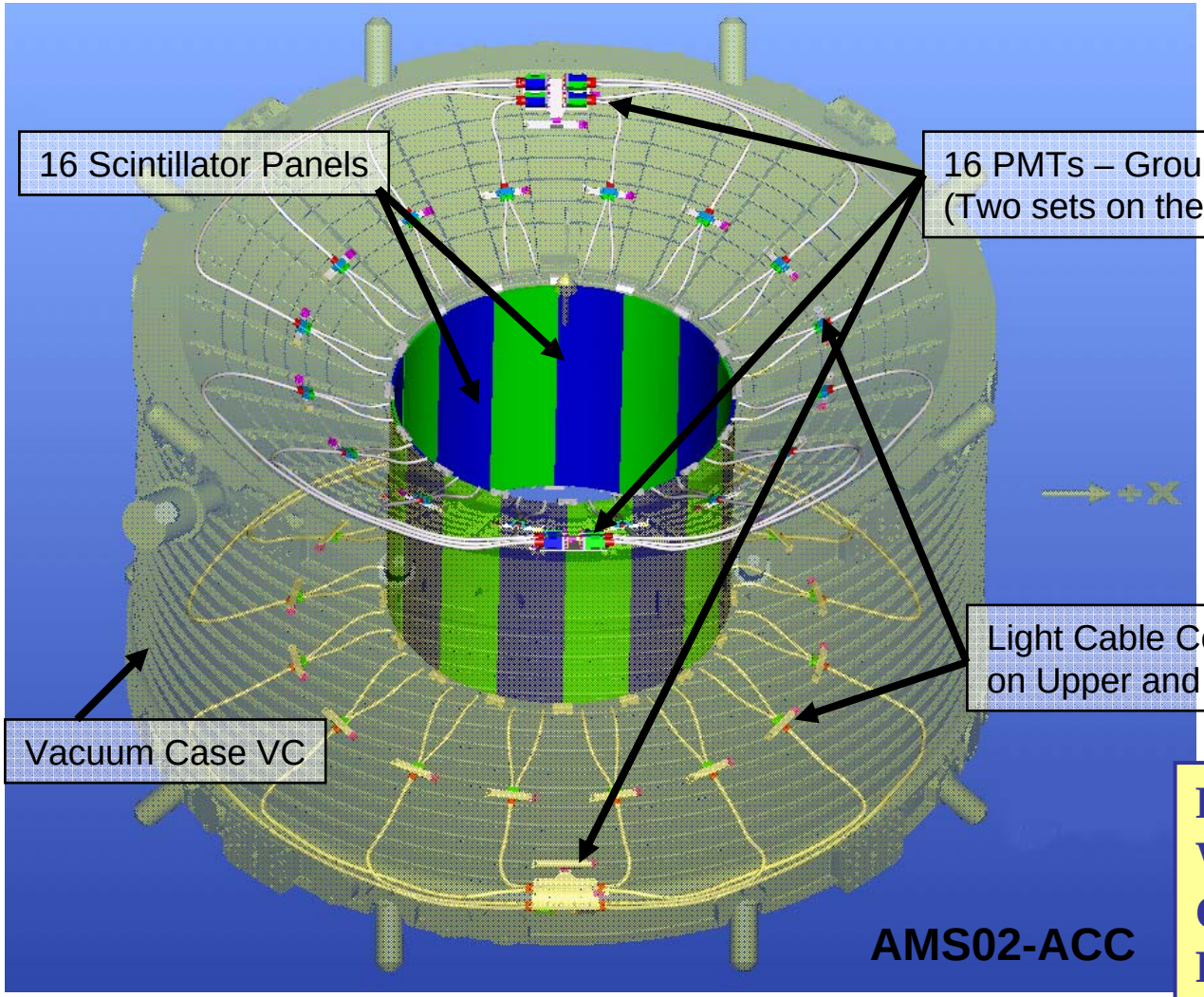
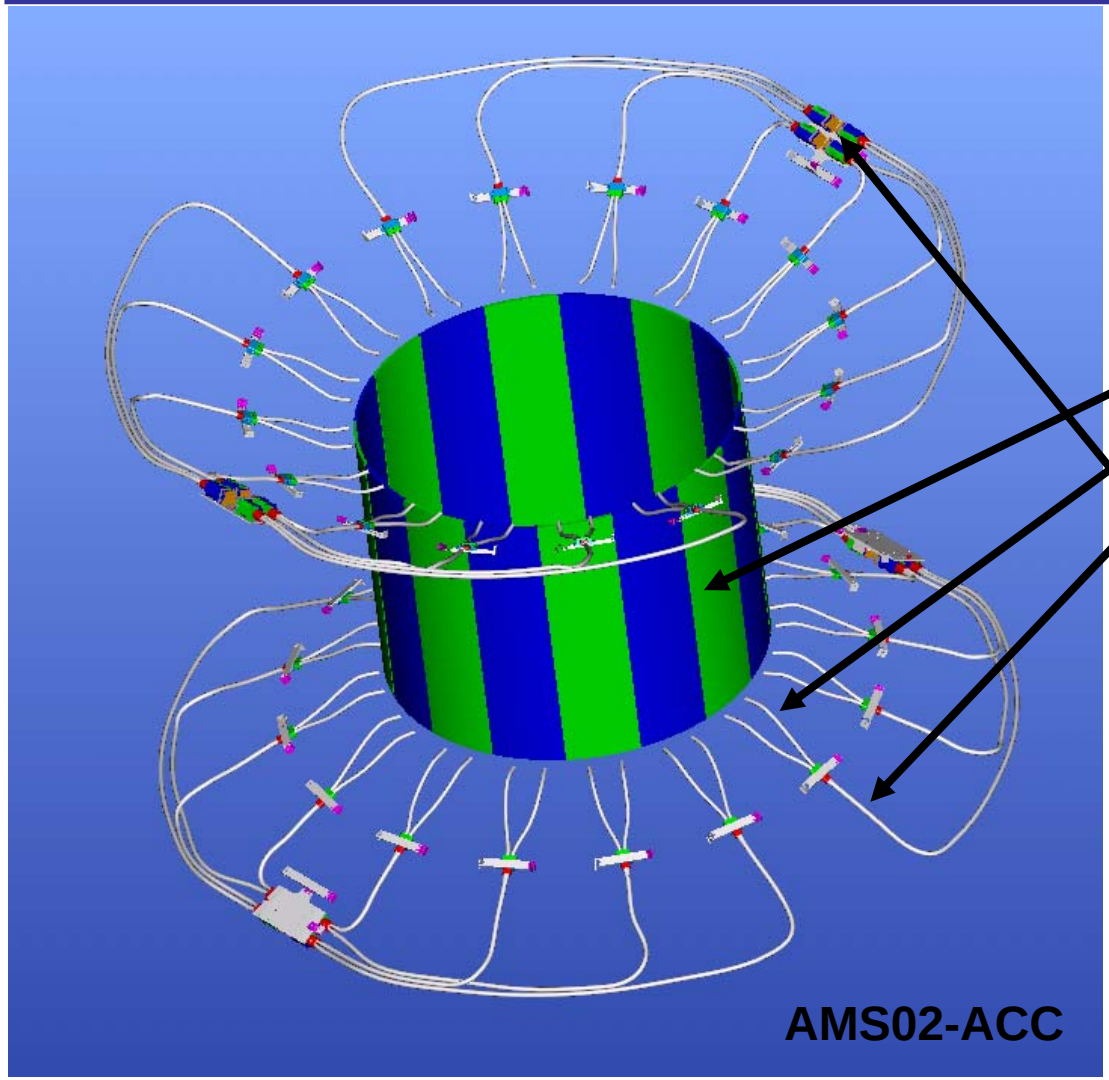
AMS-02 Anticoincidence Counter System (ACC) ADP



Panel: Bicron BC414
WLS: Kuraray Y-11(200)M
CLF: Toray PJU-FB1000
PMT: Hamamatsu R5946

AMS-02 Anti Coincidence Counter System (ACC) without VC



Panel: Bicron BC414
WLS: Kuraray Y-11(200)M
CLF: Toray PJU-FB1000
PMT: Hamamatsu R5946

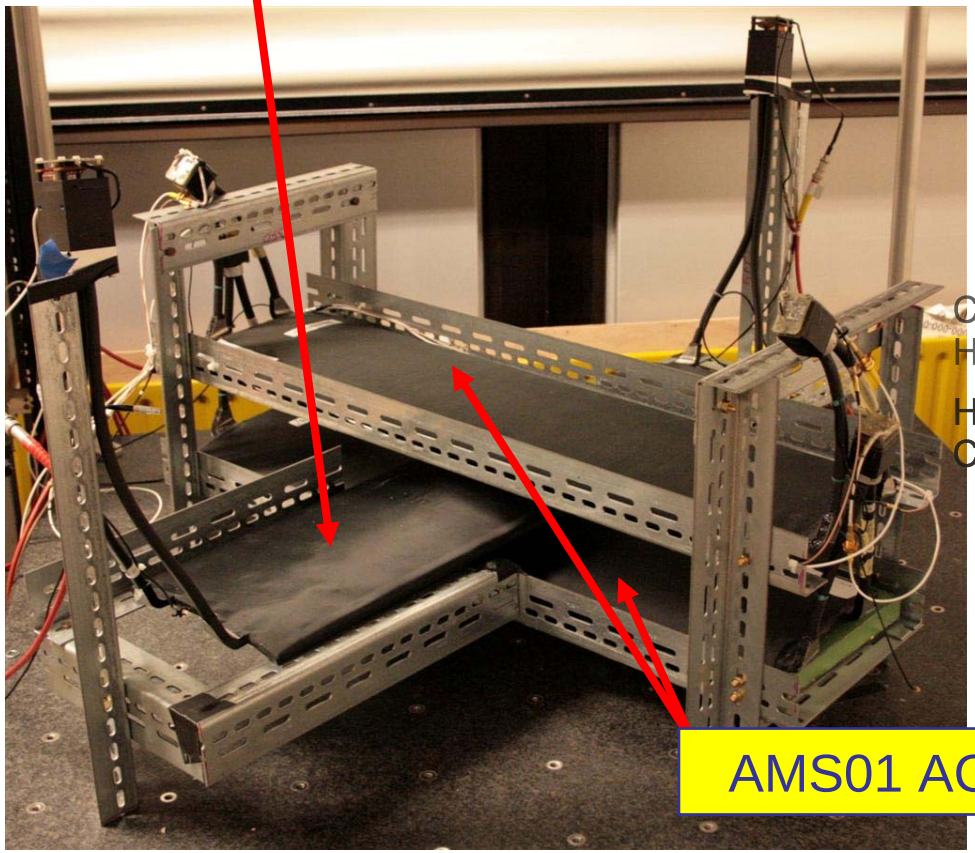
AMS02-ACC System:
Historical Log / Notes / Comments
Section I

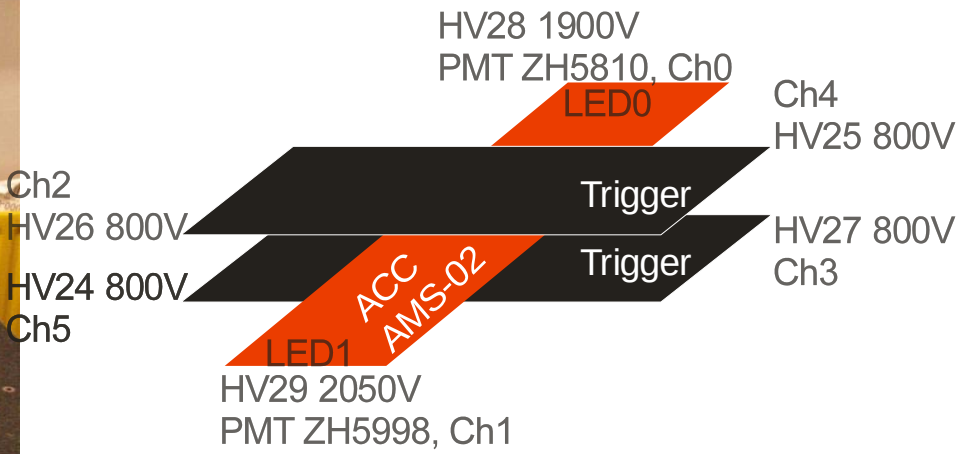
Section I
Tests performed

AMS02-ACC Scintillation Panel: Lightyield-Test, Setup

Test with atmospheric muons & pulsed LED-signals

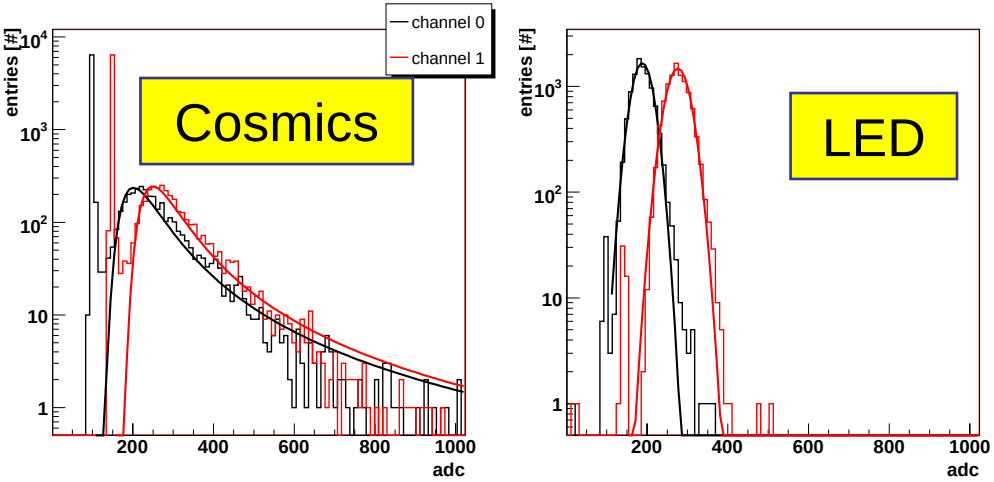
AMS02 ACC scintillation panel

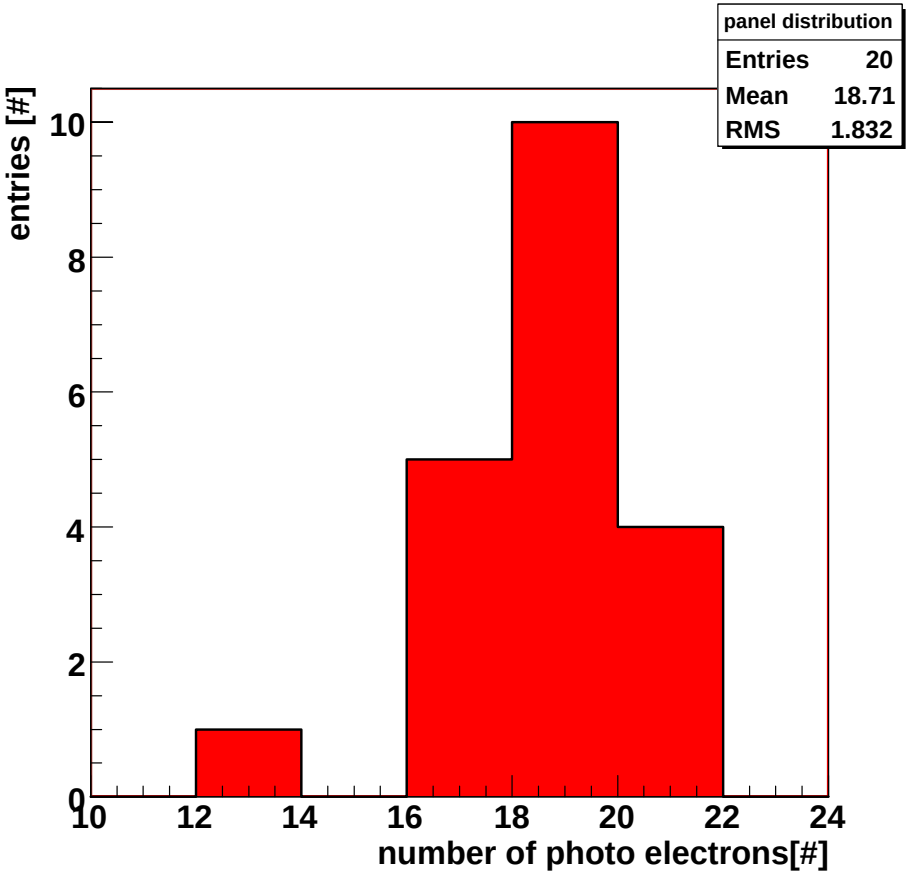




AMS01 ACC trigger counters

AMS02-ACC Scintillation Panel: Lightyield-Test, Calculation of photo electron number





- Measurement of MOP with cosmics
- calibration with LEDs implemented in scintillation panels

Calculation of photo electron number $N_{pe} = \frac{Q_C Q_{LED}}{\sigma^2_{LED}}$

AMS02-ACC Scintillation Panel: Light Output - Test, Results

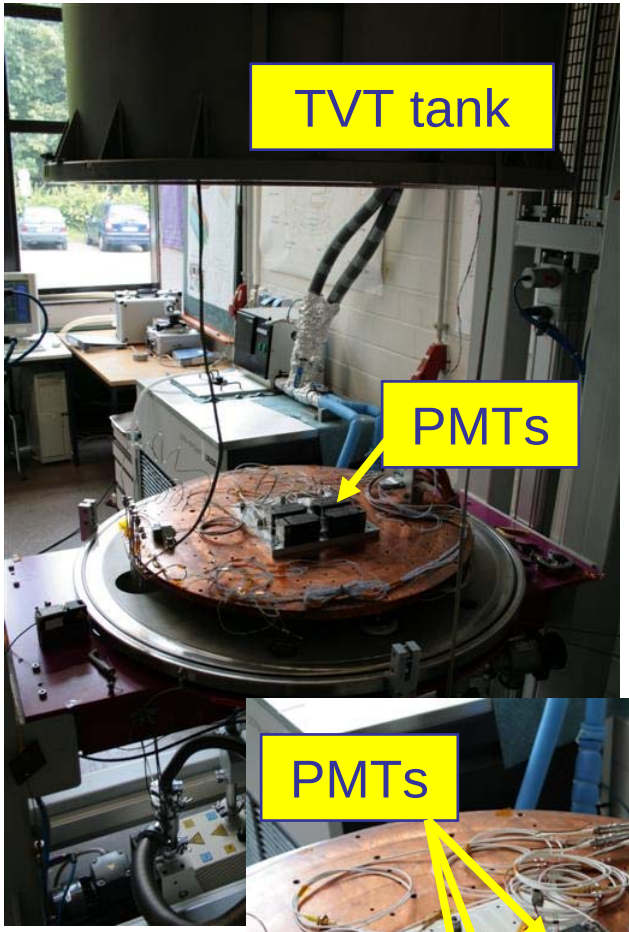
ACC panel	number of photo electrons	ACC panel	number of photo electrons
1	13	11	19
2	17	12	18
3	17	13	17
4	19	14	19
5	19	15	20
6	20	16	19
7	19	17	20
8	20	18	21
9	19	19	18
10	19	20	21

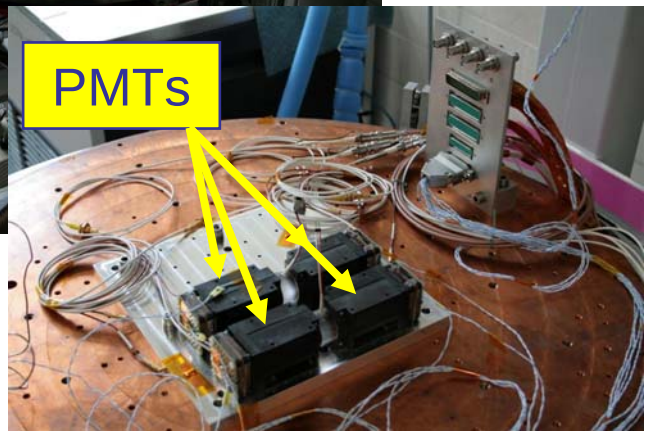
red: flight

blue: flight spare

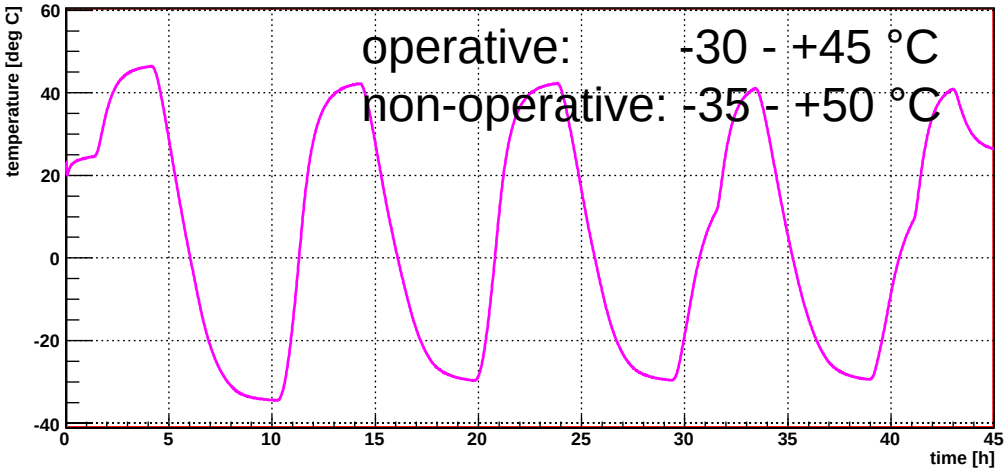
panel 17: 5mm smaller

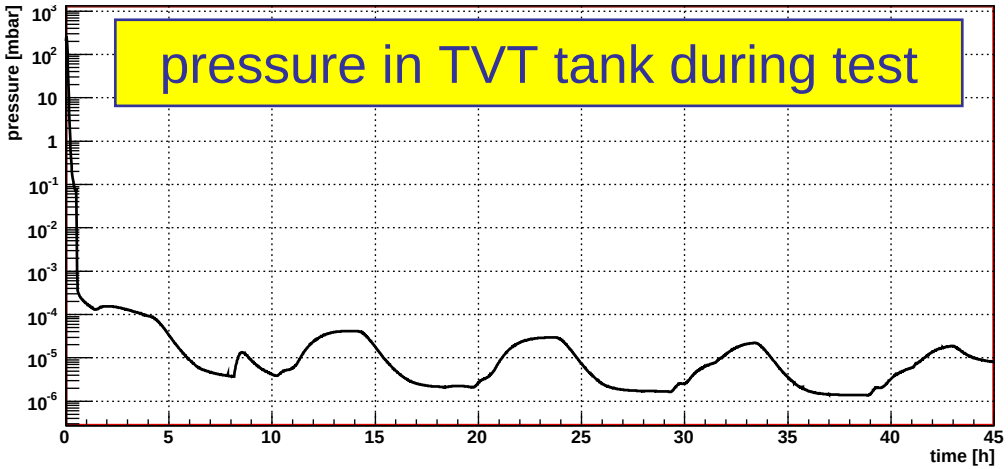
AMS02-ACC Photomultiplier (PMT): Space Qualification Tests, Thermo-Vacuum-Cycles



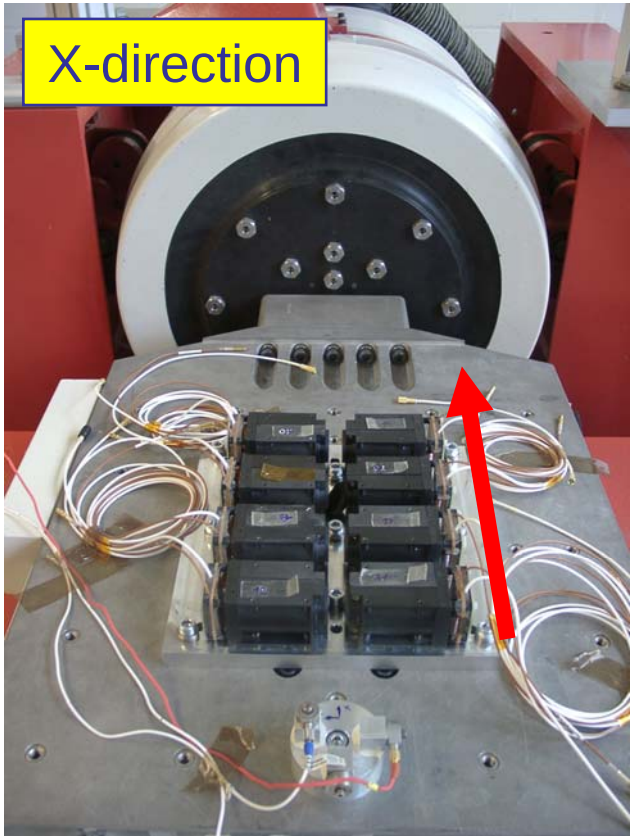


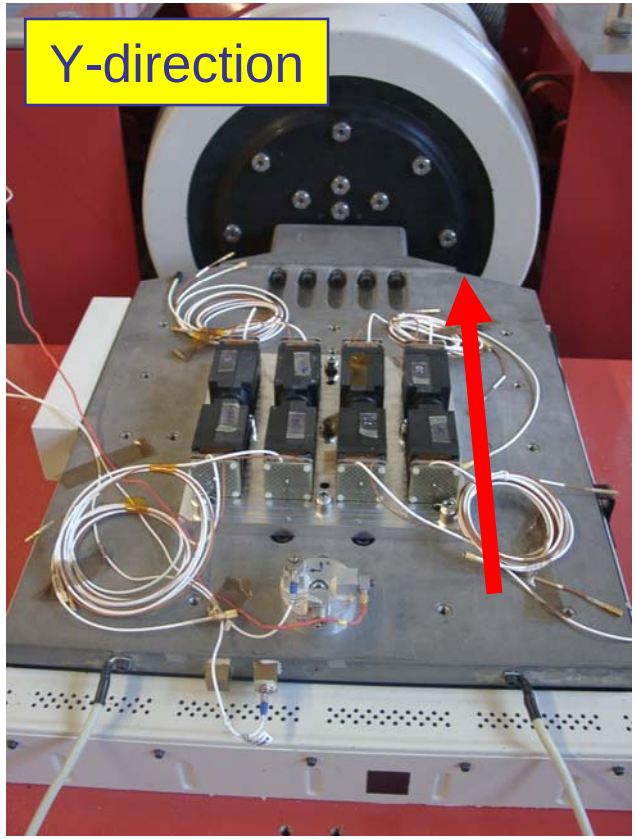
Temperature on voltage divider

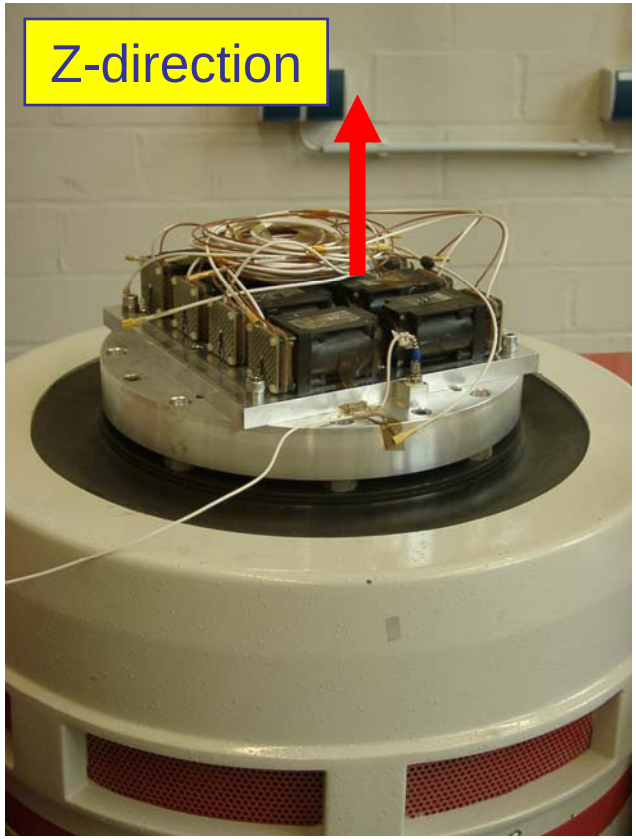




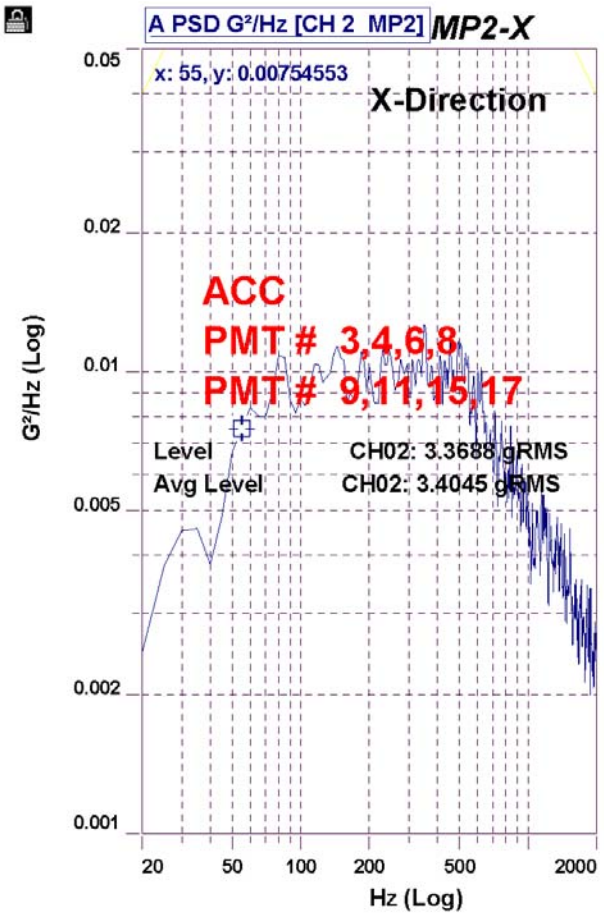
AMS02-ACC Photomultiplier (PMT): Space Qualification Tests, Vibration Tests

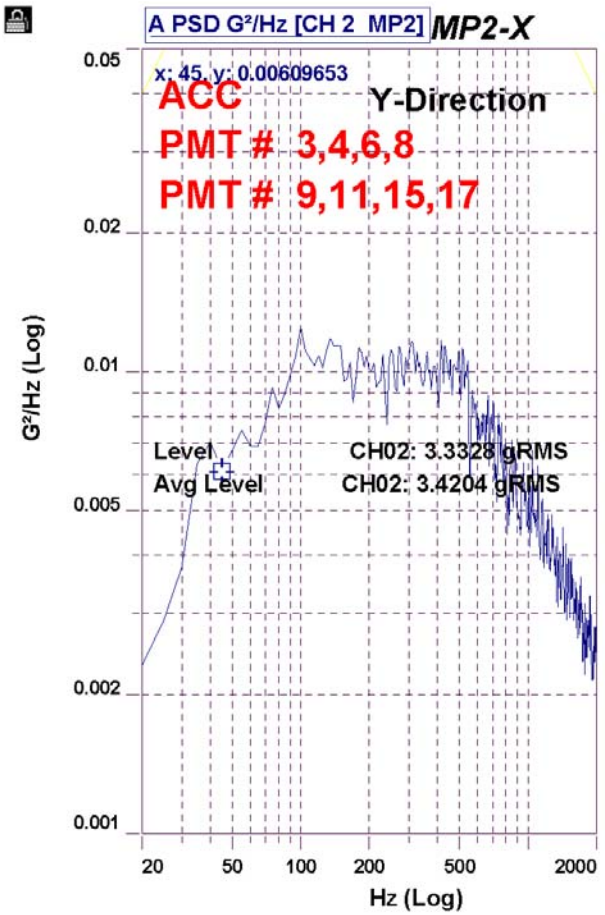


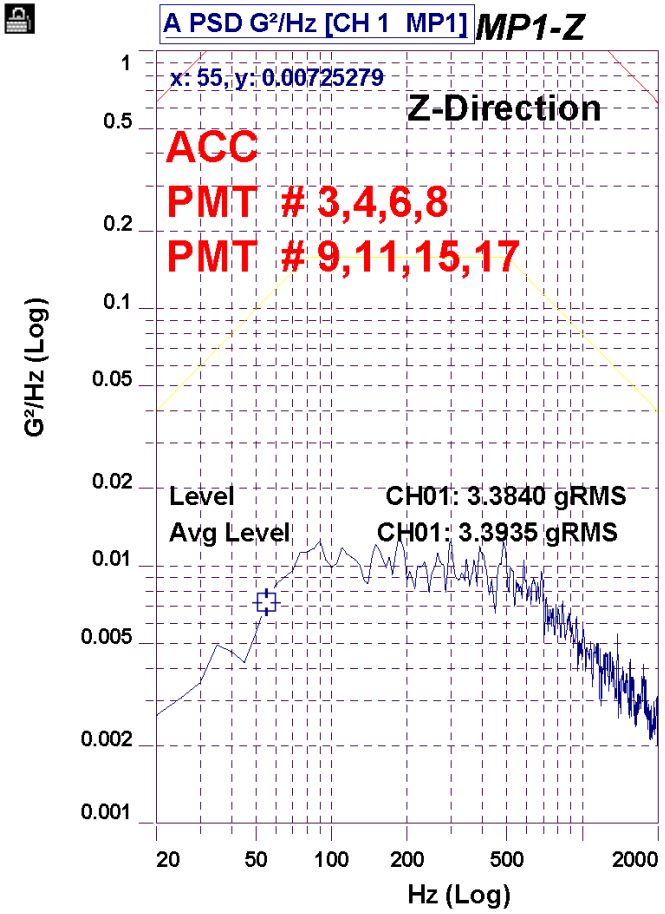




AMS02-ACC Photomultiplier (PMT): Space Qualification Tests, Vibration Tests



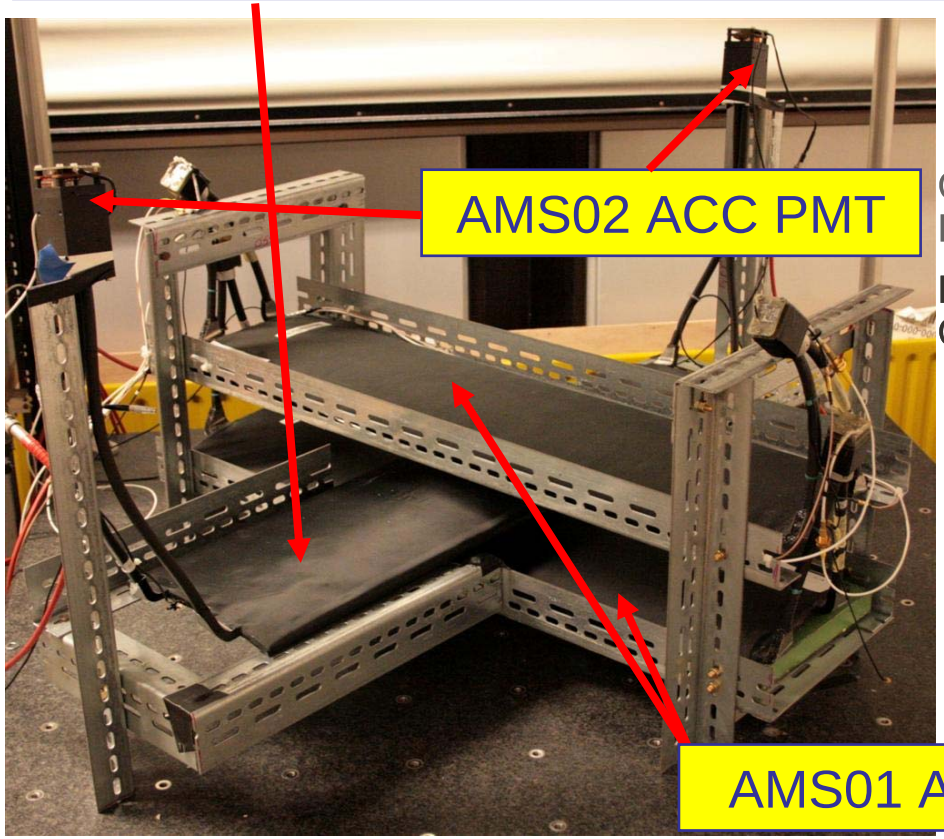


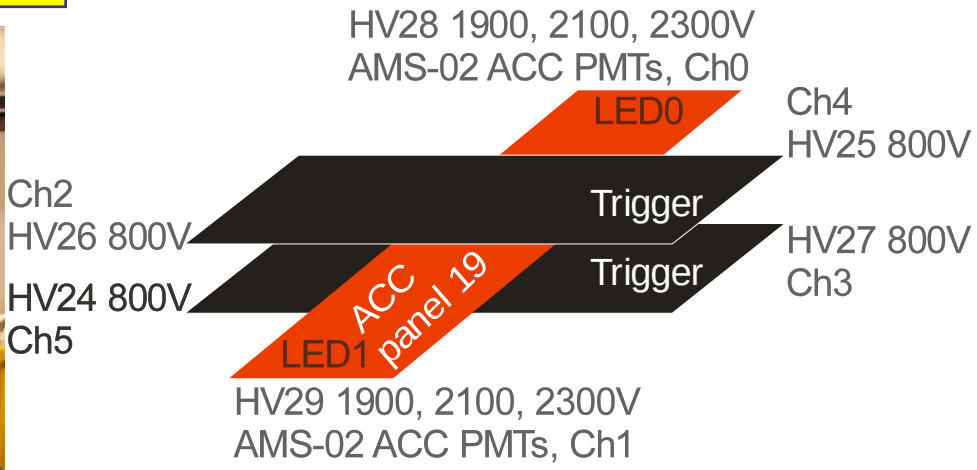


AMS02-ACC Photomultiplier (PMT): Space Qualification Tests, Measurement of # photo electrons

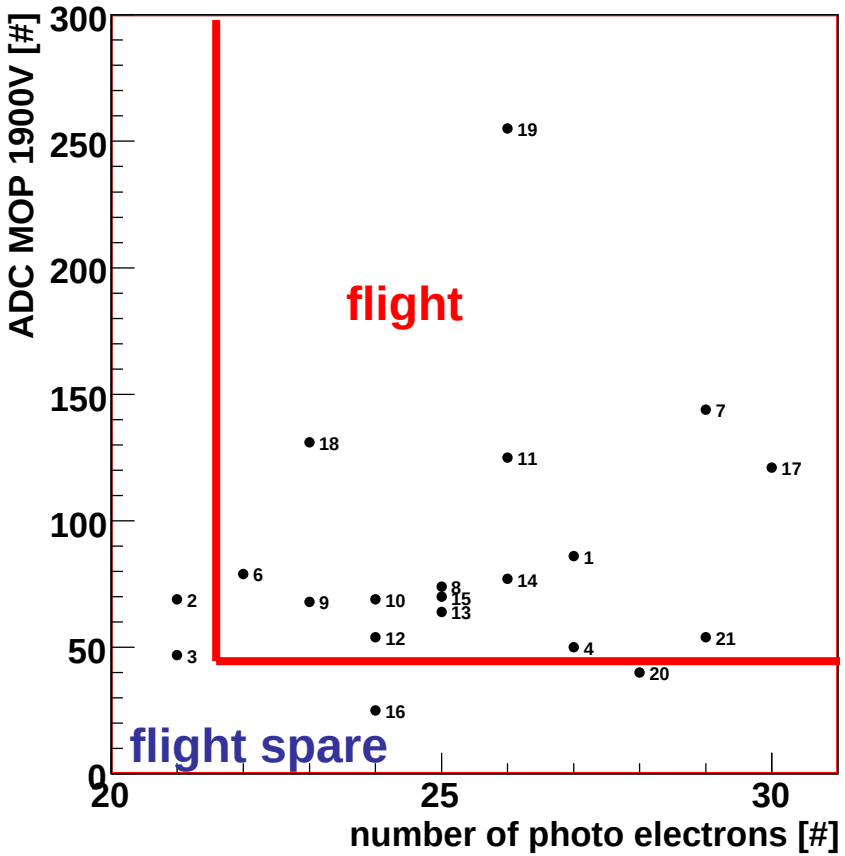
Test with atmospheric muons & pulsed LED-signals for 3 different PMT HVs

AMS02 ACC scintillation panel nr. 19





AMS02-ACC Photomultiplier (PMT): Results after Space Qualification Tests (TVT & Vibration)

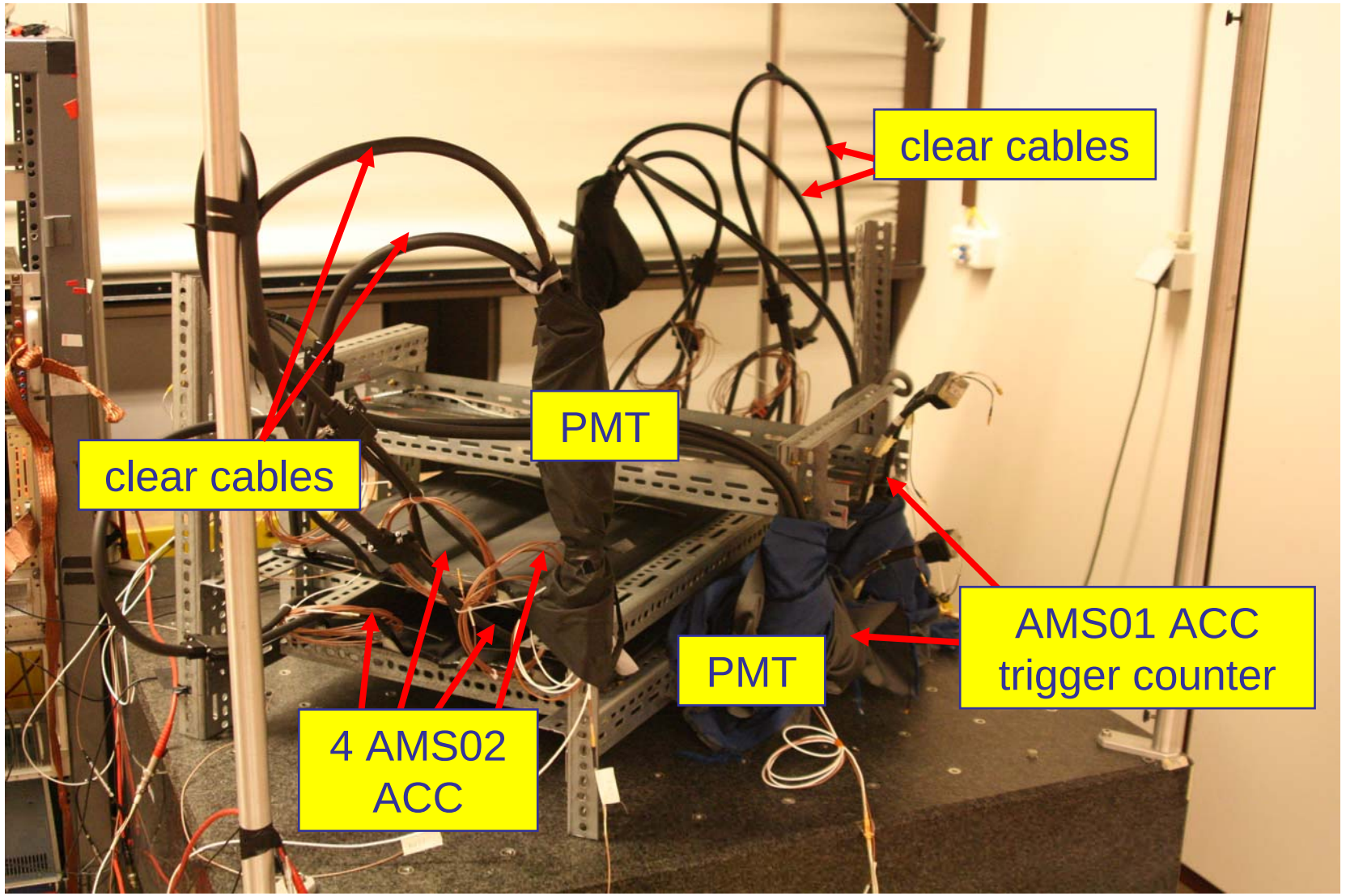


red: flight

blue: flight spare

PMT	MOP 1900V (adc counts)	number of photo electrons
1	86	27
2	69	21
3	47	21
4	50	27
6	79	22
7	144	29
8	74	25
9	68	23
10	69	24
11	125	26
12	54	24
13	64	25
14	77	26
15	70	25
16	25	24
17	121	30
18	131	23
19	255	26
20	40	28
21	54	29

AMS02-ACC System Test: (FM scintillation panel, clear fiber cable and PMT)

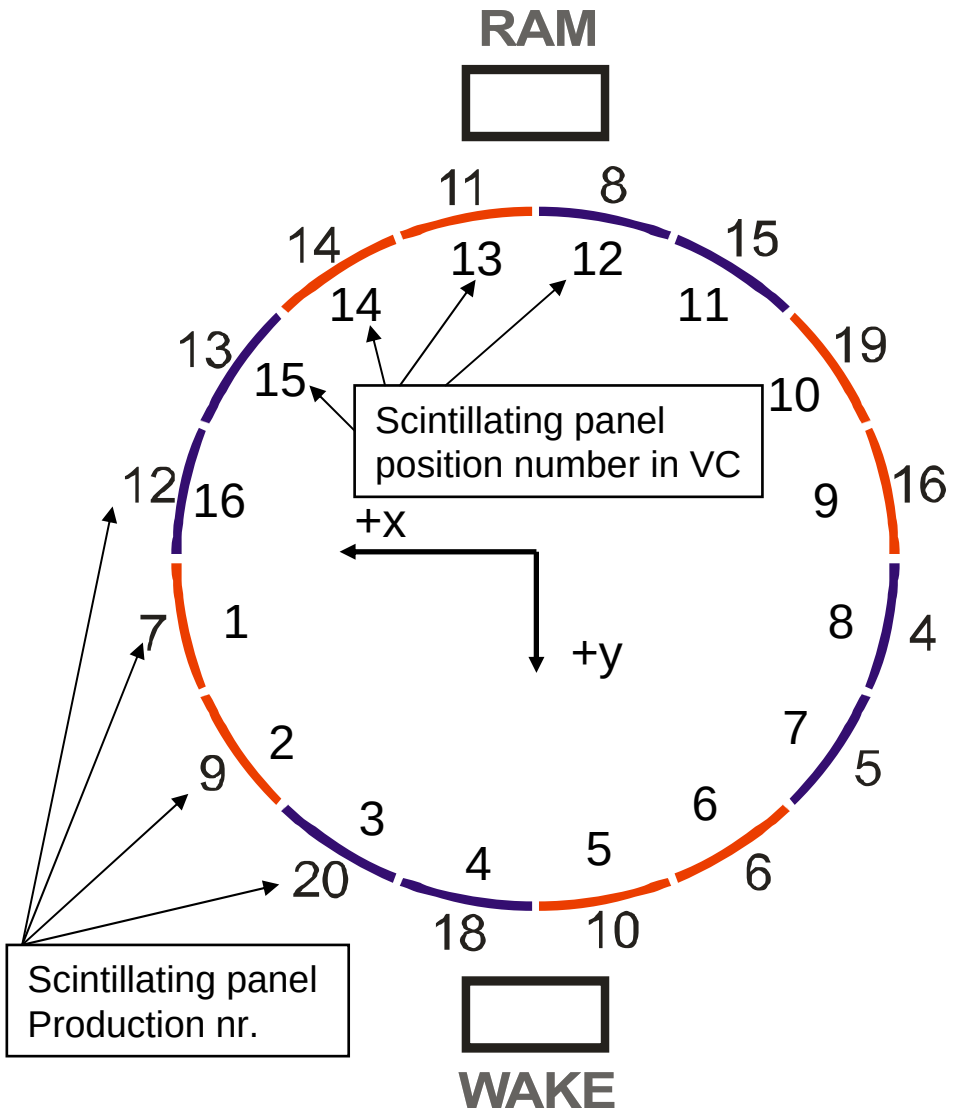


AMS02-ACC System Test Results: (FM scintillation panel, clear fiber cable and PMT)

Panel	Cable A	PMT A	MOP A 1900V (adc counts)	number of photo electrons A	Cable B	PMT B	MOP B 1900V (adc counts)	number of photo electrons B
13 12	18 short 18 long	19	127	15	7 short 7 long	7	70	13
19 16	2 short 2 long	18	76	14	11 short 11 long	11	60	16
5 4	1 short 1 long	1	46	17	17 short 17 long	17	69	18
9 7	8 short 8 long	8	44	16	6 short 6 long	6	53	14
11 14	15 short 15 long	15	44	16	3 short 3 long	14	45	16
10 6	10 short 10 long	10	44	16	9 short 9 long	9	41	15
8 15	13 short 13 long	13	43	17	14 short 14 long	21	33	17
18 20	12 short 12 long	12	37	17	4 short 4 long	4	36	17
3 17	19 short 19 long	2	41	14	21 short 21 long	3	40	16

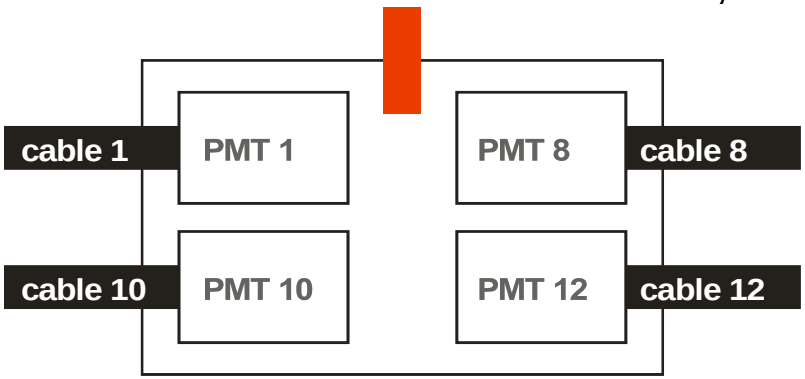
red: flight; blue: flight spare

AMS02-ACC System Test Results: Positioning of scintillation panels

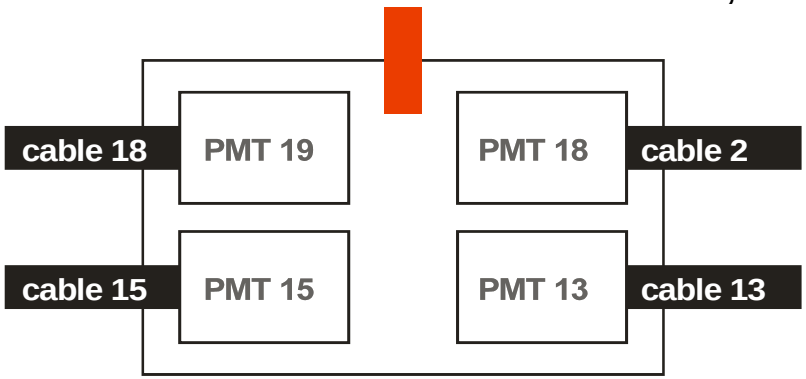


AMS02-ACC System Test Results:
PMT Boxes: Order of PMTs and clear fiber cables

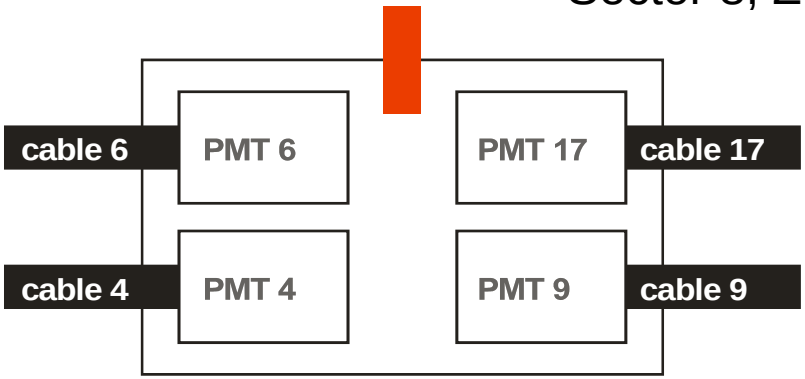
WAKE A TOP Sector 8, Z+



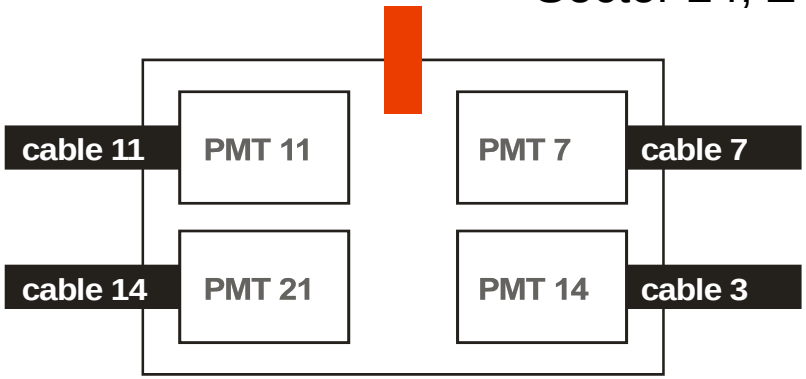
RAM A TOP Sector 24, Z+



WAKE B BOTTOM Sector 8, Z-



RAM B BOTTOM Sector 24, Z-



Section I
Potential hazards:
Venting
HV

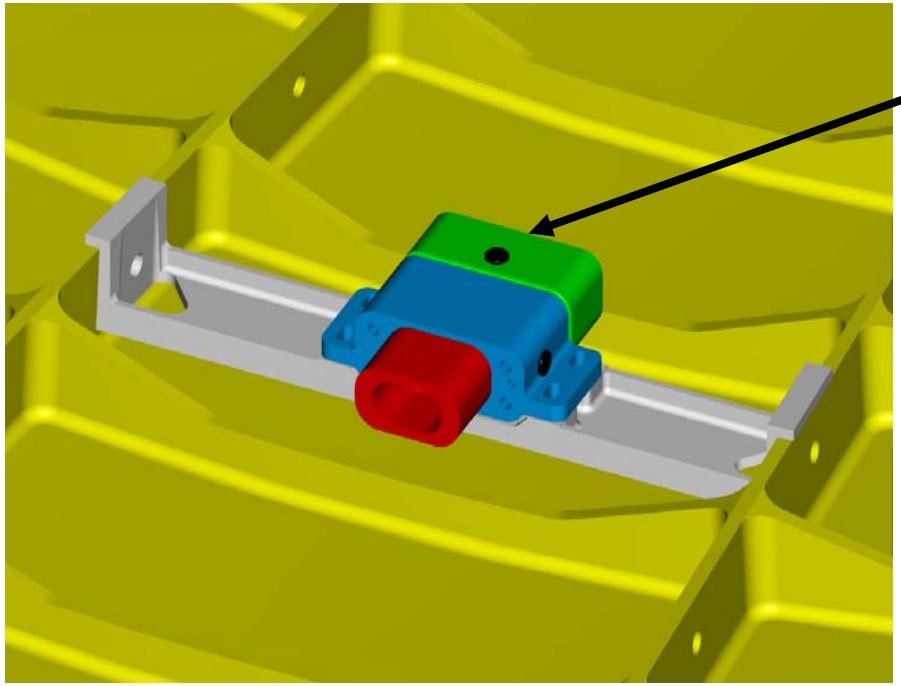
Section I
Potential hazards: Venting

Venting channels of AMS02 ACC System:

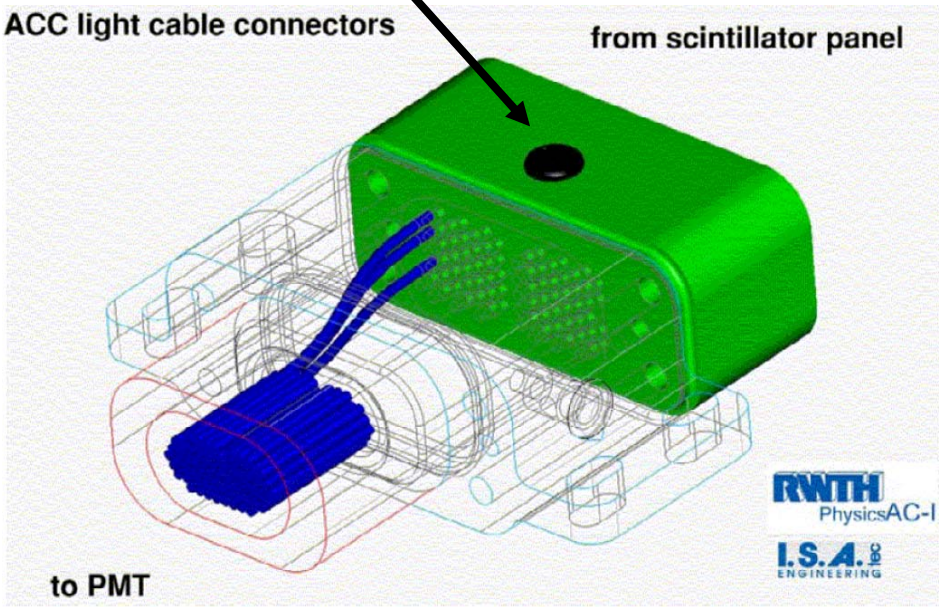
WLS and Fiber Side of ACC Connector:		Diameter 2 mm
PMT Housing	:	Diameter 2 x 2 mm
PMT Support	:	Diameter 2 x 5 mm

Porous Foam Material: Bulpren S 90
Amount of effective volume of foam skeleton is 3% of total volume, not affecting the volume to be vented

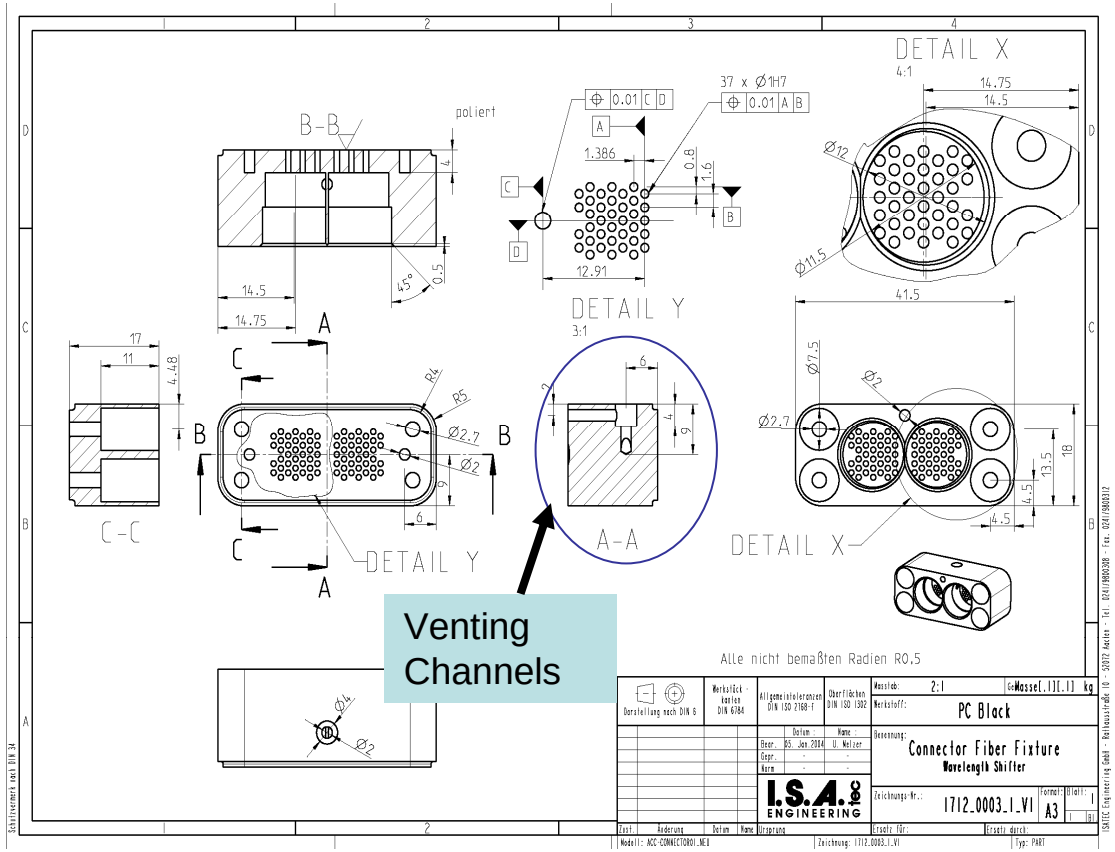
AMS02-ACC Connector Assembly

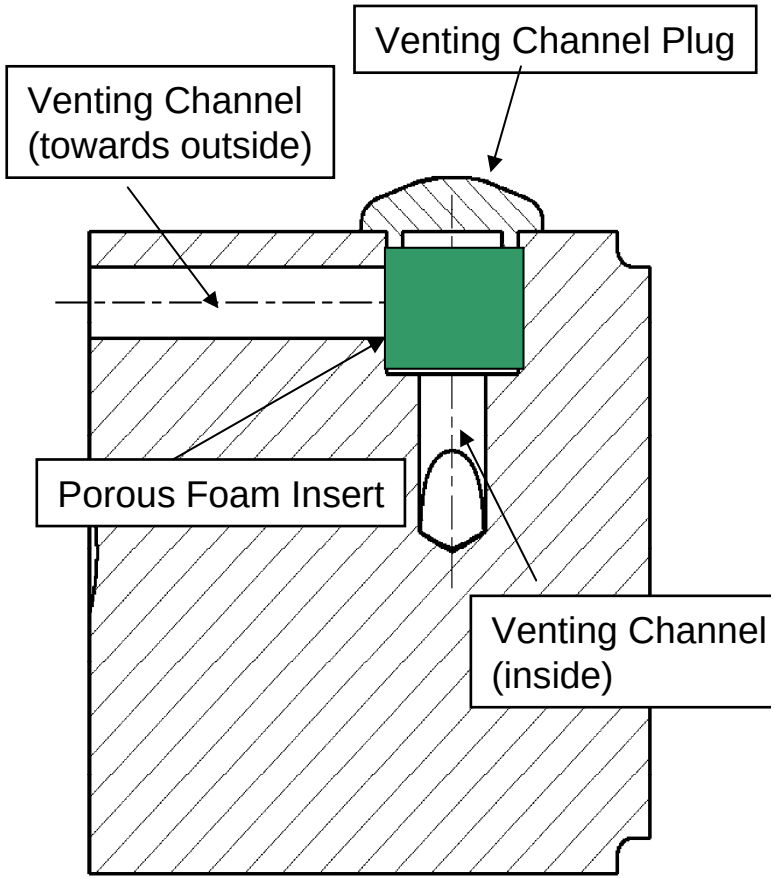


The ACC connector housings have venting channels, which are closed with the open pored foam to enable venting

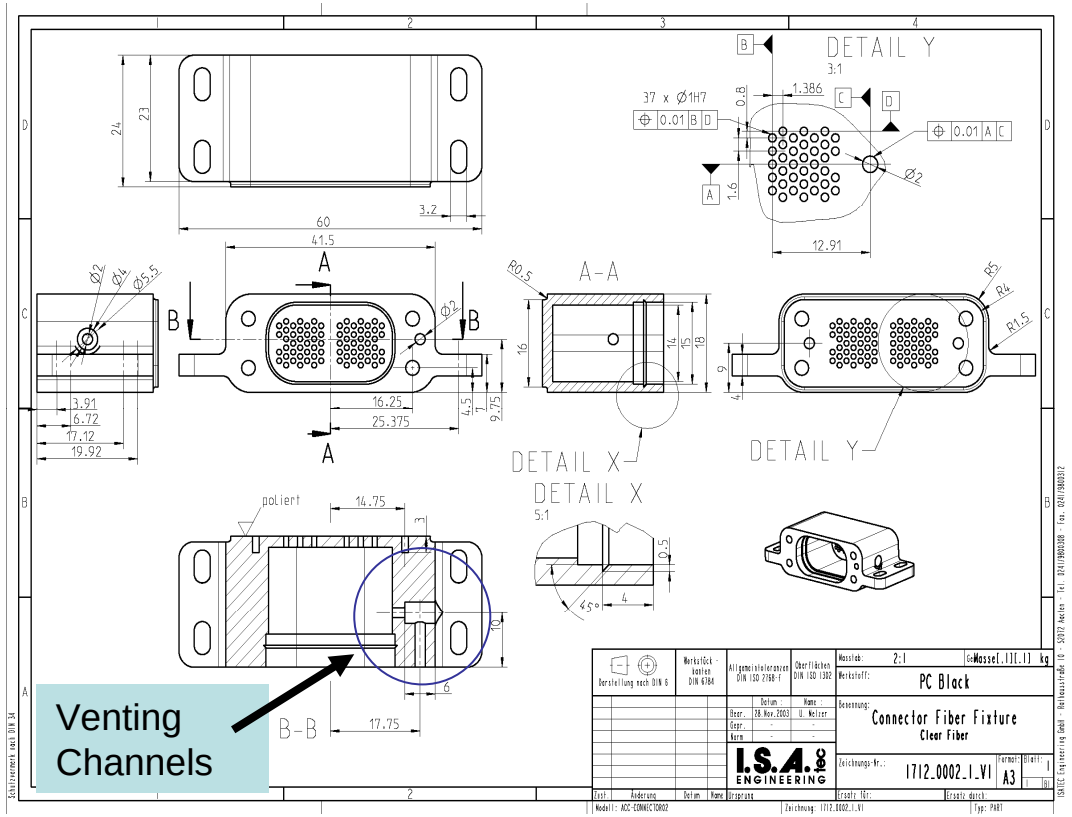


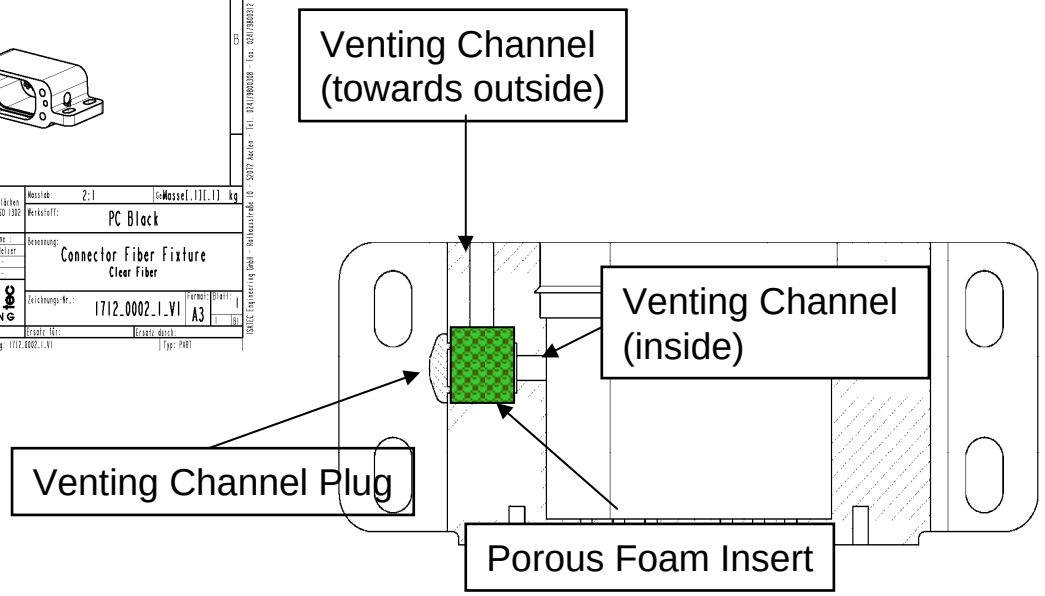
AMS02-ACC Connector Assembly (WLS)



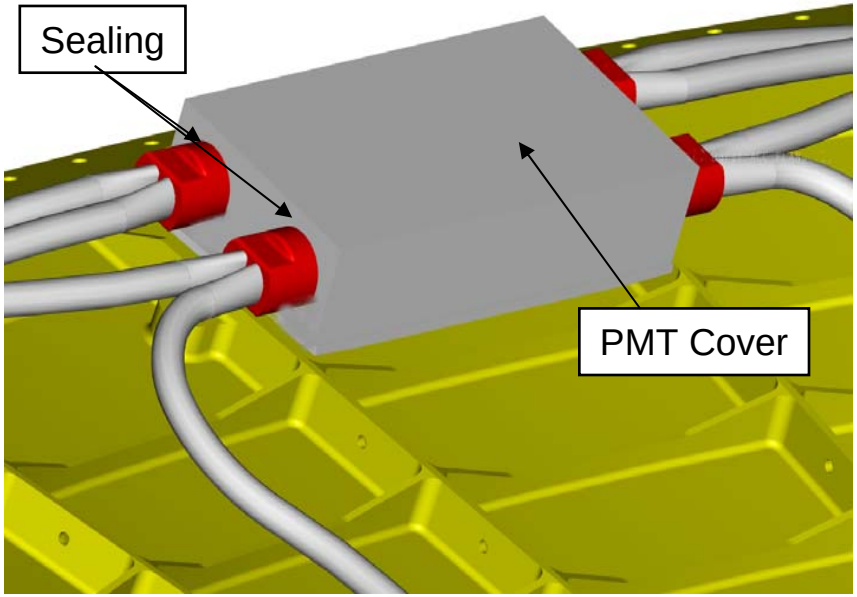


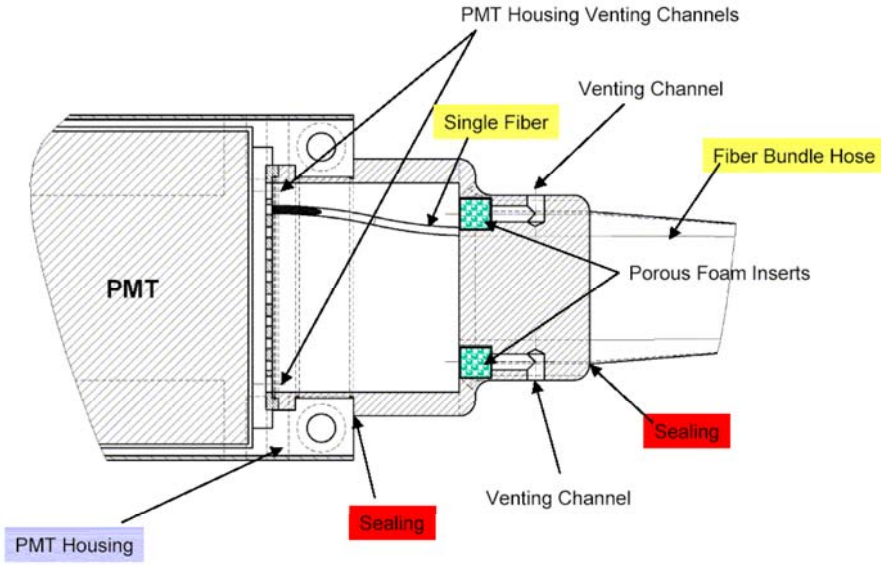
AMS02-ACC Connector Assembly (Clear Fiber)



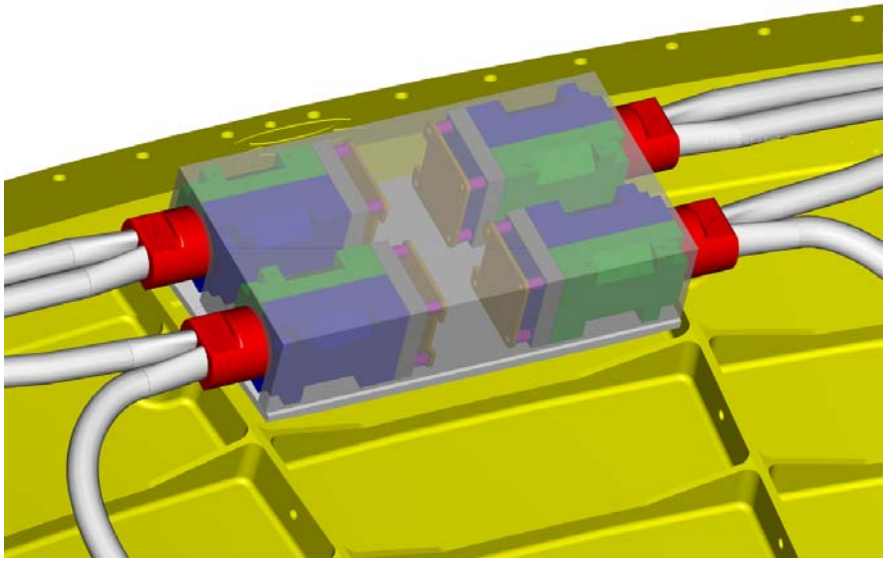


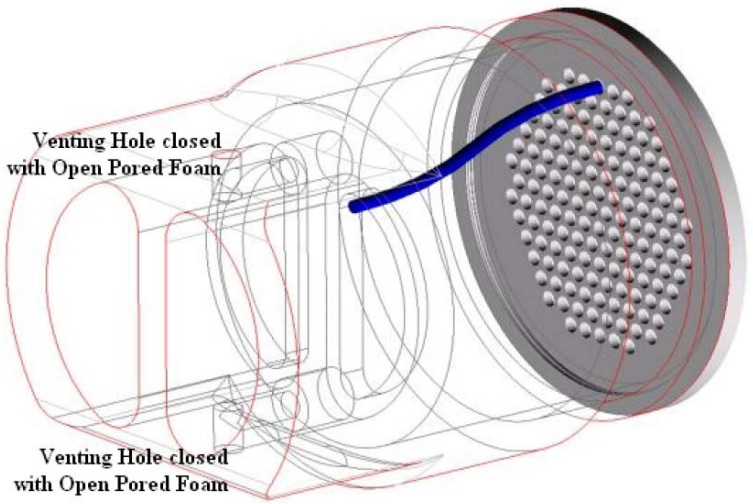
AMS02-ACC PMT Housing



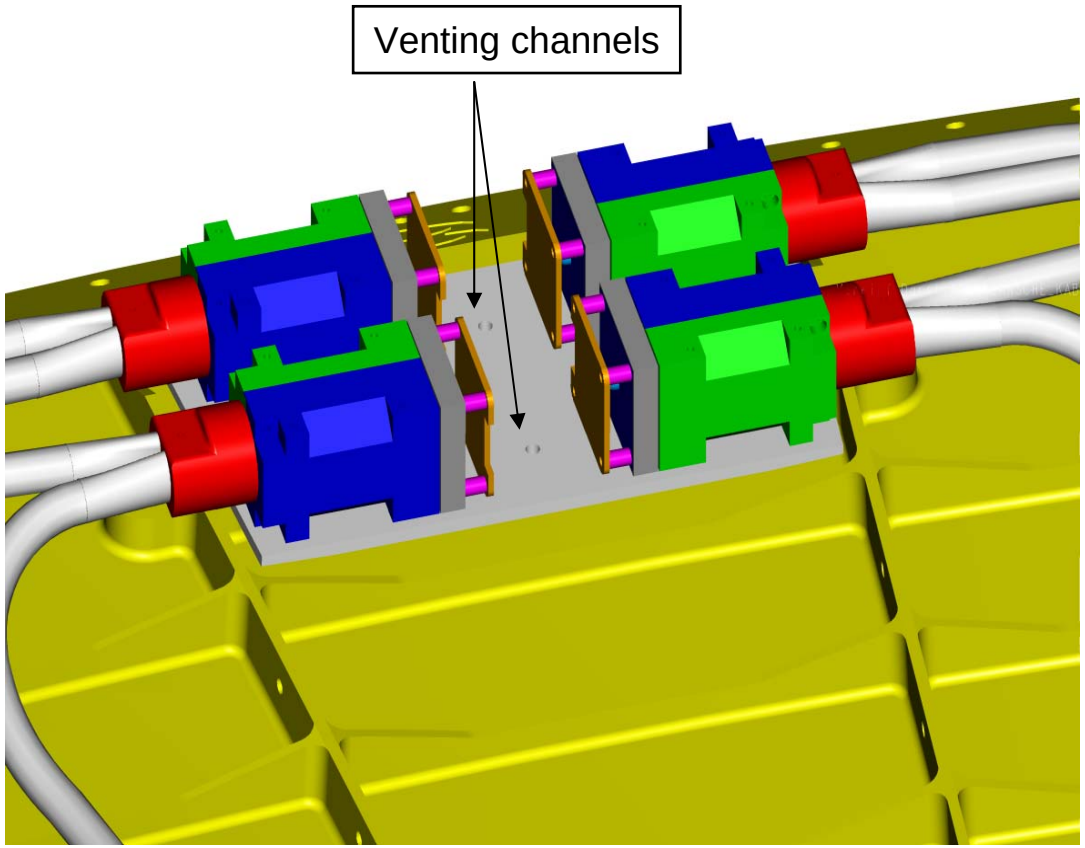


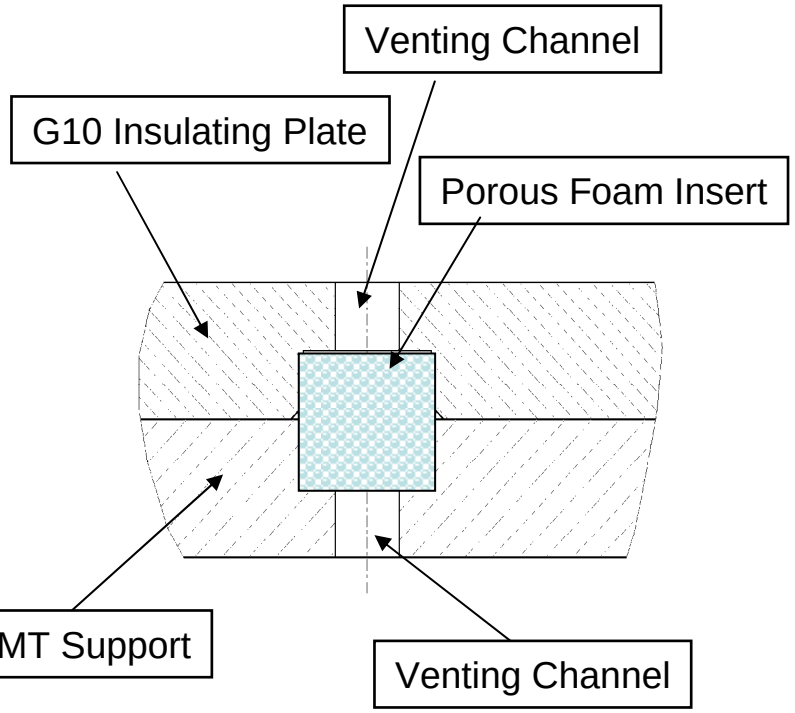
ACC PMT Construction Detail (Variance from TOF design)





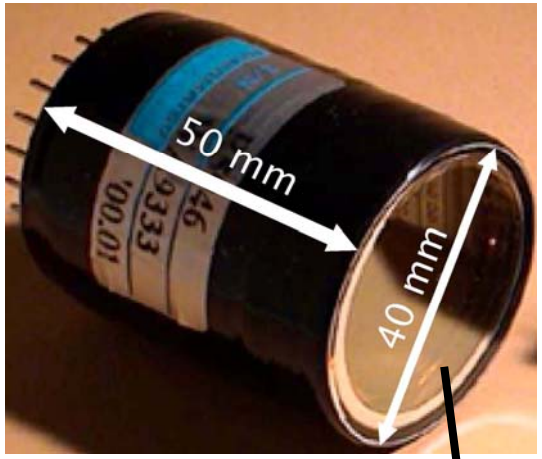
AMS02-ACC PMT Housing



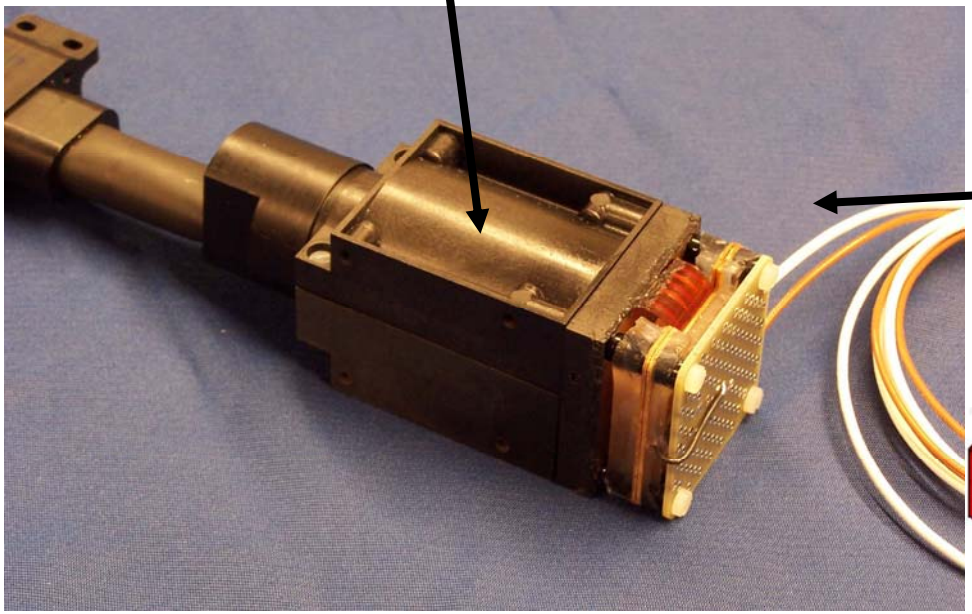


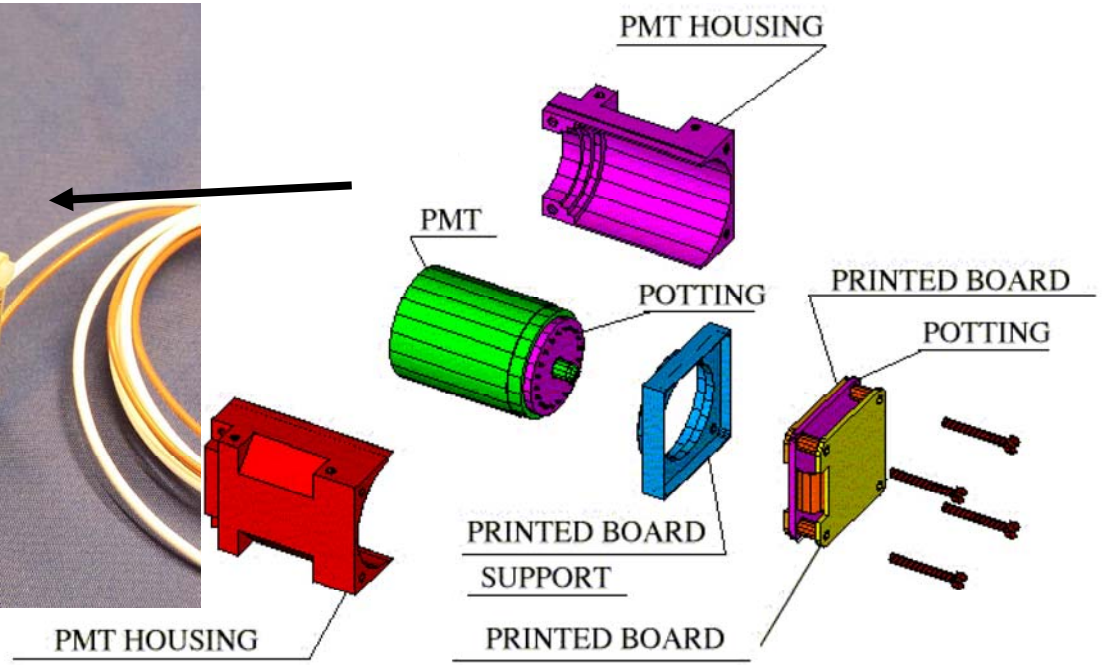
Section I
Potential hazards: HV

AMS02-ACC PMTs Hamamatsu R5946



The 16 PMTs of the ACC system record the light of the ACC panels. They are identical to the ones of the TOF system. The ACC PMTs have to work in a moderate magnetic field of 1.2 kG on top and bottom of the VC. The PMTs and high voltage interfaces are potted and conformal coated to avoid discharges of high voltages at low atmospheric pressures. The PMTs are isolated from any potential exterior contact. They
are sealed within housings with potting used to protect the high voltage circuitry



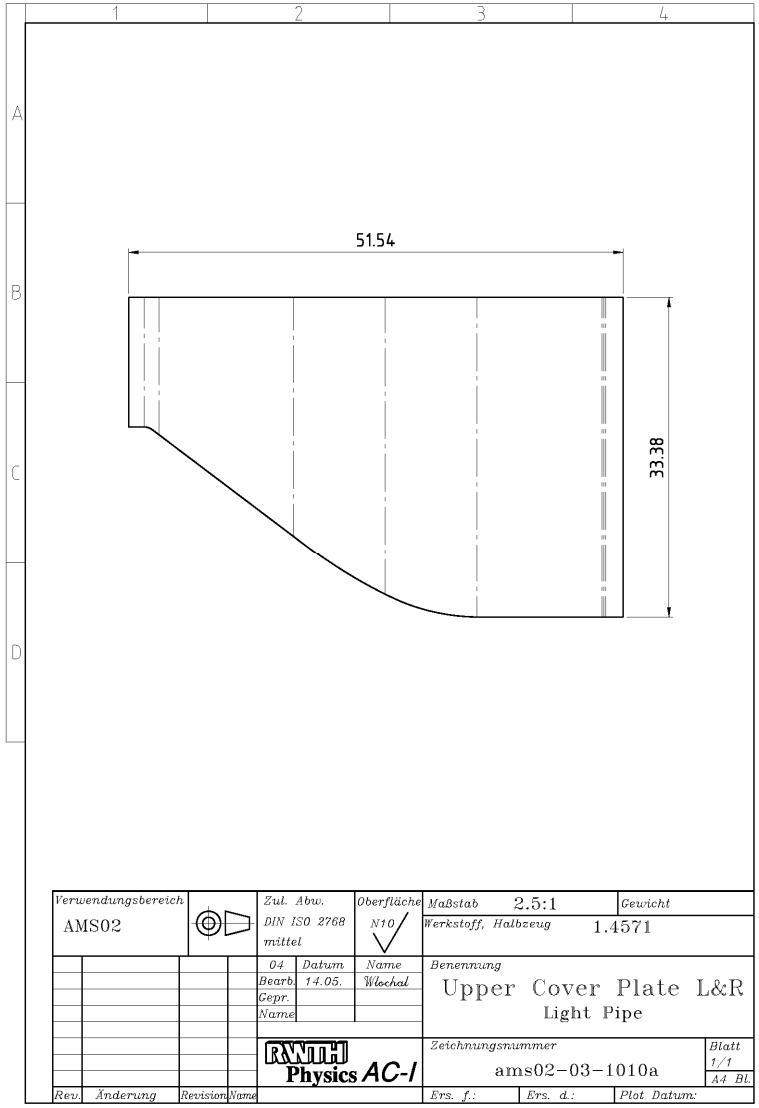


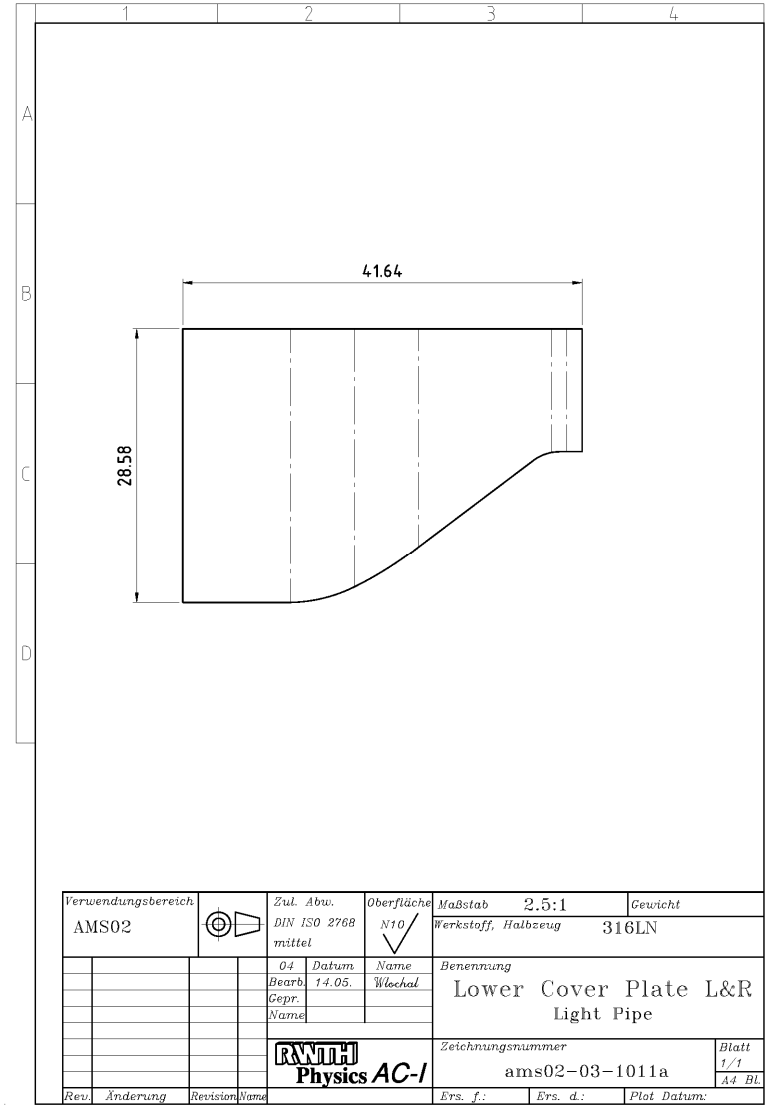
Section I
Drawing Charts

AMS02-ACC System – Drawing Charts

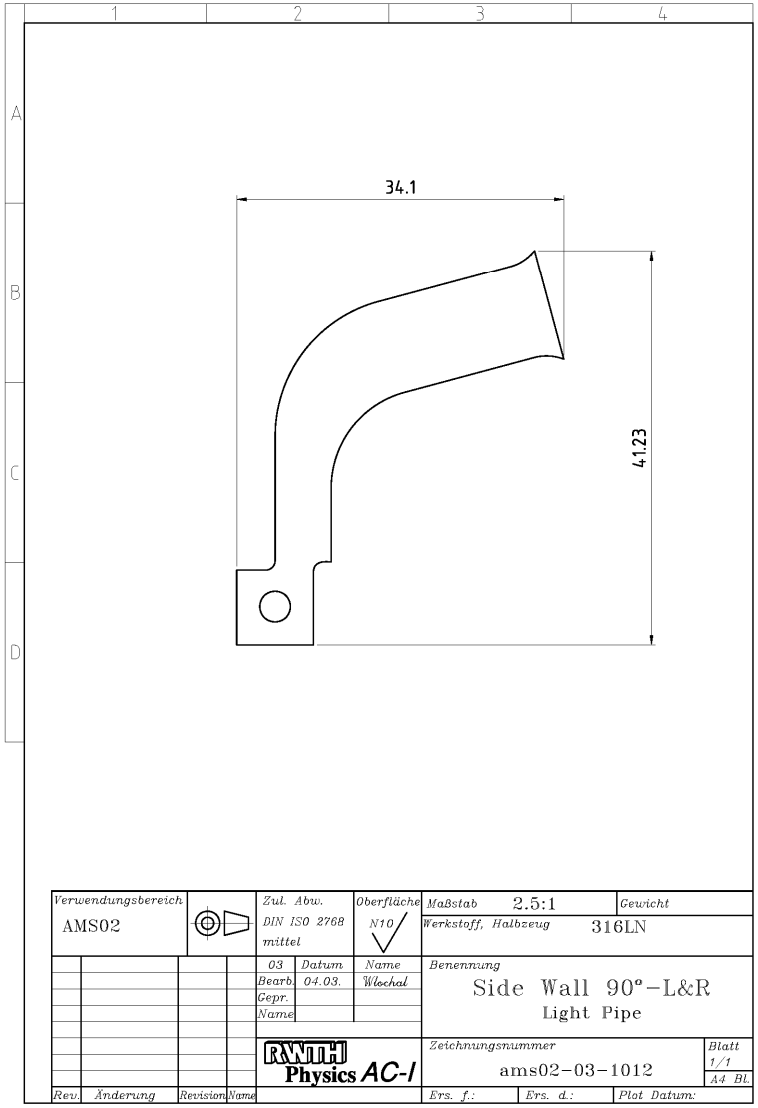
AMS-ACC-Drawing-Numbers		
RWTH Physics AC-I	**Date:** 14th September 2007	Page No. 1
Item No.	Object / Content	Drawing Number
2.0 General		
1	ACC	040115-Isatec.ppt
2.1 Modules		
2	Upper Cover Plate	ams02-03-1010a
3	Lower Cover Plate	ams02-03-1011a
4	Side Wall 90°	ams02-03-1012
5	Side Wall 38°	ams02-03-1013a
6	Scintillator	~~ams02-1771c~~ ams02-03-1000c
6	Direction Pipe R+L	ams02-04-1000
7	Part List Anti Coincidence Counter	ams02-1771g
2.2 ACC		
8	ACC Support Tube	ams1626
9	ACC-Clamp Z-	ams02-03-1024b
10	Pressure Plate	ams02-07-1000
11	ACC-Clamp Z+	ams02-04-1023a
12	ACC-Module	ams02-1771g
13	PMT Box Mounting Scheme	ams02-07-1032
14	PMT Connector Mounting Scheme	ams02-07-1033
15	Mounting Scheme ACC Panels + Clamps	ams02-07-1035
16	ACC Mounting Scheme	ams02-07-1037
17	Temporary Fiber Cabel Support	ams02-07-1040
18	installation clamp ACC modules	ams02-07-3036
19	spacer PMT connector	ams02-07-3037

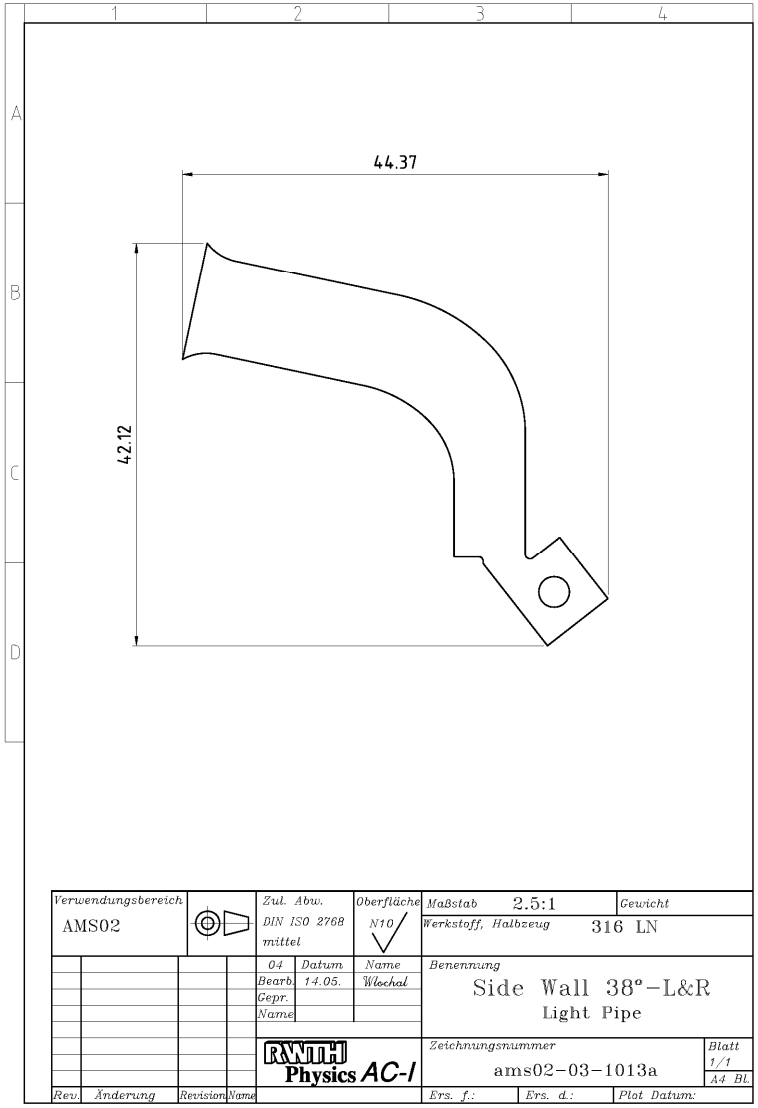
AMS02-ACC System – Drawing Charts



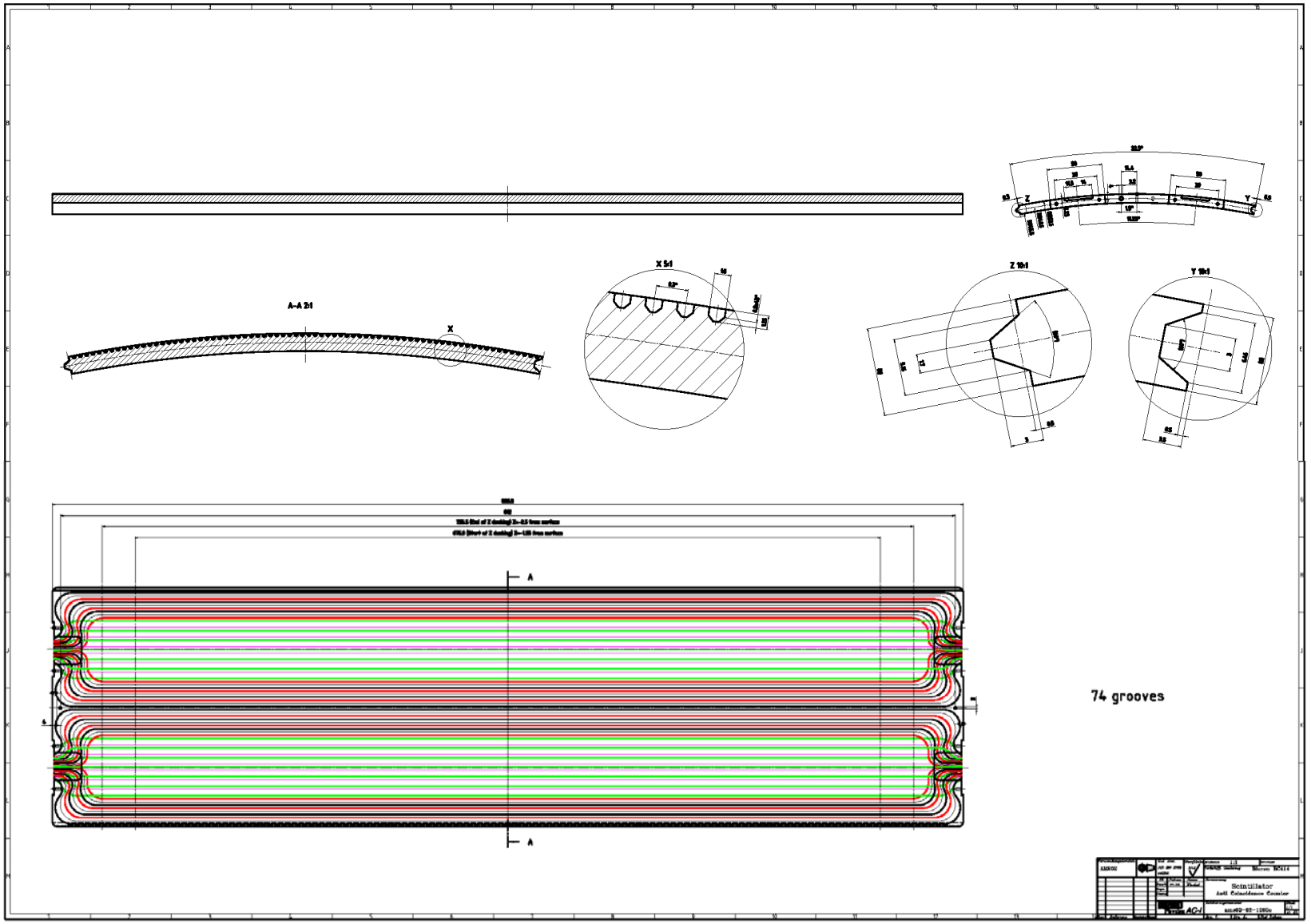


AMS02-ACC System – Drawing Charts

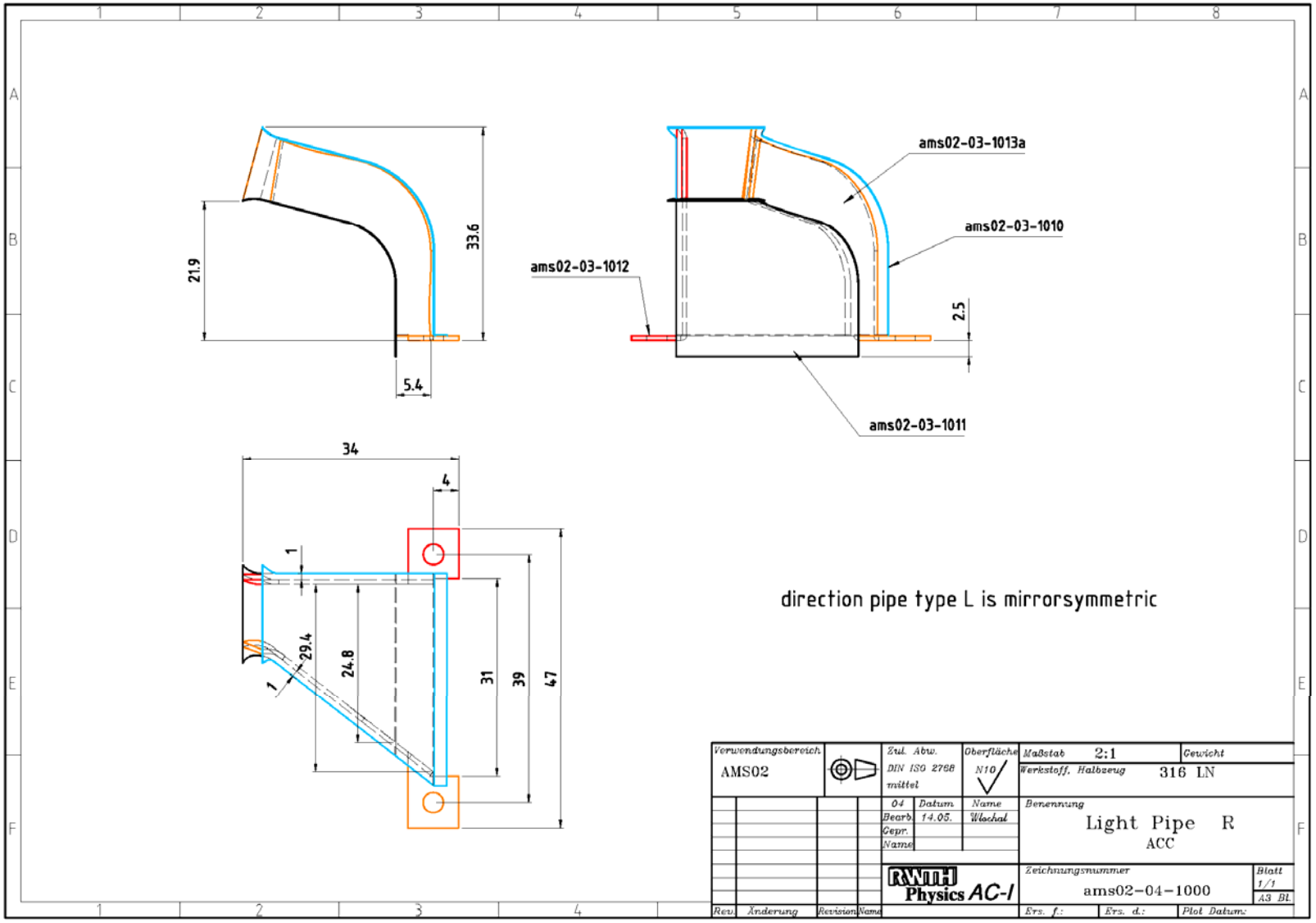




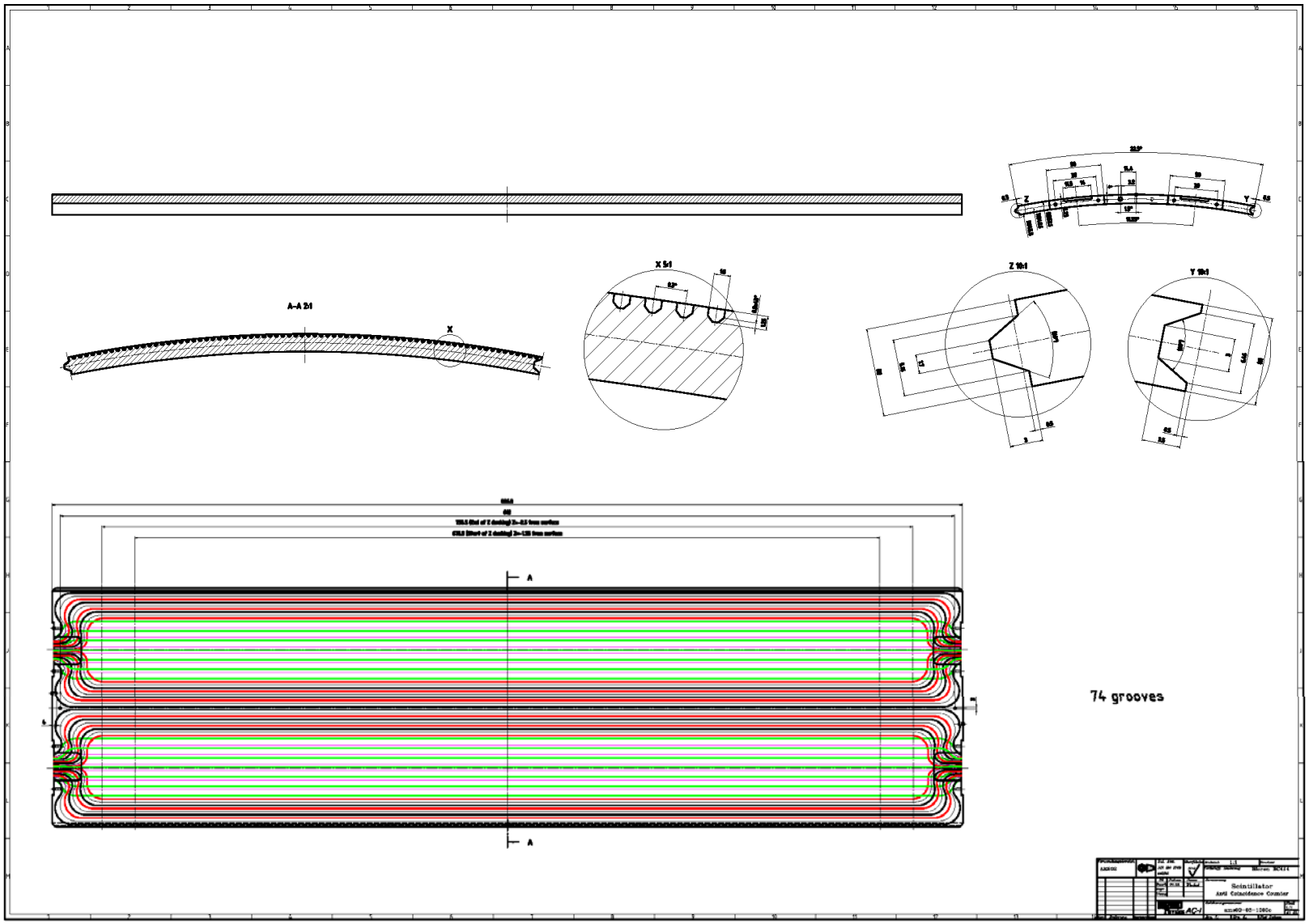
AMS02-ACC System – Drawing Charts



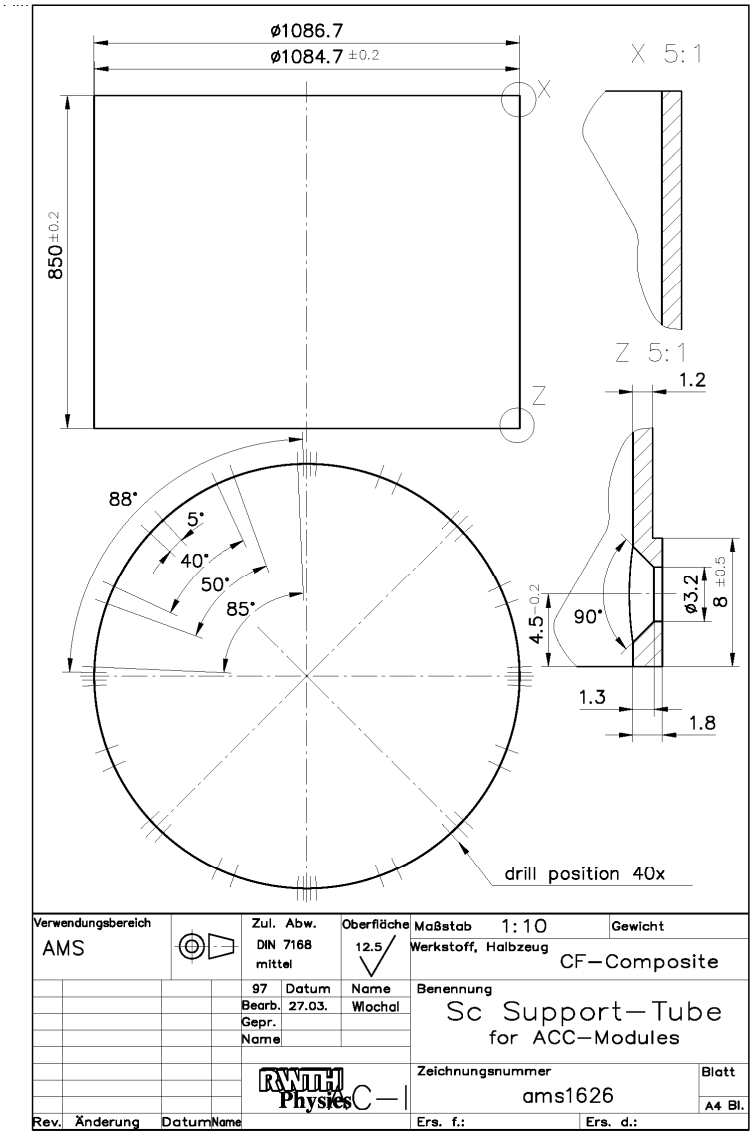
AMS02-ACC System – Drawing Charts



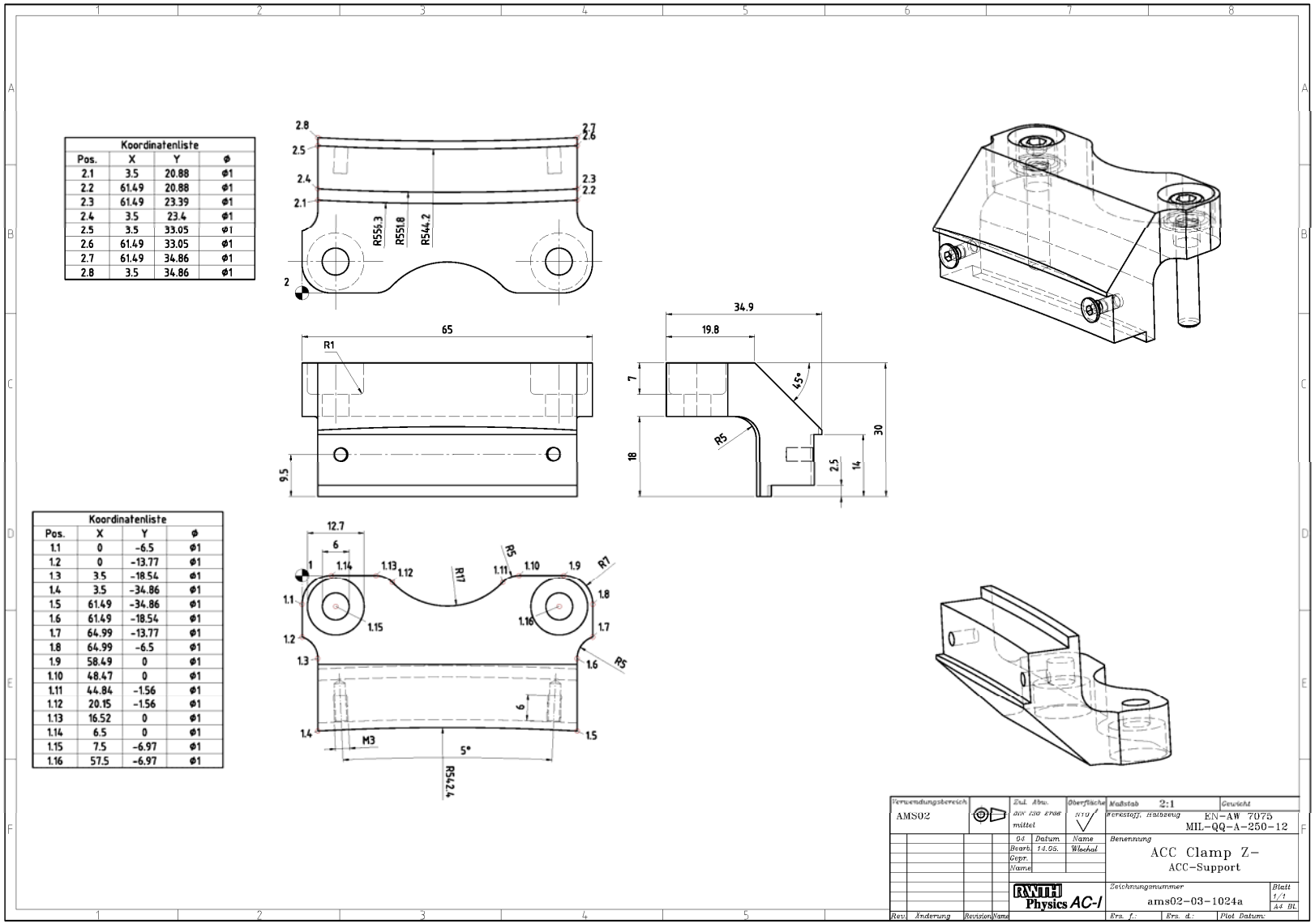
AMS02-ACC System – Drawing Charts



AMS02-ACC System – Drawing Charts



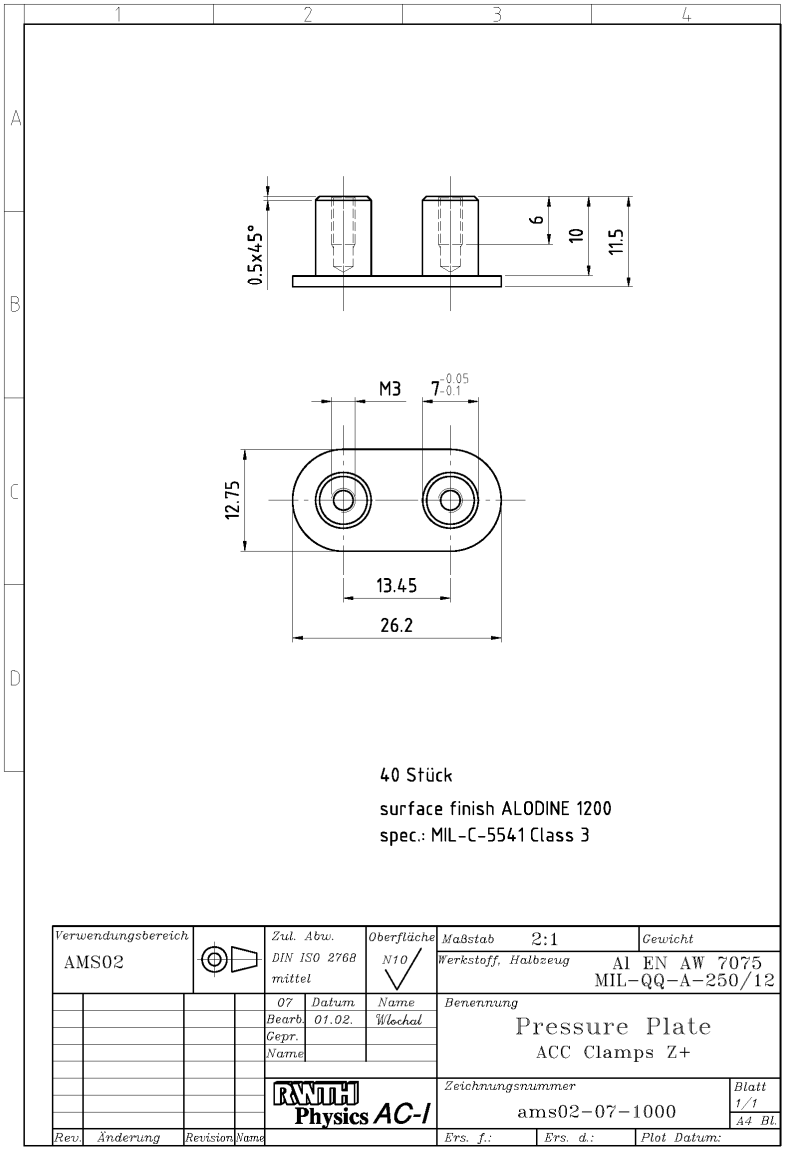
AMS02-ACC System – Drawing Charts



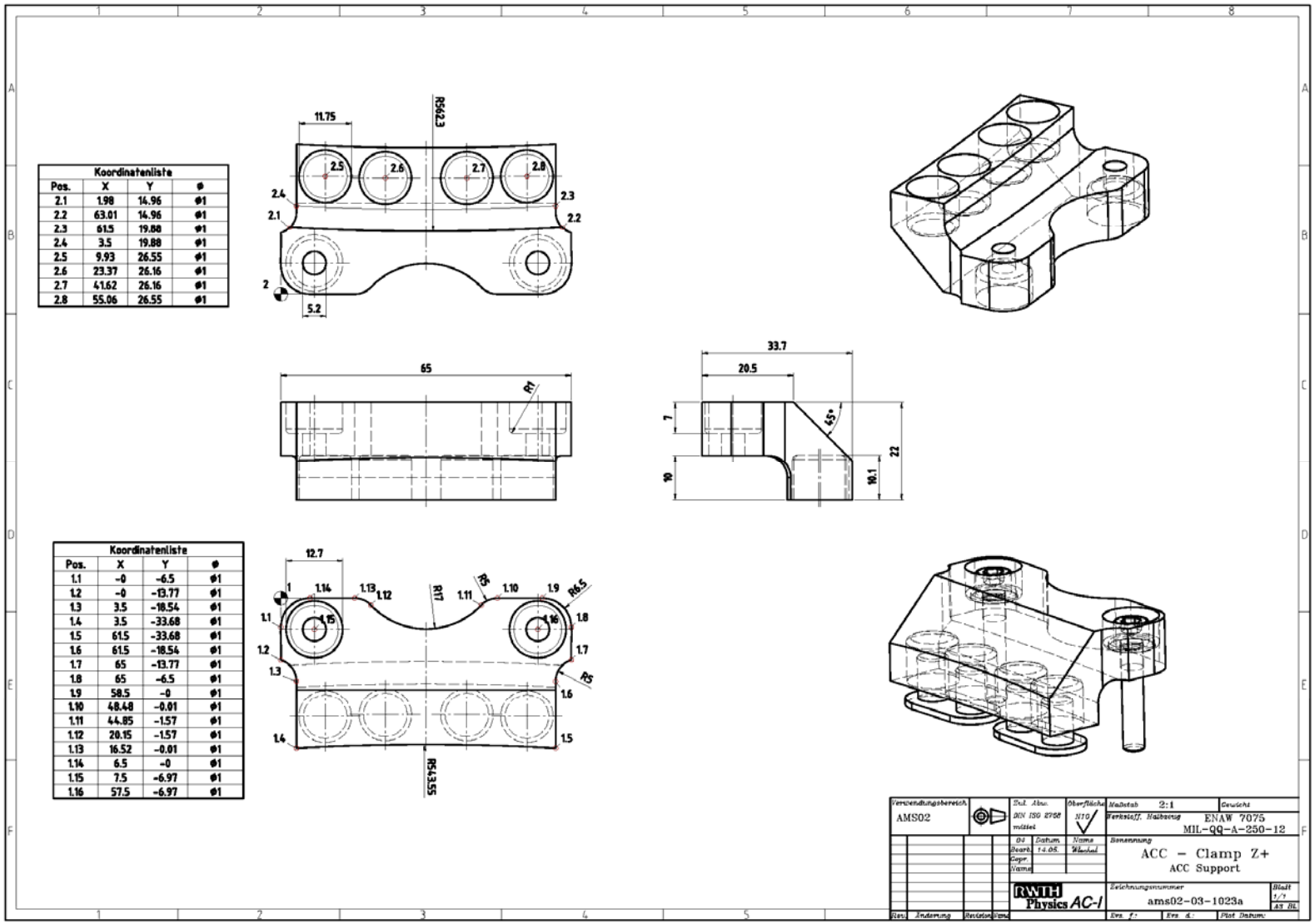
Koordinatenliste			
Pos.	X	Y	ø
2.1	3.5	20.88	ø1
2.2	61.49	20.88	ø1
2.3	61.49	23.39	ø1
2.4	3.5	23.4	ø1
2.5	3.5	33.05	ø1
2.6	61.49	33.05	ø1
2.7	61.49	34.86	ø1
2.8	3.5	34.86	ø1

Koordinatenliste			
Pos.	X	Y	ø
1.1	0	-6.5	ø1
1.2	0	-13.77	ø1
1.3	3.5	-18.54	ø1
1.4	3.5	-34.86	ø1
1.5	61.49	-34.86	ø1
1.6	61.49	-18.54	ø1
1.7	64.99	-13.77	ø1
1.8	64.99	-6.5	ø1
1.9	58.49	0	ø1
1.10	48.47	0	ø1
1.11	44.84	-1.56	ø1
1.12	20.15	-1.56	ø1
1.13	16.52	0	ø1
1.14	6.5	0	ø1
1.15	7.5	-6.97	ø1
1.16	57.5	-6.97	ø1

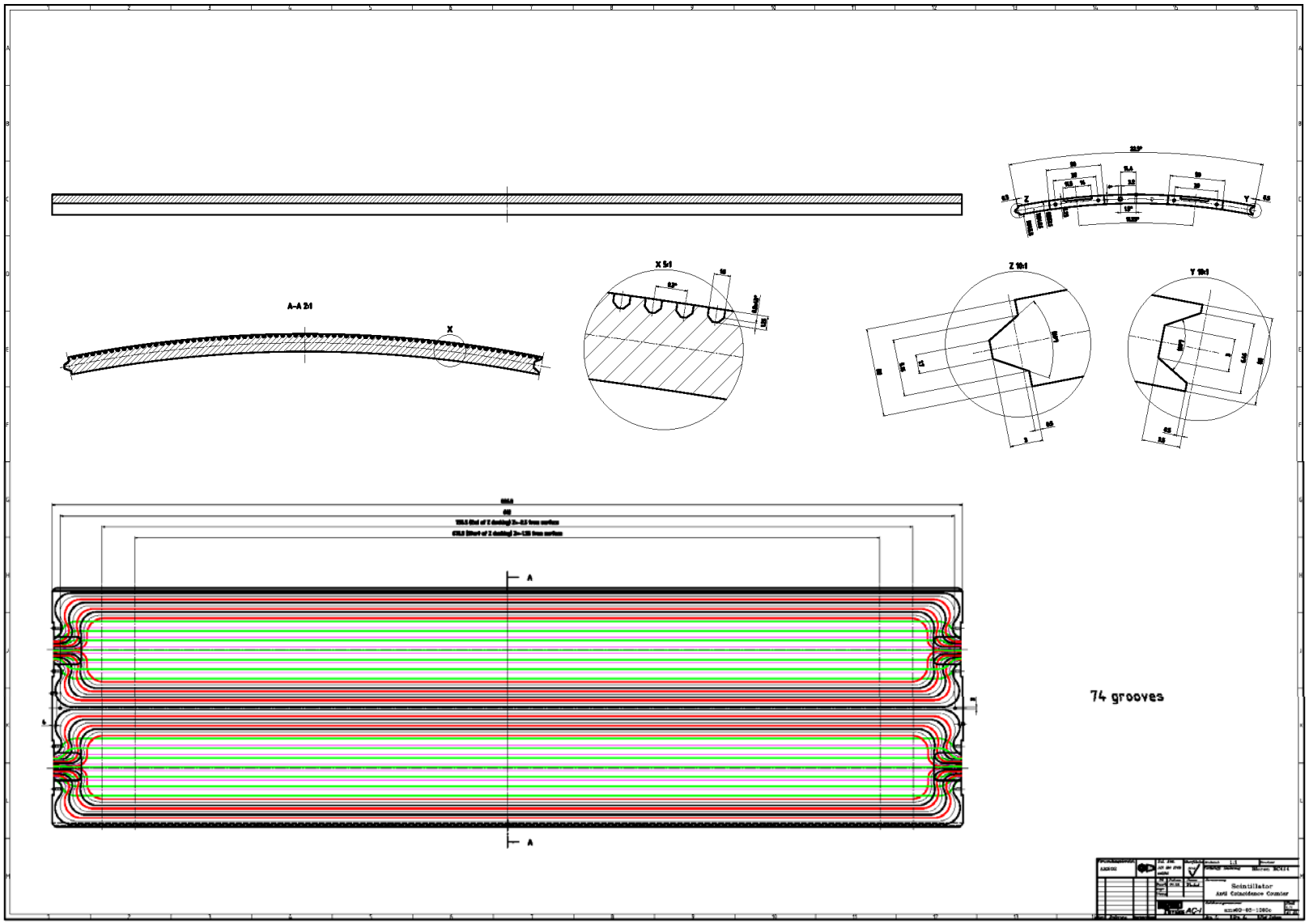
AMS02-ACC System – Drawing Charts



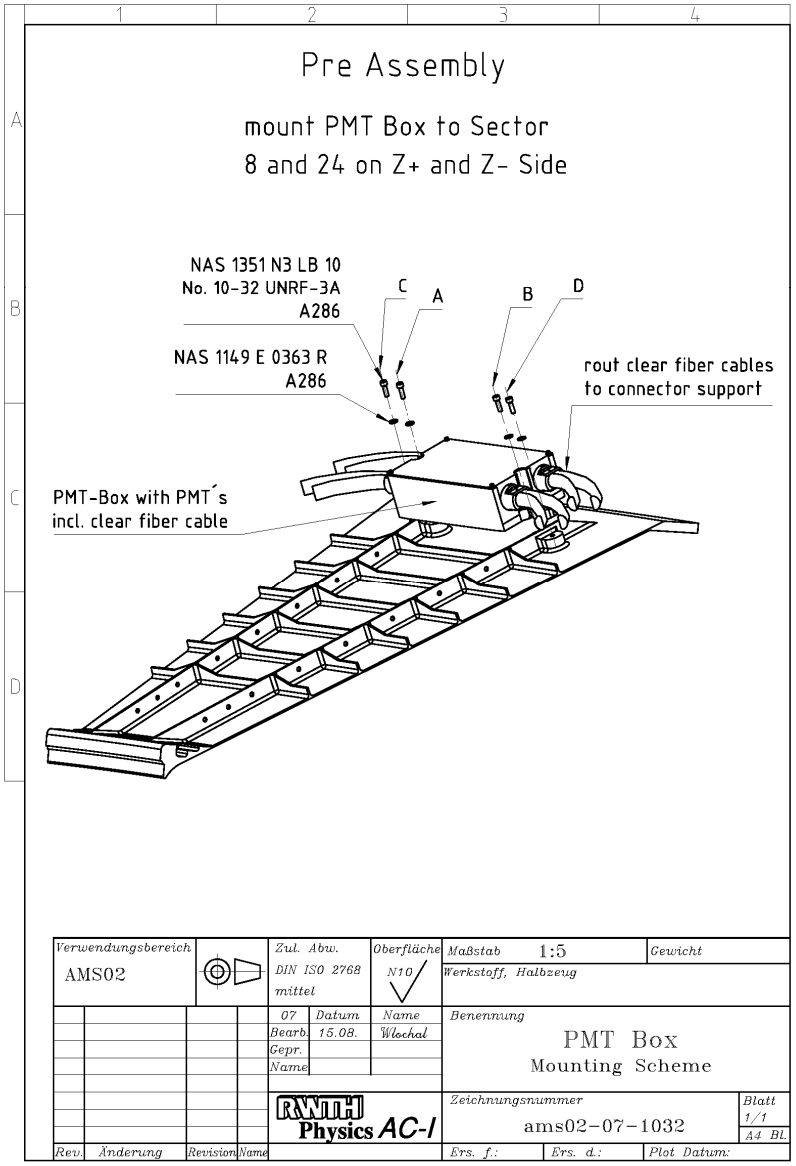
AMS02-ACC System – Drawing Charts



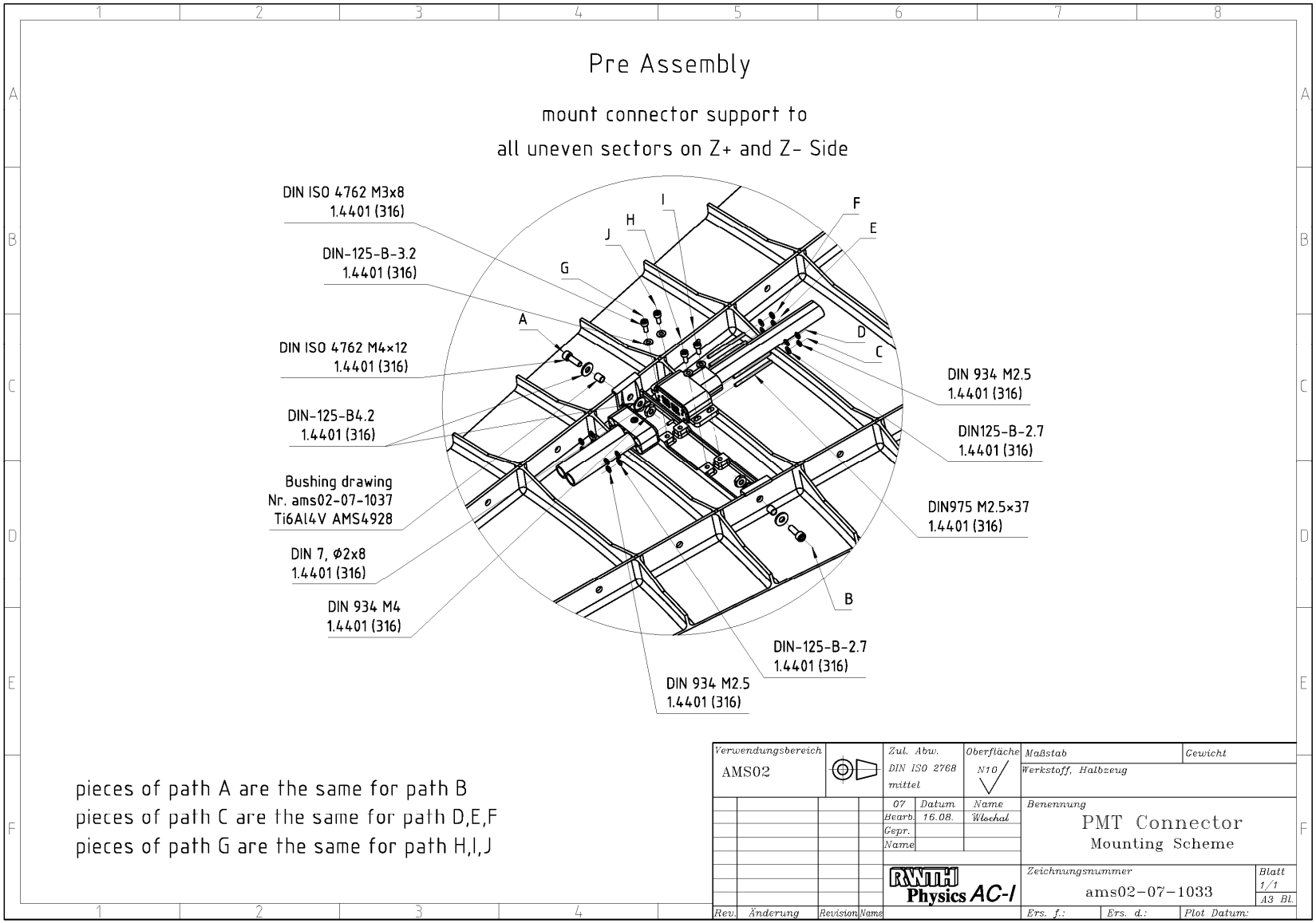
AMS02-ACC System – Drawing Charts



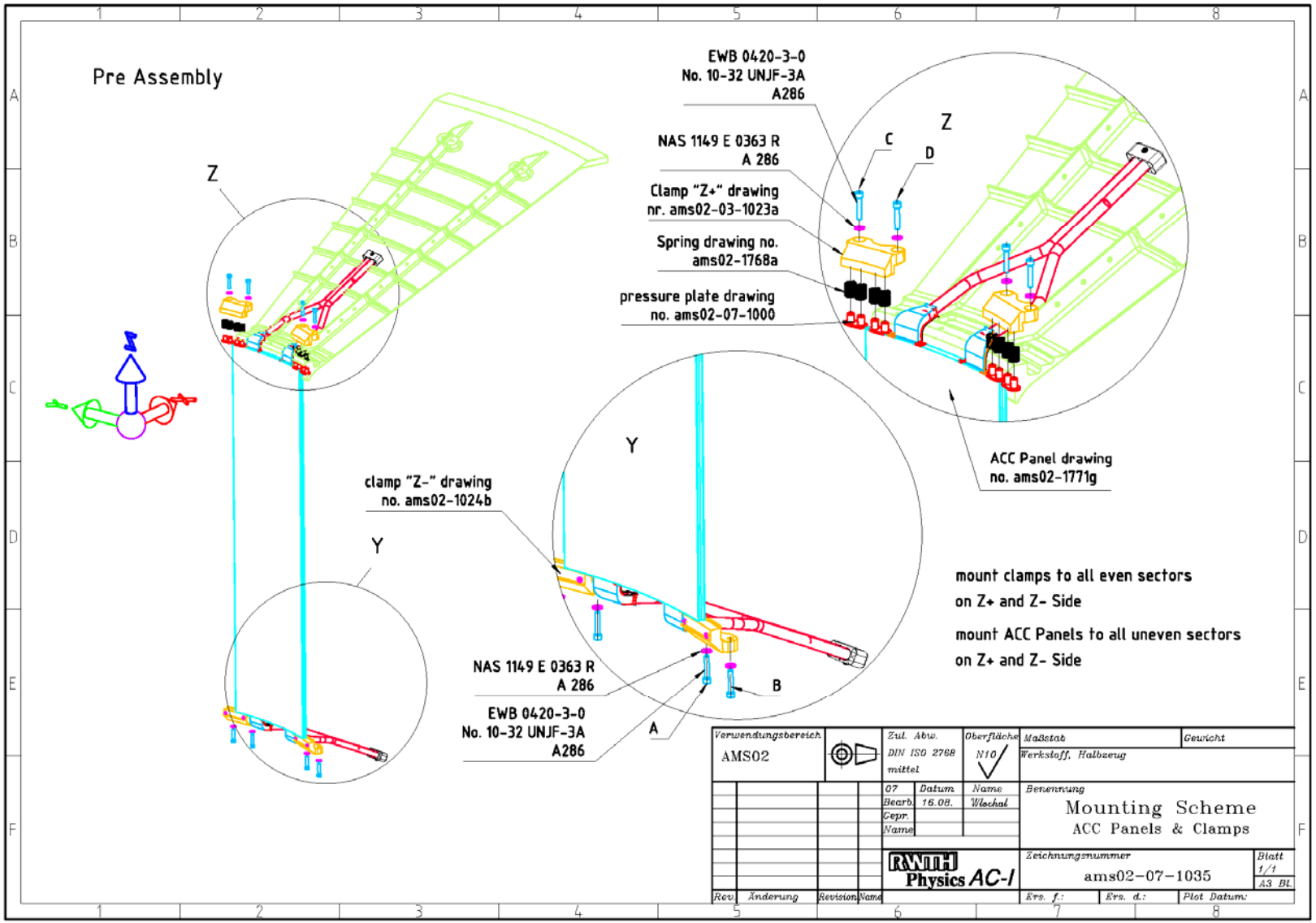
AMS02-ACC System – Drawing Charts



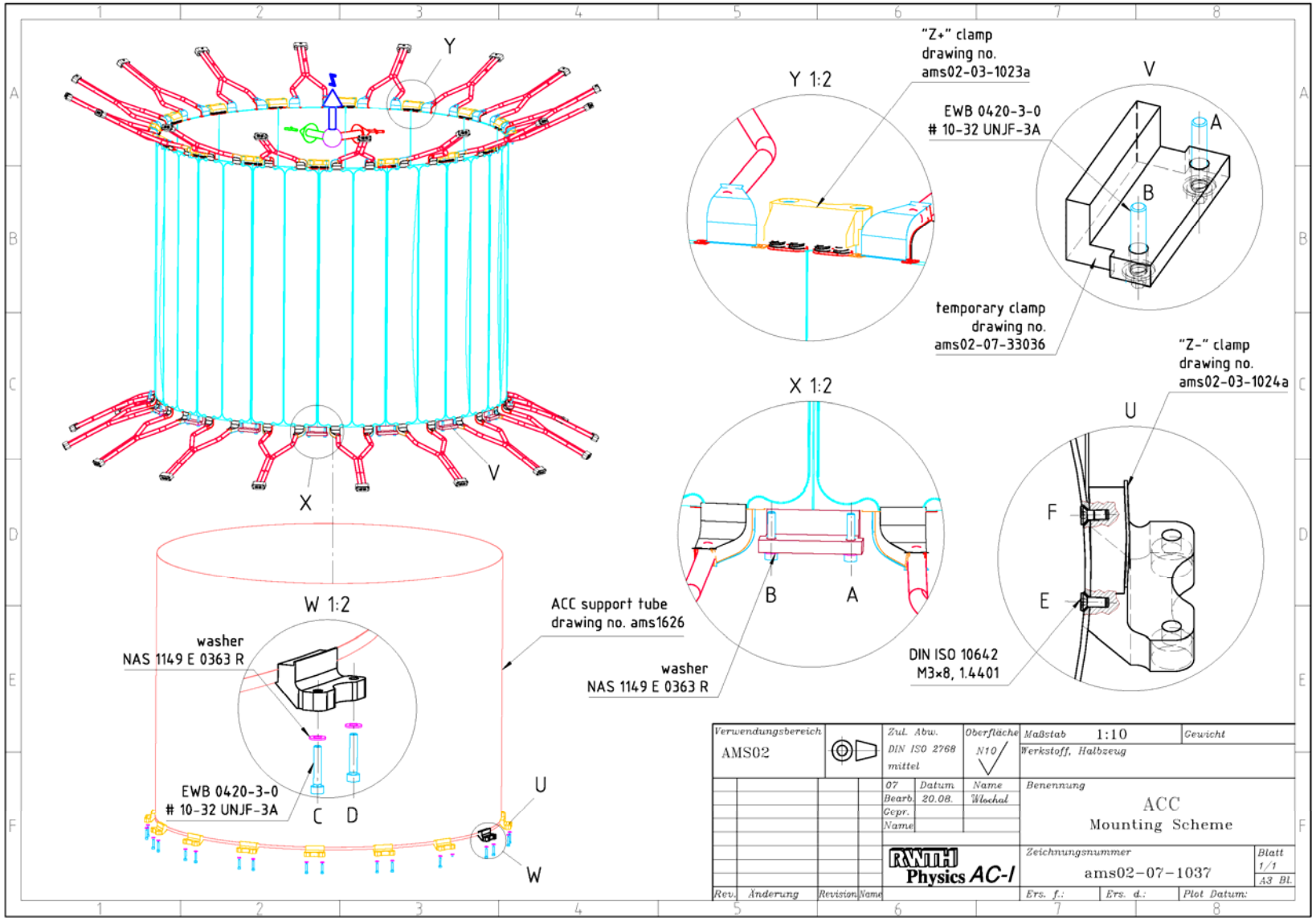
AMS02-ACC System – Drawing Charts



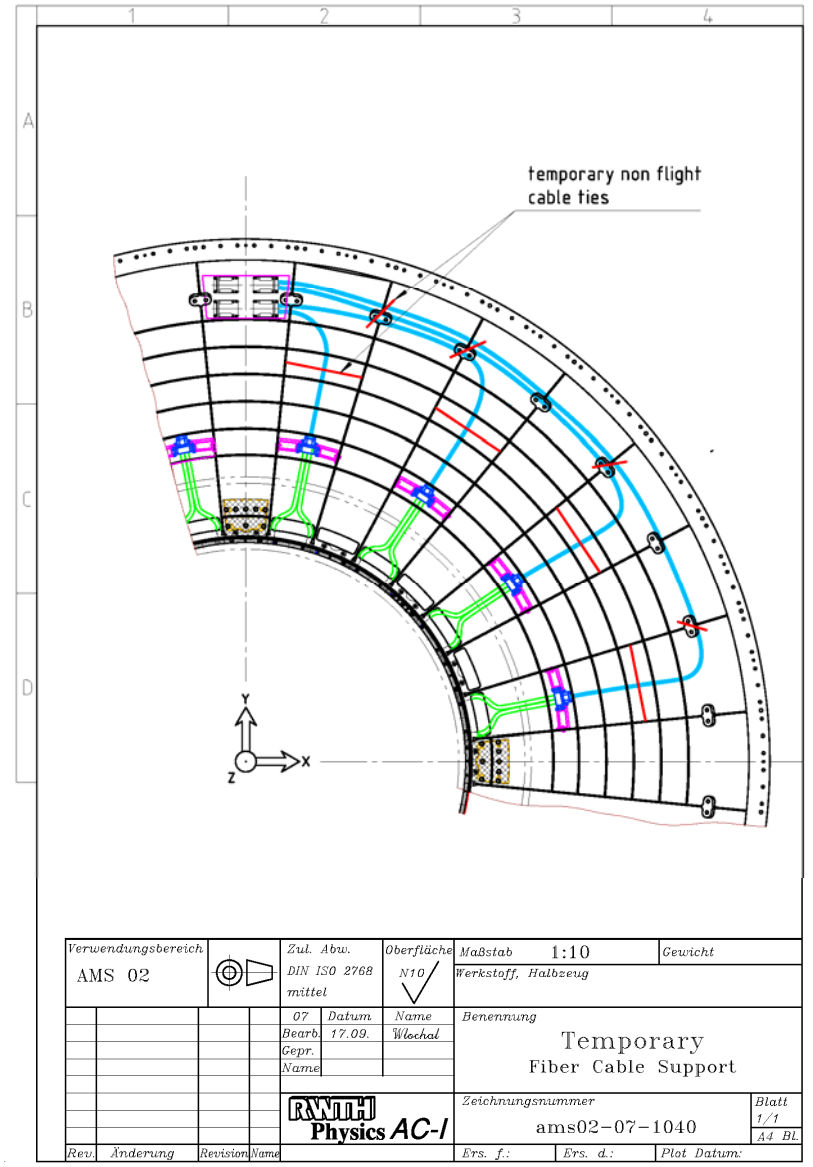
AMS02-ACC System – Drawing Charts



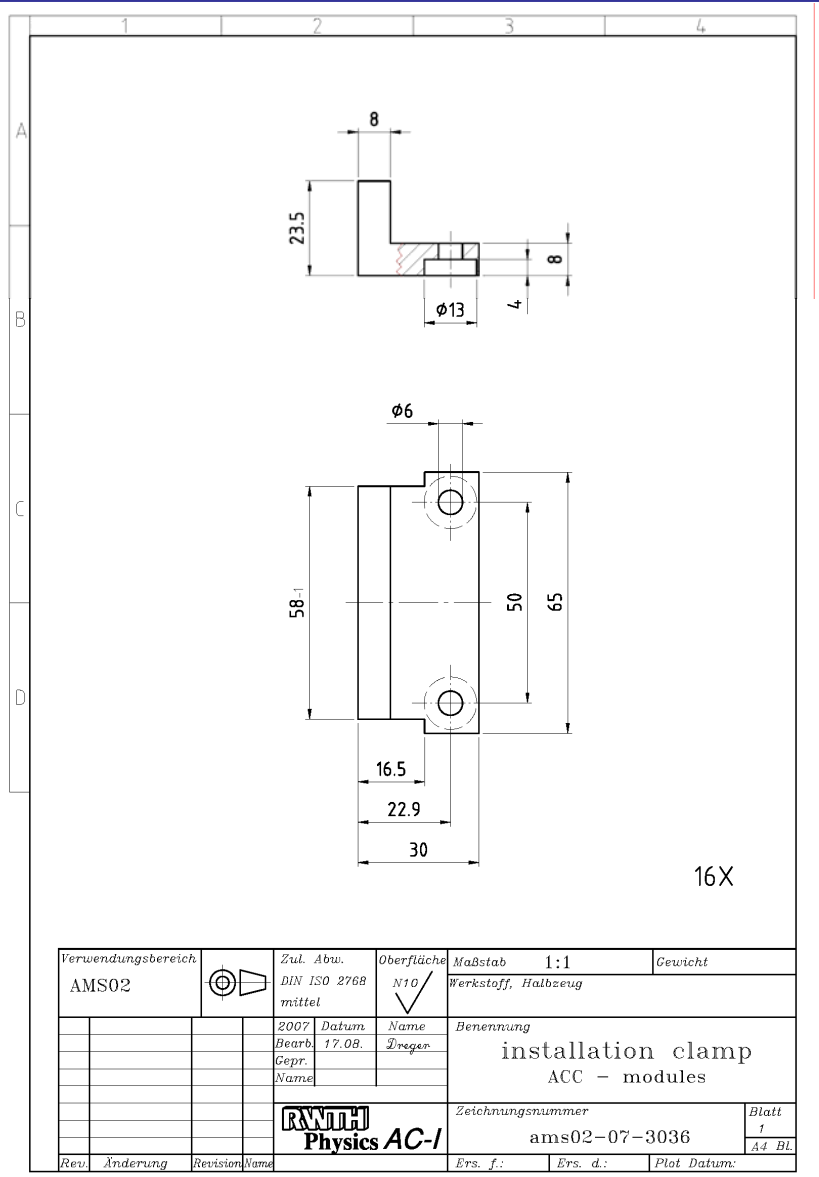
AMS02-ACC System – Drawing Charts



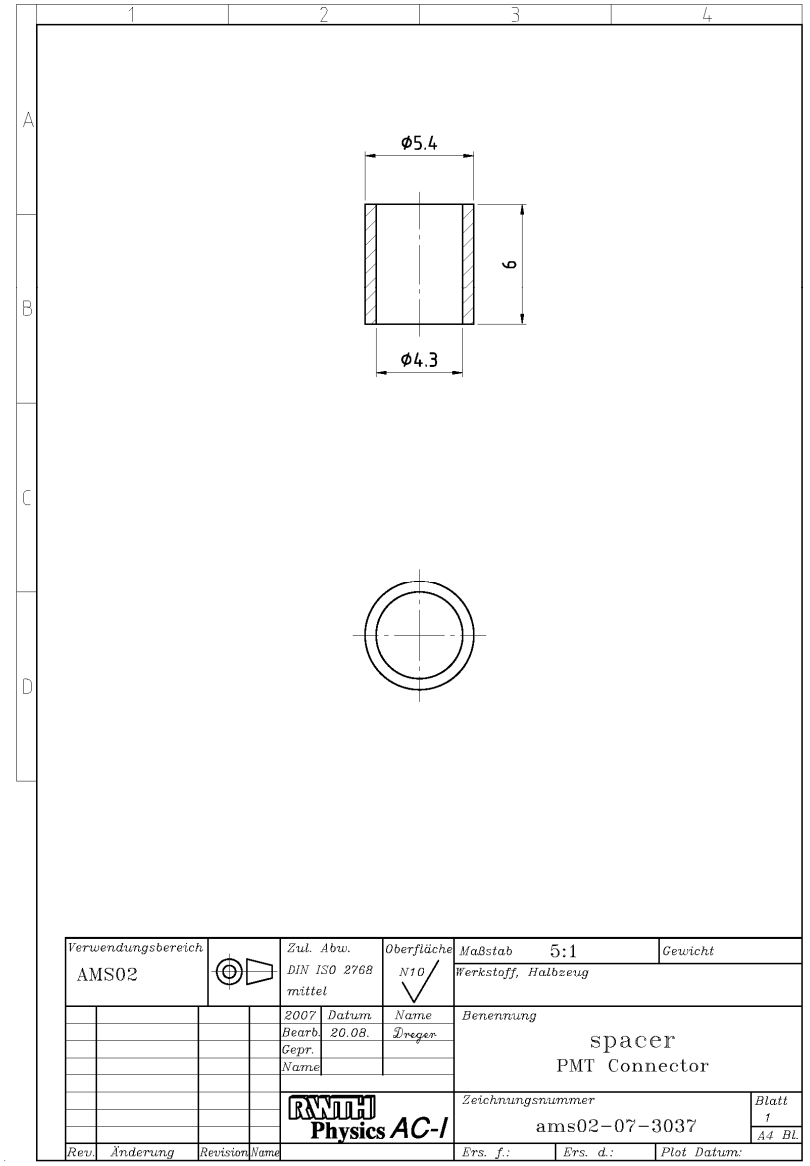
AMS02-ACC System – Drawing Charts



AMS02-ACC System – Drawing Charts



AMS02-ACC System – Drawing Charts



AMS02-ACC System:
Material Safety Data Sheet
Section XIV

AMS02-ACC System – Material List

Declared material list

RWTH Physics AC-I

Anticounter ACC

Doc. No: AMS-ACC-RWTH-001 **Page:** 1

Issue/Rev.: 1 draft **Date:** 9th Dec. 2004

1	2	3	4	5	6	7	8			9			10					11
Item No	Drawing No	Group No	Commercial identification	*Chemical nature *type of product	*Procurement Information *Manufacturer / Supplier *Specification Issue/Rev	Use/ location	Environment. code			Size code			Corr	SCC	Flam	OFFG	OUTG	Remarks/ Approval
							R	A	T	WT (kg)	THK (cm)	ESA* cm^2						
01		1	Aluminium foil	Al99 w 3.020510		ACC Module	L	V	3 4 4			A5						
02	ams02-1770b ams02-1768	1	Aerospace Aluminium	EN AW-7075 T7351 3.4364		ACC Support Photomultiplier	L	V	3 4									
03	ams1626 ams02-1770b	15	CFC	Tenax-J UMS2526 Araldit LY556 Hardener HY917 Accelerator DY 070	Tenax Fibers Ciba Geigy	ACC Support tube	L	V	3 4									same as flown with AMS-01
04	ams02-1771g ams02-1771c	18	Plastic Scintillator	BC-414 Polystyrene	Bicron	ACC Module	L	V	3 4									
05	ams02-1771g	18	WL-Shifter Fiber	Y-11	Kuraray	ACC Module	L	V	3 4									same as flown with AMS-01
06		18	Clear Fiber	BCF-98 double cladded	Bicron	ACC Module	L	V	3 4									
07		10	Optical Cement	BC600	Bicron	ACC Module	L	V	3 4									flown with AMS-01
08	ams02-1770b		Screws	A286/V4A (1.4401)	NASA/DIN	ACC Module ACC Support Photomultiplier	L	V	3 4									
09	ams02-1770b		Washers	A286/V4A (1.4401)	NASA/DIN	ACC Module ACC Support Photomultiplier	L	V	3 4									
10		10	Epoxy Glue	Araldit AV138M MP HV998MP/HW106	Ciba Geigy (Astorit Ch)	Photomultiplier ACC Support	L	V	3 4									same as flown with AMS-01

AMS02-ACC System – Material List

Declared material list

RWTH Physics AC-I

Anticounter ACC

Doc. No: AMS-ACC-RWTH-001 **Page:** 2

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Item No	Drawing No	Group No	Commercial identification	*Chemical nature *type of product	*Procurement Information *Manufacturer / Supplier *Specification Issue/Rev	Use/ location	Environment. code			Size code			Corr	SCC	Flam	OFG	OUTG	Remarks/ Approval
							R	A	T	WT (kg)	THK (cm)	ESA* cm^2						
11		10	Silicon	CV 1146-2	Nusil Silastic	ACC Module	L	V	3 4									
12	ams02-1771g		Columbus Optical Black Cloth	Polyester Fabric (Trevira) with Acrylat Foam Columbus Foam Dess 1514	Breuer	ACC Module	L	V	3 4									ASTM E1559
13		16	Sealing Ring Viton-Tube	VITON Rubber	FKM (VITON)	ACC Module	L	V	3 4									
14			Polycarbonate	Injection Molded	black	Photomultiplier Housing	L	V	3 4									
15			PEEK (2%)			Connector	L	V	3 4									
16			Photomultiplier	R5946	Hamamatsu	Photomultiplier	L	V	3 4									
17	ams02-1770b		Spring	CuBe2 F95	Gutekunst	ACC support	L	V	3 4									same as flown with AMS-01
18		6	Stainless Steel	316LN/ (1.4429)	AISI/DIN	ACC Module	L	V	3 4									same as flown with AMS-01
19			see 02			Connector Fixation	L	V	3 4									
20			see 02			PMT Support	L	V	3 4									
21			Titan	Ti 6 Al 4V		PMT support	L	V	3 4									
22			Bulpren S90		Teroson	PMT support, Venting plug in PMT housing	L	V	3 4									