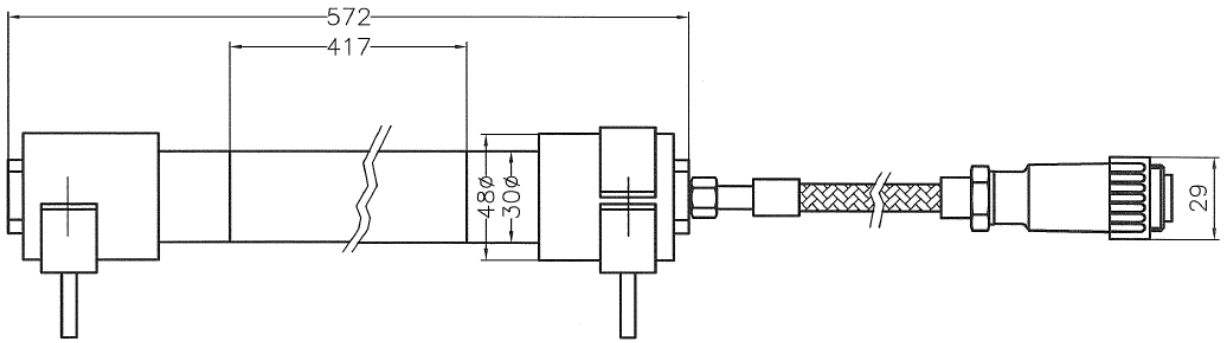


Data scheet PushPull® – Transducer 40 kHz

Transducer	Material	Description	Frequency	Length A/B
Push / Pull	TiAl	PP 03.40.122	40 kHz	122/277
Push / Pull	TiAl	PP 05.40.183	40 kHz	183/338
Push / Pull	TiAl	PP 07,5.40.302	40 kHz	302/457
Push / Pull	TiAl	PP 10.40.427	40 kHz	427/582
Push / Pull	VA	PP 03.40.122	40 kHz	122/277
Push / Pull	VA	PP 05.40.183	40 kHz	183/338
Push / Pull	VA	PP 07,5.40.302	40 kHz	302/457
Push / Pull	VA	PP 10.40.427	40 kHz	427/582
Push / Pull	ReTi	PP 03.40.122	40 kHz	122/277
Push / Pull	ReTi	PP 05.40.183	40 kHz	183/338
Push / Pull	ReTi	PP 07,5.40.302	40 kHz	302/457
Push / Pull	ReTi	PP 10.40.427	40 kHz	427/582

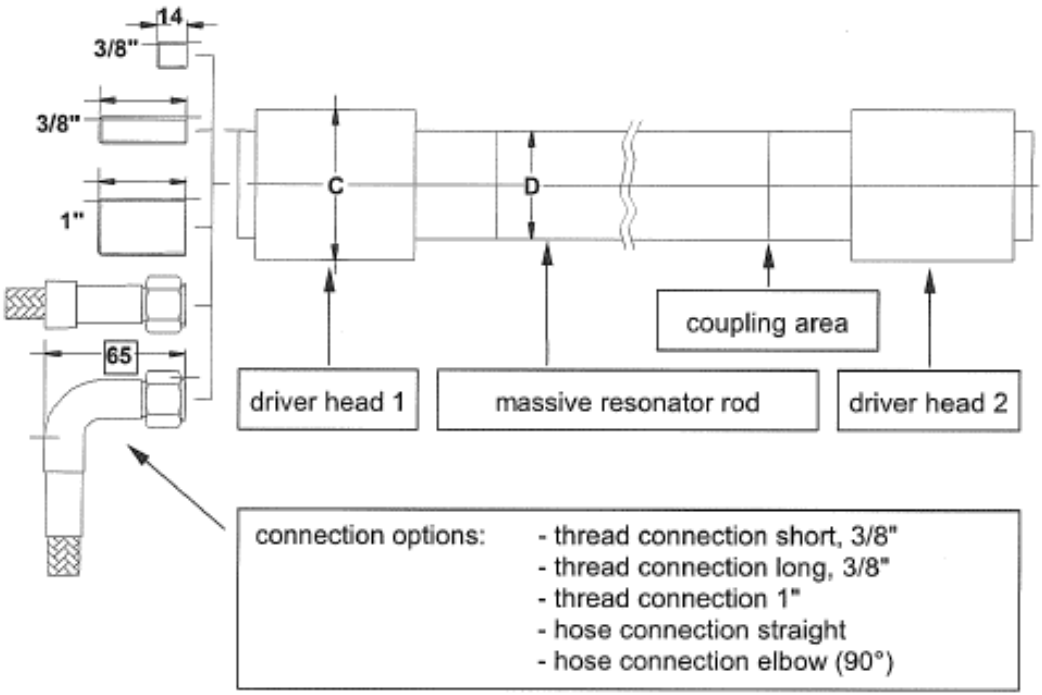



terminal
block
wiring box
For side wall mounting second
fixing (loose bearing) necessary
flat type sealing
washer
with nut



Bearb. edited	M. Seiser	Skizze, keine maßstäbliche Darstellung. Nur zu Informationszwecken. Sketch, not to scale. For information purpose only.	
Datum date	22.03.2002		
martin walter ultraschalltechnik D-75334 straubenhardt		Push–Pull 45kHz, A=417mm gerader Abgang, HF–Stecker	Blatt/sheet 1 von/of 1
Form/form: 0190.0203		Datei/file: PP10_45_417_HF–Stecker.dwg	

Appendix PushPull® – and SinglePush Transducers

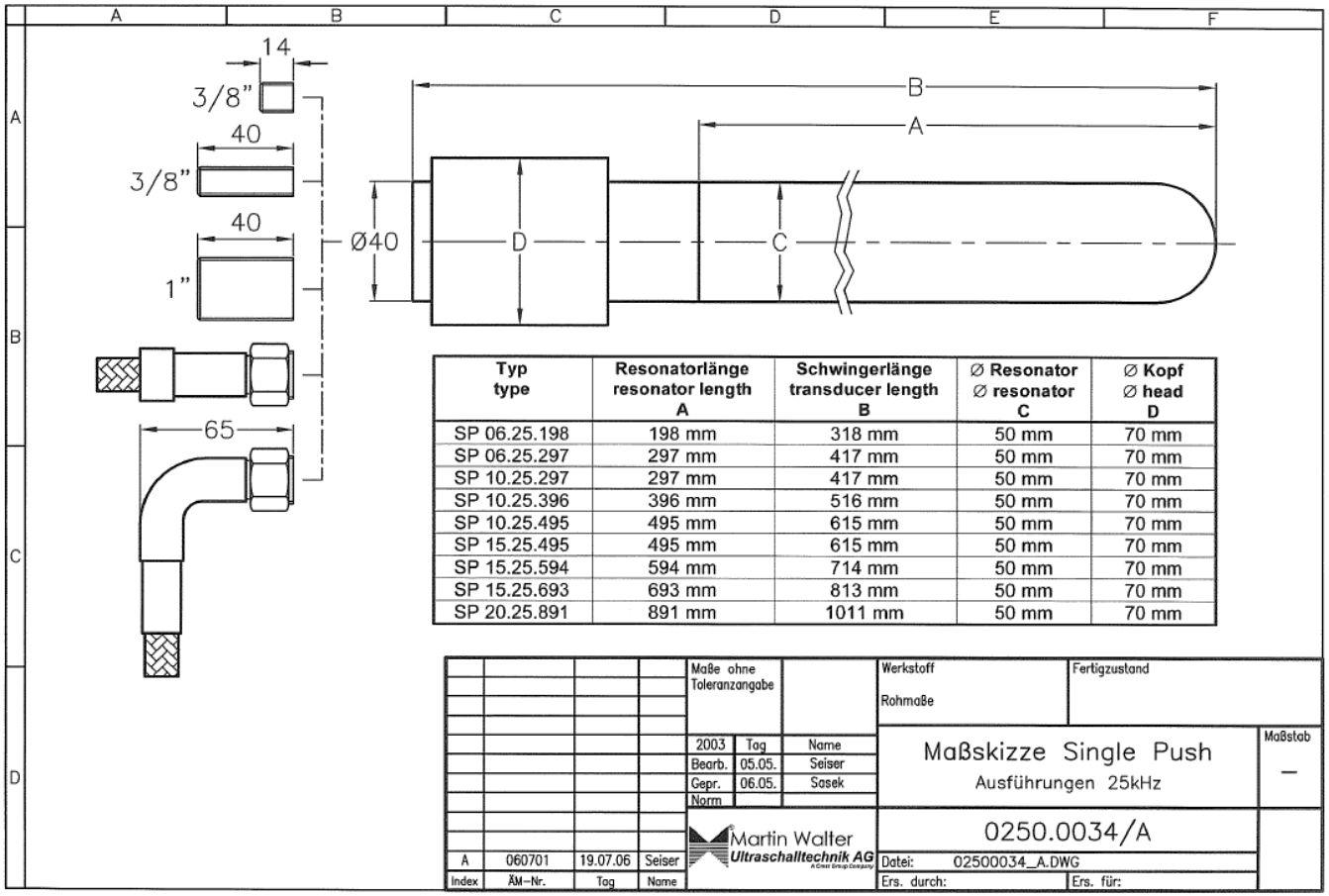


Type / frequency	driver head diameter 'C'	resonator diameter 'D'
25 kHz	70 mm	50 mm
30 kHz	55 mm	38 mm
40 kHz	48 mm	38 mm
45 kHz	48 mm	38 mm

At the SinglePush-transducer, the driver head 2 is missing.

The SinglePush®

SinglePush® 25 kHz



Typ type	Resonatorlänge resonator length A	Schwingerlänge transducer length B	∅ Resonator ∅ resonator C	∅ Kopf ∅ head D
SP 06.25.198	198 mm	318 mm	50 mm	70 mm
SP 06.25.297	297 mm	417 mm	50 mm	70 mm
SP 10.25.297	297 mm	417 mm	50 mm	70 mm
SP 10.25.396	396 mm	516 mm	50 mm	70 mm
SP 10.25.495	495 mm	615 mm	50 mm	70 mm
SP 15.25.495	495 mm	615 mm	50 mm	70 mm
SP 15.25.594	594 mm	714 mm	50 mm	70 mm
SP 15.25.693	693 mm	813 mm	50 mm	70 mm
SP 20.25.891	891 mm	1011 mm	50 mm	70 mm

Maße ohne Toleranzangabe

Werkstoff
Rohmaße

Fertigzustand

	Tag	Name
2003	Tag	Name
Bearb.	05.05.	Seiser
Gepr.	06.05.	Sasek
Norm		

Maßskizze Single Push
Ausführungen 25kHz

Maßstab
–

Martin Walter Ultraschalltechnik AG

0250.0034/A

Datei: 02500034_A.DWG

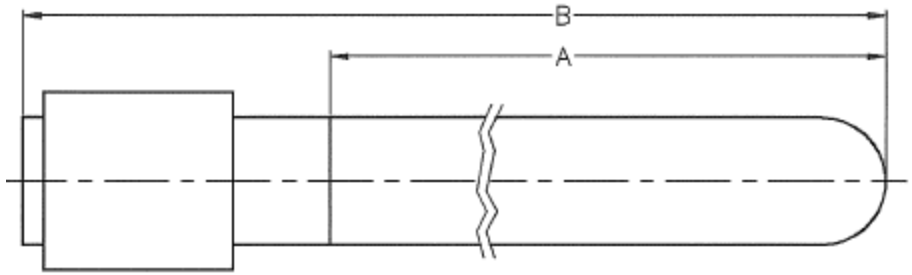
Ers. durch:

Ers. für:

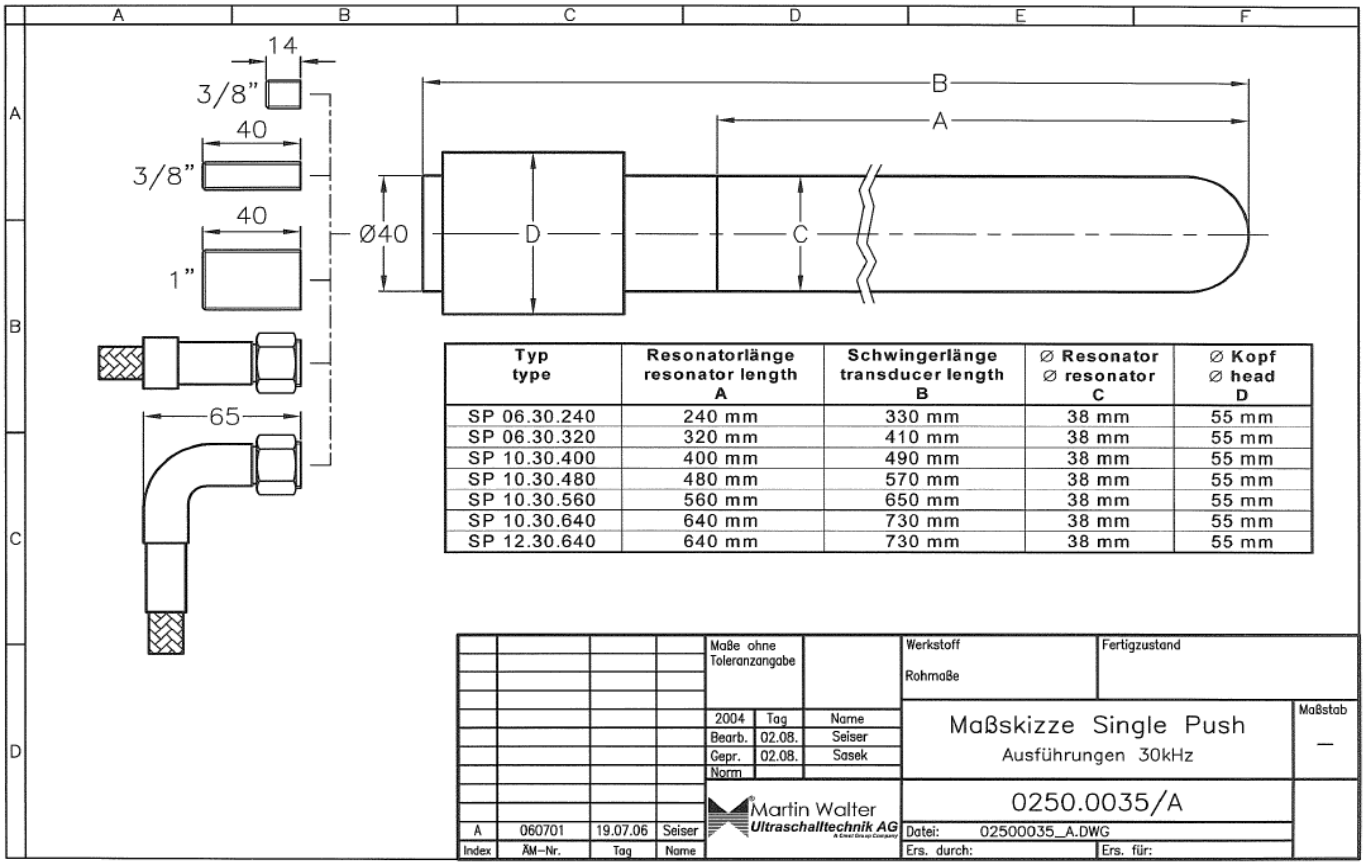
Index	ÄM–Nr.	Tag	Name
A	060701	19.07.06	Seiser

Data sheet SinglePush® 25 kHz

Bezeich.	Material	Beschr.	Frequenz	Länge A/B
Single Push	TiAl	SP 06.25.198	25 kHz	198 / 318
Single Push	TiAl	SP 06.25.297	25 kHz	297 / 417
Single Push	TiAl	SP 10.25.297	25 kHz	297 / 417
Single Push	TiAl	SP 10.25.396	25 kHz	396 / 516
Single Push	TiAl	SP 10.25.495	25 kHz	495 / 615
Single Push	TiAl	SP 15.25.495	25 kHz	495 / 615
Single Push	TiAl	SP 15.25.594	25 kHz	594 / 714
Single Push	TiAl	SP 15.25.693	25 kHz	693 / 813
Single Push	TiAl	SP 15.25.891	25 kHz	891/1011
Single Push	TiAl	SP 20.25.891	25 kHz	891/1011
Single Push	V4A	SP 06.25.198	25 kHz	198 / 318
Single Push	V4A	SP 06.25.297	25 kHz	297 / 417
Single Push	V4A	SP 10.25.297	25 kHz	297 / 417
Single Push	V4A	SP 10.25.396	25 kHz	396 / 516
Single Push	V4A	SP 10.25.495	25 kHz	495 / 615
Single Push	V4A	SP 15.25.495	25 kHz	495 / 615
Single Push	V4A	SP 15.25.594	25 kHz	594 / 714
Single Push	V4A	SP 15.25.693	25 kHz	693 / 813
Single Push	V4A	SP 15.25.891	25 kHz	891/1011



SinglePush® 30 kHz



Typ type	Resonatorlänge resonator length A	Schwingerlänge transducer length B	∅ Resonator ∅ resonator C	∅ Kopf ∅ head D
SP 06.30.240	240 mm	330 mm	38 mm	55 mm
SP 06.30.320	320 mm	410 mm	38 mm	55 mm
SP 10.30.400	400 mm	490 mm	38 mm	55 mm
SP 10.30.480	480 mm	570 mm	38 mm	55 mm
SP 10.30.560	560 mm	650 mm	38 mm	55 mm
SP 10.30.640	640 mm	730 mm	38 mm	55 mm
SP 12.30.640	640 mm	730 mm	38 mm	55 mm

Maße ohne Toleranzangabe

	Tag	Name
2004		
Bearb.	02.08.	Seiser
Gepr.	02.08.	Sasek
Norm		

Index	ÄM-Nr.	Tag	Name
A	060701	19.07.06	Seiser

Martin Walter Ultraschalltechnik AG

Werkstoff
Rohmaße

Fertigzustand

Maßskizze Single Push
Ausführungen 30kHz

Maßstab
—

0250.0035/A

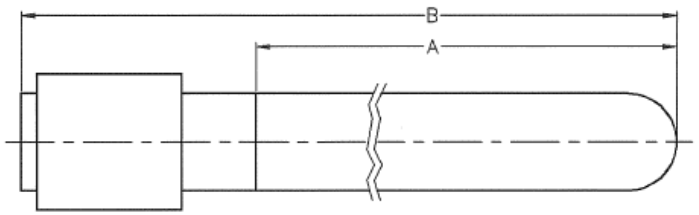
Datei: 02500035_A.DWG

Ers. durch:

Ers. für:

Data sheet SinglePush® 30 kHz

Bezeich.	Material	Beschr.	Frequenz	Länge A/B
Single Push	TiAl	SP 06.30.240	30 kHz	240 / 330
Single Push	TiAl	SP 06.30.320	30 kHz	320 / 410
Single Push	TiAl	SP 10.30.400	30 kHz	400 / 490
Single Push	TiAl	SP 10.30.480	30 kHz	480 / 570
Single Push	TiAl	SP 10.30.560	30 kHz	560 / 650
Single Push	TiAl	SP 10.30.640	30 kHz	640 / 730
Single Push	TiAl	SP 12.30.640	30 kHz	640 / 730



MW Generators

Measurement:

28 TE : 194 x 184 x 397 mm (H x W x D)

42 TE : 222 x 236 x 411 mm (H x W x D)

63 TE: 222 x 342 x 411 mm (H x W x D)

84 TE : 222 x 449 x 411 mm (H x W x D)

Power supply :

28 TE : AC 230V, 16A

42 TE : AC 230V, 16A

63 TE : AC 230/400V, 3 x 16 A

84 TE : AC 230/400V, 3 x 32 A

OPERATING MANUAL
POWERSONIC®

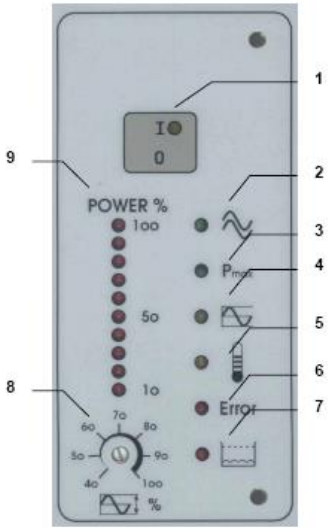
MW-GT/GTI/GPI/GPS

Ultrasonic Cleaning Systems

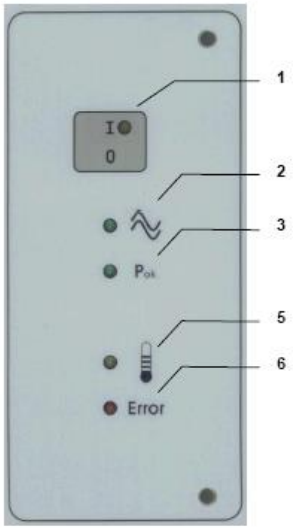
Ultrasonic Transducers and

Modular Ultrasonic Generators

Controls and Indicators



Frontansicht GTI / GPI



Frontansicht GT

Pos.	Bezeichnung	Beschreibung
1	Ein/Aus - Taste mit LED	Ultraschall ein/aus, die LED leuchtet bei Ultraschall 'Ein'
2	HF - Anzeige	HF-Ausgangsspannung liegt an
3	P_{ok} - Anzeige	maximale Ausgangsleistung liegt an
4	Amplitudenanzeige *1)	Amplitudenregelungsbetrieb
5	Temperaturanzeige	Übertemperatur des Generators
6	Störungsanzeige	Störung am Schwingsystem, Kabel oder Generator
7	Trockenlaufanzeige *2)	Flüssigkeitspegel unterschritten
8	Leistungseinstellung *3)	Einstellung der Ausgangsleistung von 40% bis 100%
9	Leistungsanzeige	Anzeige des Leistungswertes in 10% Schritten

*1) only with generator version GPI, *2) only with connected level sensor (Option), *3) not with “external power setting“ (Option)

Technical Data

The technical data are valid for a single module. Connected to the power supply, the total power consumption per housing has to be considered.

Application: Ultrasonic cleaning, mixing and separating applications for industrial use, special applications

Design: Module 14TE resp. 28TE / 4HE for mounting in corresponding 19“-housing

Modultyp	Schwingertyp
GT / GTI	Tauch- oder Plattenschwinger
GPI	PushPull® Schwinger
GPS	SinglePush Schwinger

Output:

HF-Voltage for operation of matched ultrasonic transducers frequency approx.: 25 kHz, 30 kHz, 40 kHz, 45 kHz, 58 kHz, 132 kHz, 192 kHz

Modul	max. eff. Ausgangsleistung	Netz-Leistungsaufnahme
MW 500	500 W	550 VA
MW 500 132k	500 W	750 VA
MW 600	600 W	660 VA
MW 750	750 W	825 VA
MW 1000	1000 W	1100 VA
MW 1200	1200 W	1320 VA
MW 1500	1500 W	1650 VA
MW 2000	2000 W	2200 VA
MW 3000	3000 W	3300 VA

Leistungsregelung: ± 5%
Einschaltdauer: 100% (Dauerbetrieb)

Netzversorgung / max. Anschlussleistung / Absicherung:

28TE-1 Gehäuse:	AC 230V	± 10%, 47...63Hz, 1~, N, PE /	2200VA	/ 16A
42TE-2 Gehäuse:	AC 230V	± 10%, 47...63Hz, 1~, N, PE /	3300VA	/ 16A
63TE-3 Gehäuse:	AC 230V/400V	± 10%, 47...63Hz; 3~, N, PE /	6600VA	/ 3x 16A
84TE-5 Gehäuse:	AC 230V/400V	± 10%, 47...63Hz; 3~, N, PE /	11000VA	/ 3x 32A

Interface analog / binary (DSUB 25 pole socket)

- input/output protected up to DC30V

- Non-listed connections resp. The connections of non-assembled modules are not connected

- Ground potential ‘GND‘ is connected to protective earth (PE)

Pin 14TE	Pin 28TE	Bezeichnung	Funktion	Beschreibung
1	2	FS_M1	Freigabe US Modul 1	**Steuereingänge:** Freigabe Ultraschall, nach GND schalten, ca. 5V/2mA
2	4	FS_M2	Freigabe US Modul 2	
3	-	FS_M3	Freigabe US Modul 3	
4	-	FS_M4	Freigabe US Modul 4	
5	-	FS_M5	Freigabe US Modul 5	
6	7	AN_IN_M1	Leistungseinstellung M1	**Steuereingänge:** Sollwert Ausgangsleistung Analogsignal 4...10V → 40...100% Leistung Eingangswiderstand: Ri ≥ 10kOhm, max. 30V
7	9	AN_IN_M2	Leistungseinstellung M2	
8	-	AN_IN_M3	Leistungseinstellung M3	
9	-	AN_IN_M4	Leistungseinstellung M4	
10	-	AN_IN_M5	Leistungseinstellung M5	
11	11	LUE2	Störungsrelais Wurzel	**Meldeausgänge:** Störungsmeldung, bezugspotentialfrei, max. AC24V/DC30V, 0,1A
12	13	LUE1_M1	Störungsrelais M1	
13	15	LUE1_M2	Störungsrelais M2	
14	-	LUE1_M3	Störungsrelais M3	
15	-	LUE1_M4	Störungsrelais M4	
16	-	LUE1_M5	Störungsrelais M5	
17	18	P_OUT_M1	Analogausgang M1	**Signalausgang:** Istwert Ausgangsleistung, 0...100% Leistung → Analogsignal 0...10V, max. 5mA
18	20	P_OUT_M2	Analogausgang M2	
19	-	P_OUT_M3	Analogausgang M3	
20	-	P_OUT_M4	Analogausgang M4	
21	-	P_OUT_M5	Analogausgang M5	
22	22	EXT_T	ext. Niveauschalter	**Steuereingang:** Füllstandsüberwachung, nach GND schalten, ca. 5V/2mA
23	23	REM_LOC	Tastenverriegelung	**Steuereingang:** Verriegelung der I/O-Taste, potentialfrei nach GND schalten, ca. 5V/2mA,
24	24	GND		Bezugspotential
25	25	GND		Bezugspotential

Pin no. With assembly of 84TE-5 cases equipped with generator modules series MW 3000 GTI (module with 28 TE).

Pin no. With assembly of the 28TE-1, 42TE-2, 63TE-3 and 84TE-5 cases equipped width generator modules series

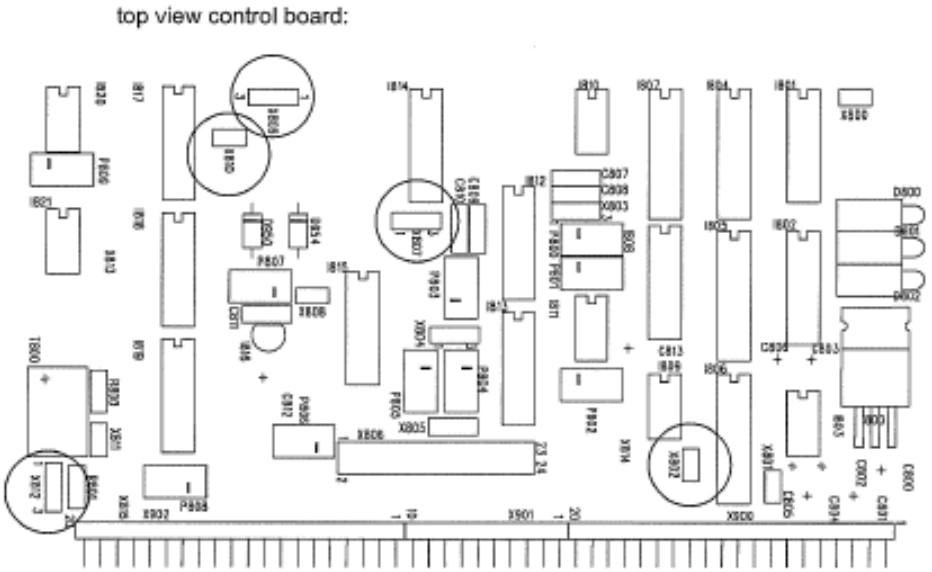
MW 300 – 2000 GT/GTI/GPI/GPS (module width 14TE) and assembly of 42TE-2 cases with generator modules series MW 3000 GTI (module width 28TE)

Service Information
Modul Generators

MW 300-2000 GT / GTI / GPI / GPS & MW 3000 GTI-Series

Funktion	Beschreibung Description	Jumper	Position	Werkseinstellung factory setting
I/O-Tastensperre I/O-button lock	aktiviert, Taste gesperrt active, button locked	X802	geschlossen closed	
	deaktiviert, Taste frei inactive, button unlocked		offen open	X
Leistungseinstellung power adjustment	intern, Frontpotentiometer internally, front panel potentiometer	X807	1 – 2	X
	extern, Steuereingang 4-10V externally, control input 4-10V		2 – 3	
Freigabe Ultraschall ultrasonic enable	Ultraschall 'ein' wenn Kontakt an GND ultrasonics 'on' at signal to GND	X809	1 – 2	X
	Ultraschall 'ein' wenn Kontakt offen ultrasonics 'on' at signal open		2 – 3	
ext. Schwimmerschalter ext. level sensor	deaktiviert, keine Überwachung inactive, no level sensing	X810	geschlossen closed	X
	aktiviert, Fehlererkennung wenn Kontakt offen active, error detection at signal open		offen open	
Fehlermelderelais error relais	im Fehlerfall geschlossen closed at error-condition	X812	1 – 2	X
	im Fehlerfall offen open at error-condition		2 – 3	

Top view control board:

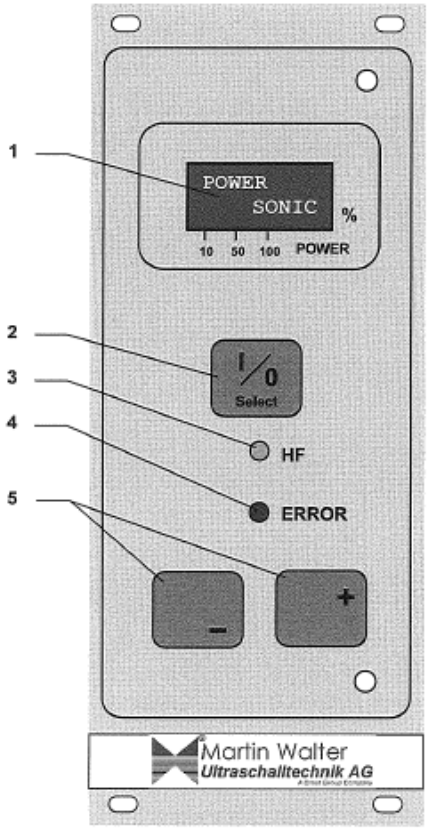


NOTES:

Unit is out of warranty, if settings of the controlboard were changed!

Only skilled persons were allowed to make changes, generator or transducer damages can occur!

Controls and Indicators



front view MI

Pos.	Name	Description
1	Display	Illuminated real test display
2	'I/O-Select' - button	Ultrasonic enable/disable, Selection button (depending on menu function)
3	HF indicator (green)	HF-output active
4	Error indicator (red)	Error at sonic system
5	Buttons 'up' and 'down'	Settings/adjustment of menu parameters

Interface for Connection to Host System (SPS, PLC, etc.)

RS485 (default):	**Parameter**:	19200, N, 8, 1
	Protocol:	MW-internal
	Cable length:	approx. max. 1200m (with shield cable and proper bus termination)
	Mode:	half duplex
	No. of Units:	247 units per bus 32 per bus segment, can be extended with off-the-shelf-repeaters
RS232 (option, instead RS485)	**Parameter**:	19200, N, 8 , 1
	Protocol:	MW-internal
	Cable length:	approx. max. 15m (with shield cable)

Available wit h 28TE-1 and 42TE-2 housing only, no bus operation possible, each module needs an own interface.

Information

The names of the interface lines “A“ and “B“ of the RS485 are not standardized, it is possbile, that these names were interchanged or named differently at other RS485-components depending on manufacturer. If a communication does not work between the units, the wires “A“ and “B“ should be interchanged. This is applicable only, if all A bus termination should also be added generally.

Identification of Circuits / Isolation

Power supply:	primary circuit
Output:	secondary circuit
Interfaces:	ELV-cricuits

Galvanic isolation between

- power supply and output	isolation voltage AC1000V
- Interfaces and output, isolation	voltage AC250V
- Power supply and interfaces	isolation voltage AC250V

Moisture degree:	2
Over voltage catgory:	III

Information: The minus-pin of output and GND of interfaces are connected to protection earth (PE).

Technical Information

Ultrasonic Generator:

Power Supply / max. Wattage / max. Line current:				
28TE-1 housing	AC 230V	± 10%, 47...63Hz, 1~, N, PE	2200VA	16A
42TE-2 housing	AC 230V	± 10%, 47...63Hz, 1~, N, PE	3300VA	16A
63TE-3 housing	AC 230V/400V	± 10%, 47...63Hz, 3~, N, PE	6600VA	3x 16A
84TE-5 housing	AC 230V/400V	± 10%, 47...63Hz, 3~, N, PE	8250VA	3x 16A
84TE-5 housing	AC 230V/400V	± 10%, 47...63Hz, 3~, N, PE	11000VA	3x 16A

DANGER: A loadable neutral line is absolutely needed!

Environment Conditions:

Max. ambient temperature:	+40°C (104F)
Humidity:	max. 70% non condensing
IP-class according IEC 529 / IP:	module without housing IP00
	module installed in housing IP20

A clearance of min. 150mm behind the housing must be provided, do not cover the air inlet and outlet.

Technical Information

Interface RS232 (9-pole DSUB plug, only for TMI/PMI/SMI/HMI)

Pin	Designator	Description
1	--	n.c.
2	TxD	transmit line (output)
3	RxD	receive line (input)
4	--	n.c.
5	GND	reference signal
6	--	n.c.
7	--	n.c.
8	--	n.c.
9	--	n.c.

Information:

for connection to a standard RS232 PC-interface a direct cable 1:1 socket/socket can be used.

Interface RS485 (9-pole DSUB socket, only for TMI/PMI/SMI/HMI)

Pin	Designator	Description
1	GND-PE	functional earth (connected to PE)
2	B	communication signal 'B'
3	GND485	bus termination RS485 (see below)
4	GND	reference signal
5	+5V	+5V auxiliary voltage for bus termination
6	GND485	bus termination RS485 (see below)
7	A	communication signal 'A'
8	GND	reference signal
9	+15V	+15V auxiliary voltage

Information:

for connecting several housings and PLC, only the lines ‘A‘, ‘B‘ and ‘GND‘ have to be used.

The naiming of the lines ‘A‘ and ‘B‘ are not standardized. Therefore it is possible, that these markings of RS485.compenents of third party suppliers are interchanged or named completely different.

HF-Cable details

Max. cables length: 30m

The HF-cables must not wired bundled, sufficient heat dissipation must be guaranteed (single layer at wall, floor, cable, trough or cable tray).

The HF-Cables of the generator moduls MW3000TMI/GTI-25kHz, MW2000TMI/GTI-25kHz and MW2000TMI/GTI-40kHz have to be wired at wall, floor, puched cable trough or cable tray single layer with gap distance same as diameter only.

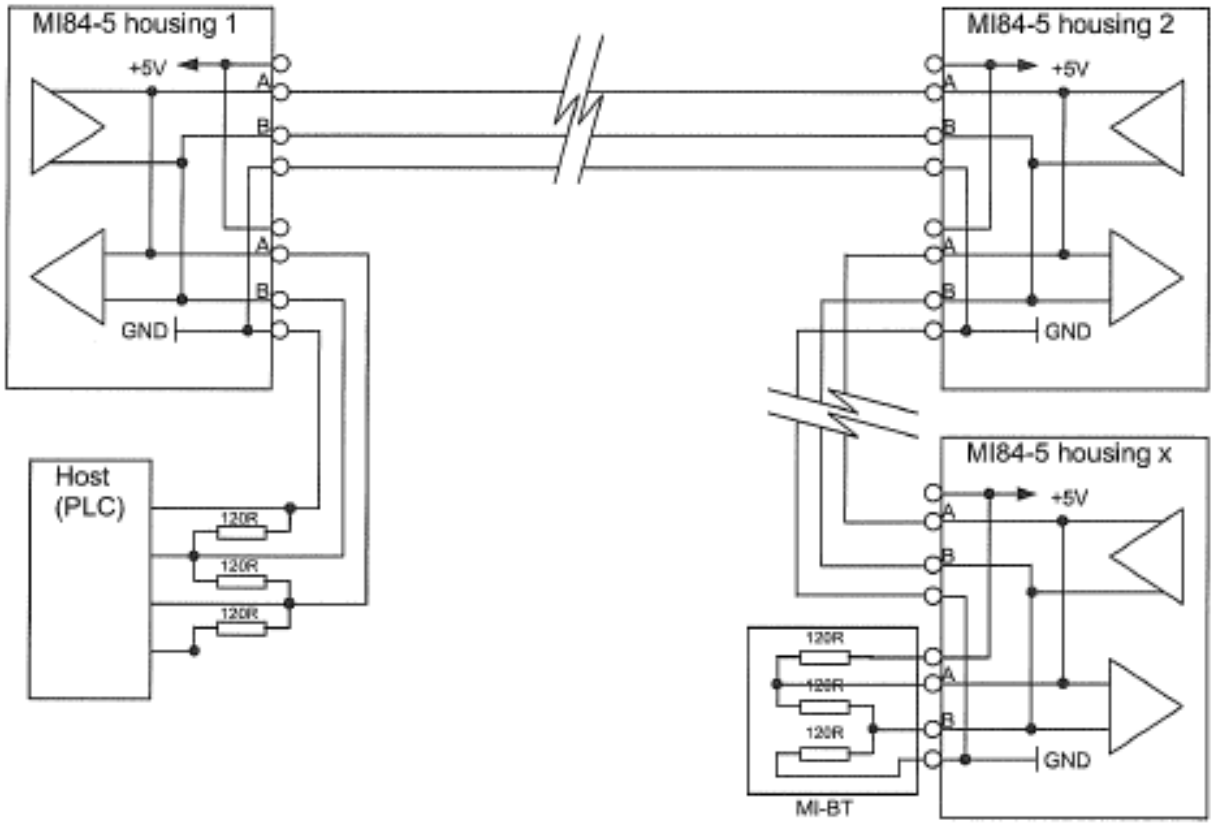
Ultrasonic transducer

Installation and Operation details, recommended distances, environment conditions

Transducer	PushPull			SinglePush			Immersible Plate type
frequency (kHz)	25	30	40/45	25	30	40/45	25/40/132
min. distance to cleaning goods	200mm			200mm			200mm
min. distance to side walls/bottom	120mm			120mm			--
min. distance to other transducers	120mm			120mm			400mm
recommended offset to eachother (mm)	50	40	30	50	40	30	--
max. storage temperature	+85°C			+70°C			+85°C
max. pressure	1MPa (10bar)			1MPa (10bar)			0,1MPa (1bar)
Mounting	Must be fixed only at the driver heads with one fixed bearing and one moving bearing.			Must be fixed at the driver head with a fixed bearing only,. from a length of 495 mm and more must be fixed vertical only.			must be fixed wit radiating side towards the cleaning goods
cleaning liquid	watery cleaning liquid, solvent			watery cleaning liquid, solvent			is not allowed to damage stainless steel (1.4462)

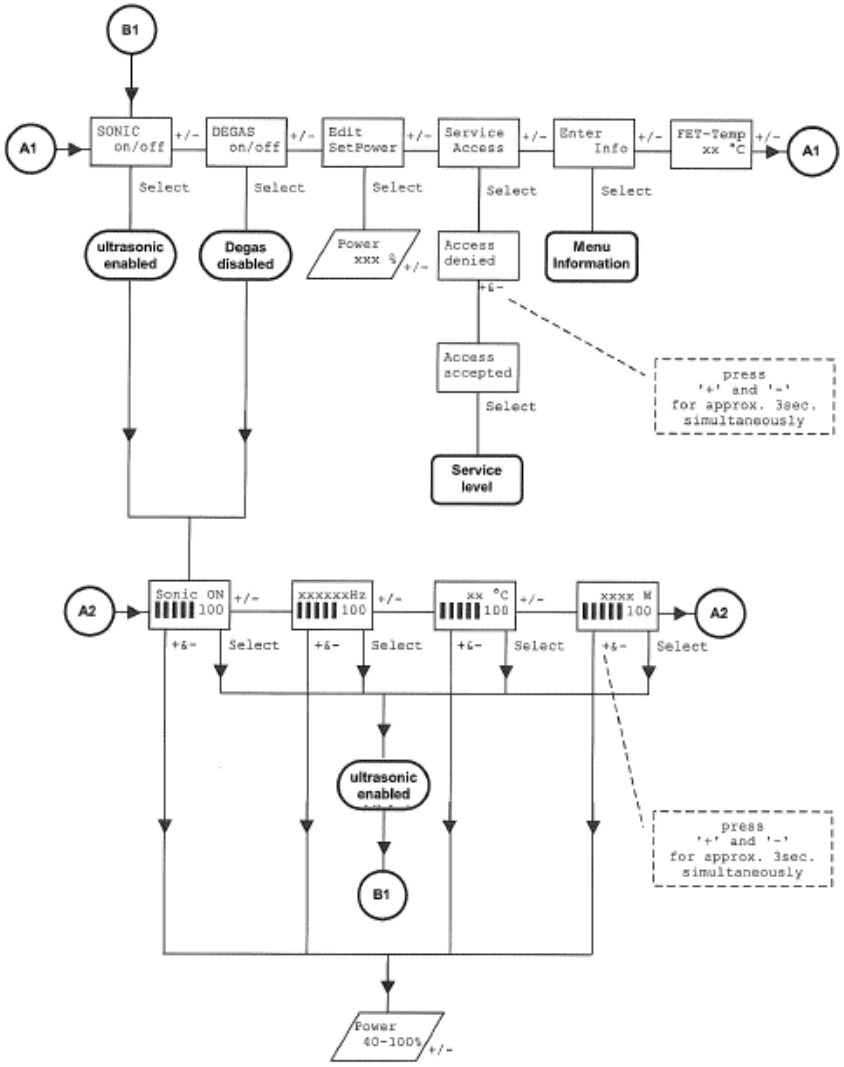
Recommended Circuit of RS485-Interface

(according recommendation of ModBus-Organisation, Aug-2004)



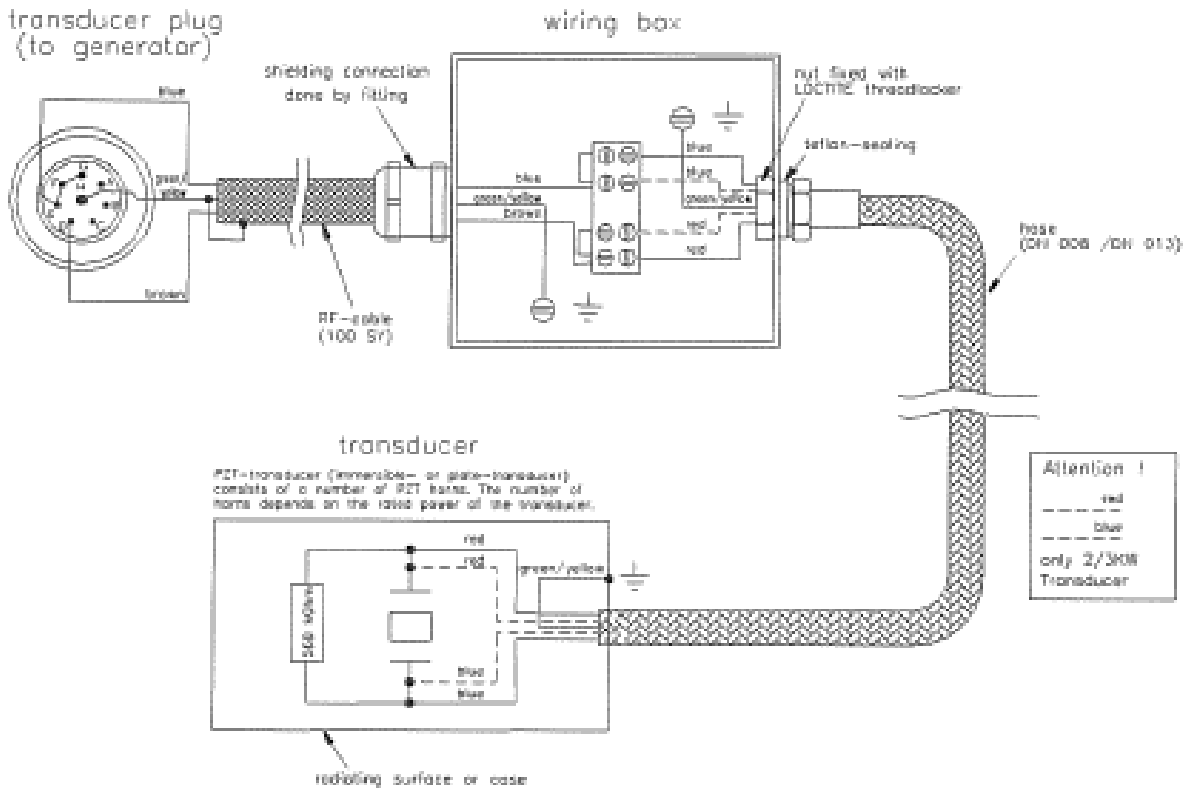
Menu Structure

User Level (‘stand-by‘ & ‘sonic on‘ mode)



Connection Plan

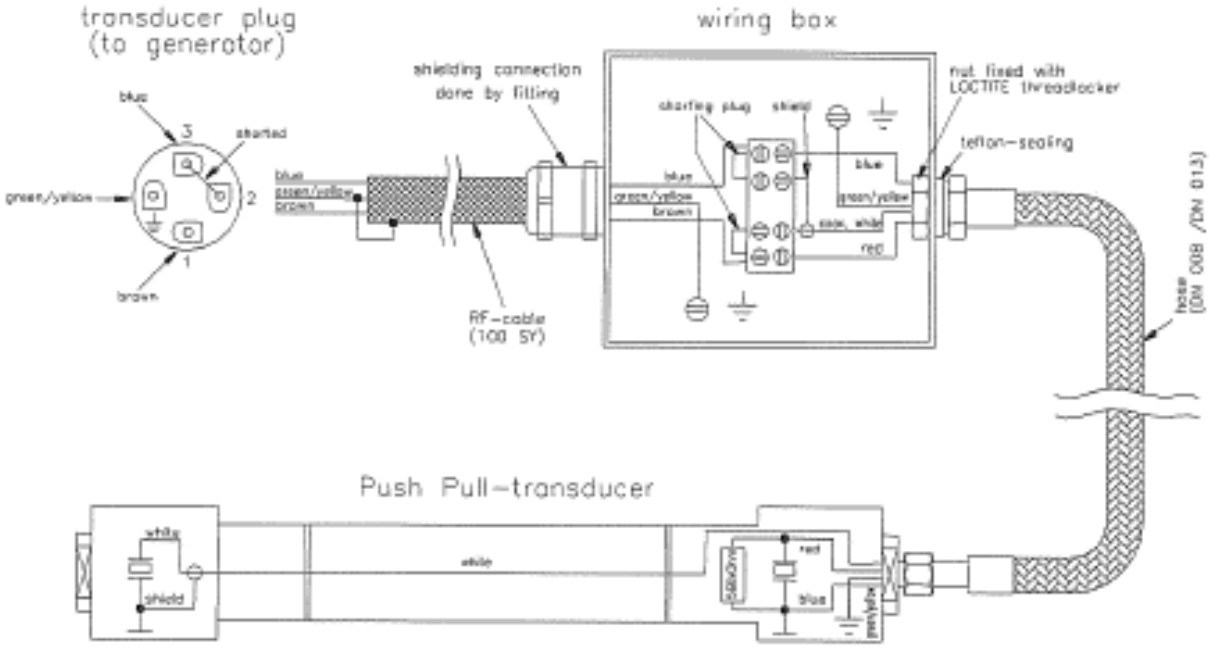
Immersible- and Plate Type Transducer



Martin Walter
Ultraschalltechnik AG
A Crest Group Company

Connection Plan

PushPull® - and SinglePush transducer:



Appendix
HF-Cable Length / Cable Width

Module type	frequency	cable width	max. cable length
MW300-2000GPI	25kHz	0,75qmm	30m
MW300-2000GPS		0,75qmm	30m
MW300-1500GT/GTI		1,5qmm	30m
MW2000GT/GTI		2,5qmm	30m
MW3000GTI *)		2,5qmm	30m
MW300-1500GT/GTI	40kHz	1,5qmm	30m
MW2000GT/GTI *)		2,5qmm	30m
Module type	**frequency**	**cable width**	**max. cable length**
MW300-1500GPI	30kHz	RG400/U	30m
MW300-1200GPS		RG400/U	30m
MW300-1500GPI	40kHz	RG400/U	30m
MW300-1000GPI	45kHz	RG400/U	30m
MW500GTI	58kHz	RG58	30m
MW500GTI	132kHz	RG58	30m
MW500GTI	192kHz	RG58	30m

Information:

- the HF-cables must not wired bundled, sufficient heat dissipation must be guaranteed (single layer at wall, floor, cable trough or cable tray)
- The HF-Cables of the generator modules MW3000GTI-25kHz and MW2000GTI-40kHz have to be wired at wall, floor, punched cable trough or cable tray single layer with gab distance same as diameter only.
- To avoid noise interference, the HF-cables must not be wired together with line or signal cables.
- Different cable lengths or layer systems are eventually possbile after consulting the manufacturer.

Installation

Placing and Mounting:

- The generator has to be installed on a flat surface, placed in an area not exposed to humidity, contamination and / or aggressive vapors.
- Do not cover the air inlet at the front and the back of the generator. Unrestricted airflow has to be maintained all the time.
- Behind the case must be a clearance of min. 150mm
- For unsuitable envoironment conditions the generator can be assembled in a cabinet, possibly with an air condition unit (option).

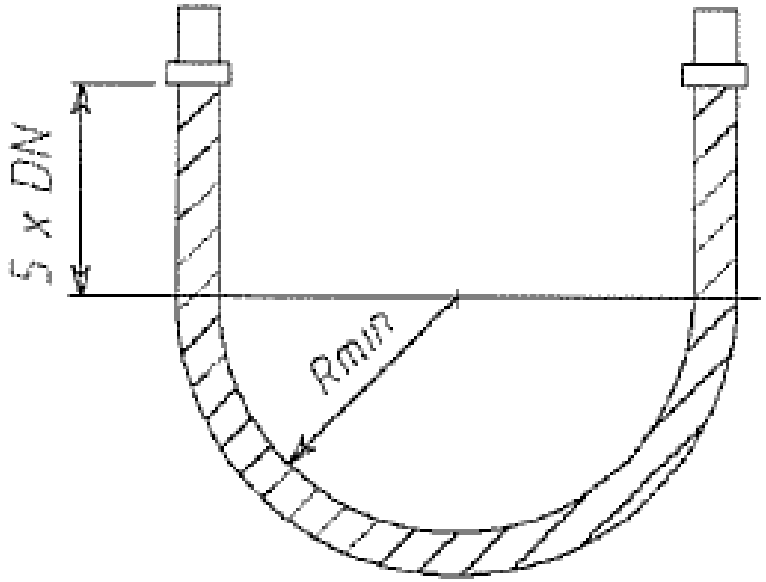
Transducer Connection

Each generator module can drive one transducer and is factory preset to type and frequency. For higher power immersible transducers or multifrequency transducers, several generator modules can drive one transducer. In this case the transducer has several connections.

Generally the transducer outputs have to correlate to the matched generator modules

For the electrical connection of the transducers to the generators, only shielded cables and adequate connections must be used.

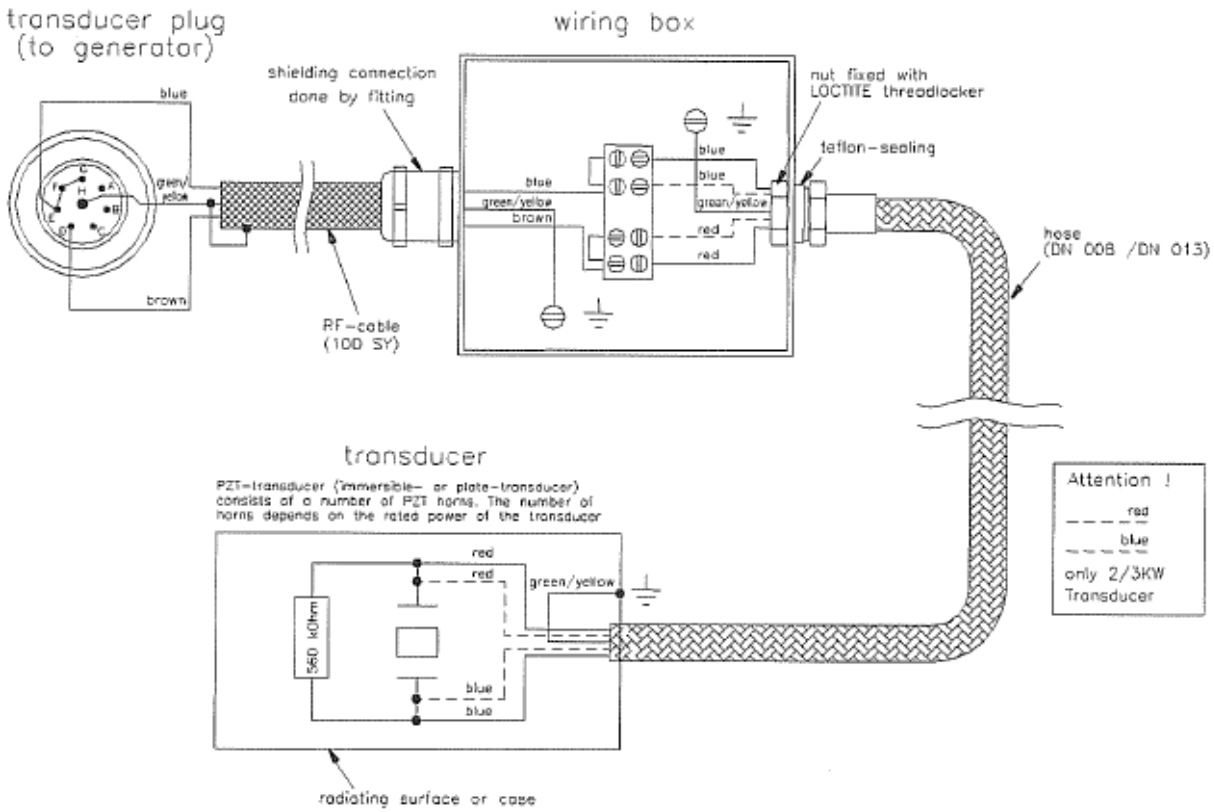
Mounting instruction for corrugated hoses



Rmin for DN8:	100mm
Rmin for DN13:	140mm

- The corrugated hoses have to be protected from mechanical damages
- Don‘t drag along the ground or over sharp edges.
- Physical contact with other hoses or surrounding objects must be avoided during operation.
- The hose should not be bent tighter than the minimum bending radius, kinks and torsion must be voided.

Immersible- and Plate Type Transducer



Martin Walter
Ultraschalltechnik AG
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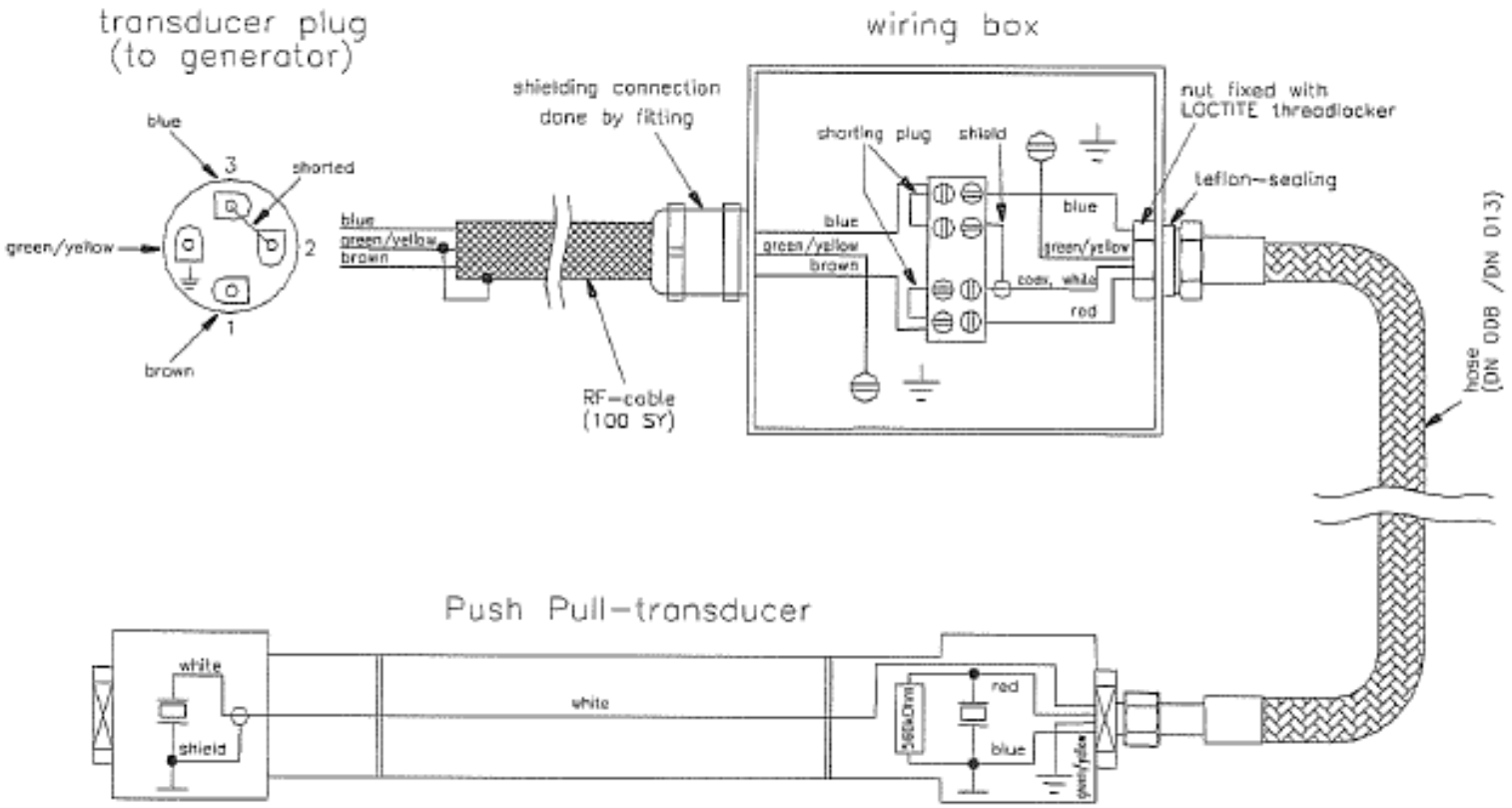
PushPull® / SinglePush Transducer



Martin Walter
Ultraschalltechnik AG
A Crest Group Company