Appendix G:
Existing
Radar
Antenna Unit
Manual

CHL NETHERLANDS B.V.
Christiaan Huygens Laboratorium

Installation and maintenance manual

Radar antenna system type SGX38.0H21-IC2

Canadian Coast Guard

Manual issue: a

Customer	:	**Kongsberg Norcontrol IT AS**
Order number	:	**13436**
Customer project no.	:	**453700**
CHL project number	:	**2010016**
Issue date(s)	:	**23 September 2010 (issue 'a')**

1 Introduction

The type SGX38.0H21-IC2 radar antenna system (see drawing no. C2010016-1 in Chapter 7 for an outline of the system) consist of a type SGX38.0H21-IC2 X-band radar antenna, a type ST2 antenna turning unit (ATU) and an ABB type ACS550-01-46A-2 frequency inverter to turn the antenna at a speed of 12 or 24 revolutions per minute in a clockwise direction (as seen from above).

Photo1-1: Radar antenna system type SGX38.0H21-IC2 with support for platform mounting

The type SGX38.0H21-IC2 antenna is 21 feet (6.34 metres) long, has a horizontal beam width of < 0.40°, a vertical beam width of < 11° and a quasi inverse $cosec^2$ vertical radiation pattern. Its gain is ≥ 38.0 dB.

The type ST2 ATU consists of a cylindrically shaped gearbox, a 3-phase electric motor to drive the gearbox, a one-channel X-band microwave rotary joint and a dual optical rotary shaft encoder assembly to provide the antenna bearing to the radar system.
The ATU has been delivered with a 1000 mm high support (pedestal) for platform mounting of the antenna system. The support has two hatches, which give access to the gearbox, the electric motor, the rotary joint and the shaft encoder assembly.

The ATU is virtually maintenance free. Oil change is in principle not required until the recommended overhaul after nine years of operation. Since the lower shaft bearings are oil lubricated and the upper shaft bearings have long-term grease filling, no regular grease lubrication of these bearings is required.

For reliable operation and a long life-time it is recommended that the ATU is overhauled after every ten years of continuous operation, for which it is to be returned to the factory.

The system is fitted with a lightning protection system. The lightning protection system consists of six lightning arresters, which are mounted to the rear of the antenna and protrude approx. 0.4 m above the antenna, and a rotary spark gap assembly. With the rotary spark assembly the lightning energy is lead from the rotating antenna to the lightning protection earth.

The radar antenna system is furthermore fitted with the extended temperature option to operate the antenna system at temperatures down to -40°C.

2 Specifications

2.1 Antenna type SGX38.0H21-IC2

Electrical

Type	:	End-fed slotted waveguide
Polarization	:	Horizontal
Frequency band	:	8900 ± 30 MHz and 9300 ± 200 MHz
Gain	:	≥ 38.0 dB
VSWR	:	≤ 1.20
Maximum power input	:	150 kW peak / 30 W average
Beam width -3 dB level	:	< 0.40º (typical 0.36º)
20 dB level	:	< 1.00º
Side lobes	:	< -28 dB within ± 5º
		< -30 dB from ± 5º to ± 10º
		< -35 dB outside ± 10º
Squint range of main beam	:	Approx. +0.29º to -0.29º with respect to bore sight at 8900 MHz Approx. +1.9º to -1.9º with respect to bore sight at 9300 MHz
Vertical radiation pattern		
Shape	:	Quasi inverse cosecant square
Beam width -3 dB level	:	≤ 11.0º (typical 8.9º)

Mechanical

Dimensions (L x W x H)	:	6369 x 984 x 551 mm
Weight	:	236 kg

Environmental

Wind speed operational	:	150 km/h
Wind speed survival	:	240 km/h
Temperature range	:	-40º C to +55º C
Relative humidity	:	100%

2.2 Antenna turning unit type ST2

Mechanical

Weight loading	:	6000 N max.
Bending moment antenna shaft	:	10,000 Nm
Rotational speed antenna shaft	:	23 $^{(-4\%)}$ rpm (at 60 Hz mains)
Backlash antenna shaft	:	Max. 3'
Maximum driving torque	:	Approx. 1920 Nm
Lubrication gear wheels and lower shaft bearings	:	Dip lubrication
Lubrication upper shaft bearings	:	Long-term grease
Lubricant	:	Shell Omala HD220 oil
Oil filling gearbox	:	Approx. 28 litres
Rated motor turning speed	:	1740 rpm
Gearbox gear wheel ratio	:	77.29 : 1
Motor coupling type	:	Elastomer insert coupling

Electrical

Motor type	:	3-phase, squirrel-cage
Motor supply	:	50 Hz: 230/400 ± 5% VAC(▲/Y), 4 kW, 14.6/8.4 A 60 Hz: 265/460 ± 5% VAC(▲/Y), 4.6 kW, 7.9 A (Y)
Gearbox heating elements	:	230 VAC / 1380 W (3 x 460 W)
Contact rating gearbox thermostat switch	:	250 VAC, 8 A
Support heaters	:	120-240 VAC/DC, 200 W (4 x 50 W)
Support cooling fan	:	230 VAC, 50/60 Hz, 41/38 W

Environmental

Temperature range	:	-40° to +45°C
Relative humidity	:	100%
Sound pressure level	:	< 65 dBA (measured at 1 metre in the open field)

Dimensions

Excluding support	:	Φ 770 x 1063 mm
Including support	:	Φ 1050 x 1267mm

Weight

Including support and oil	:	Approx. 470 kg
Including support, without oil	:	Approx. 445 kg
Excluding support and oil	:	Approx. 313 kg

2.3 Antenna system type SGX38.0H21-IC2

VSWR

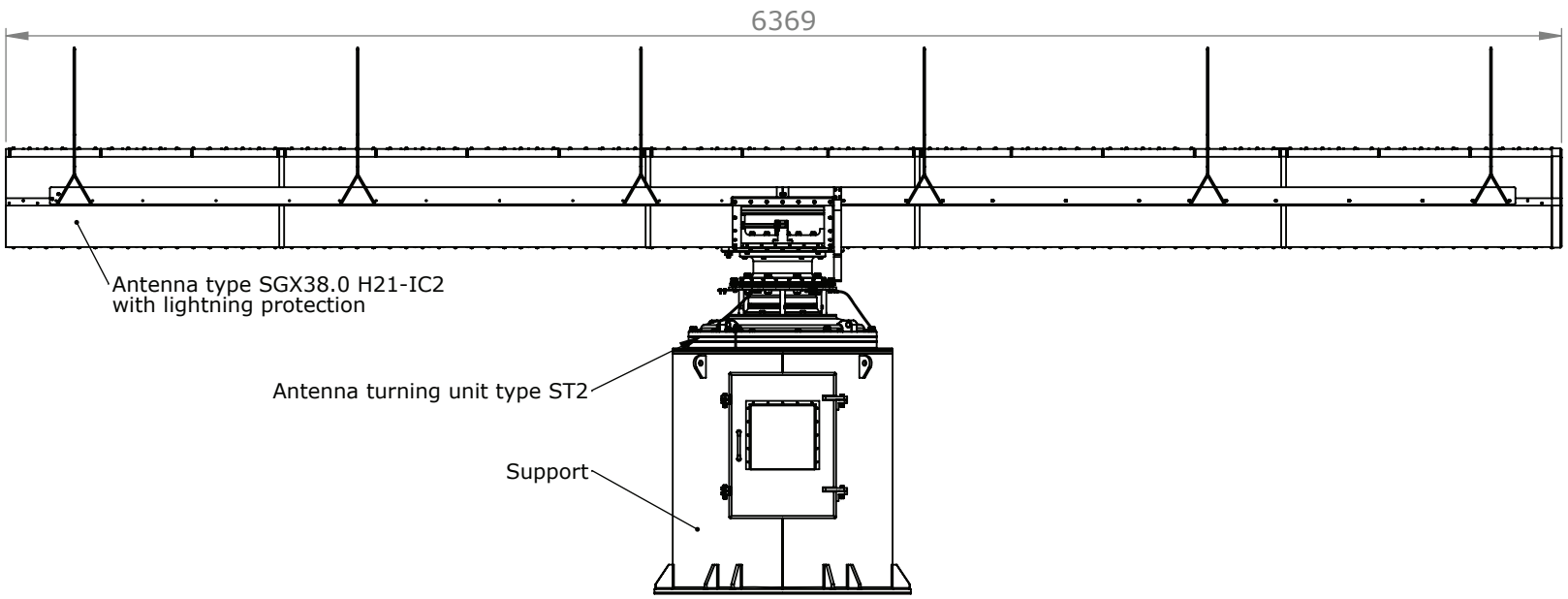
VSWR system	:	≤ 1.30

Dimensions and weight

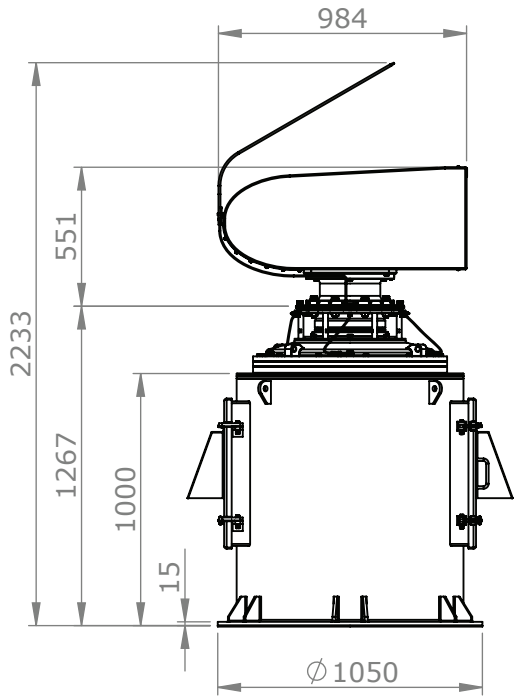
Dimensions (incl. lightning arresters)	:	6369 x Φ 1050 x 2233 mm
Weight (including oil)	:	Approx. 706 kg

Environmental

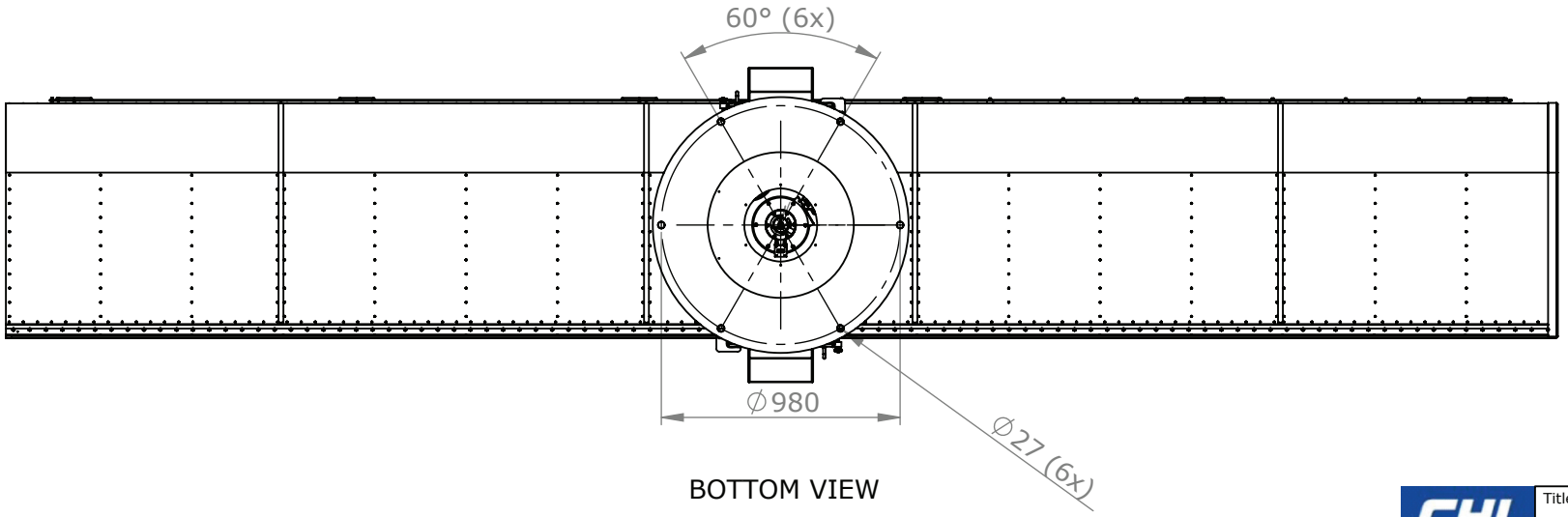
Maximum wind speed operational	:	150 km/h
Maximum wind speed survival	:	240 km/h
Temperature range	:	-40° to +45°C
Relative humidity	:	100% (non-condensing)
Degree of protection	:	IP 55



REAR VIEW

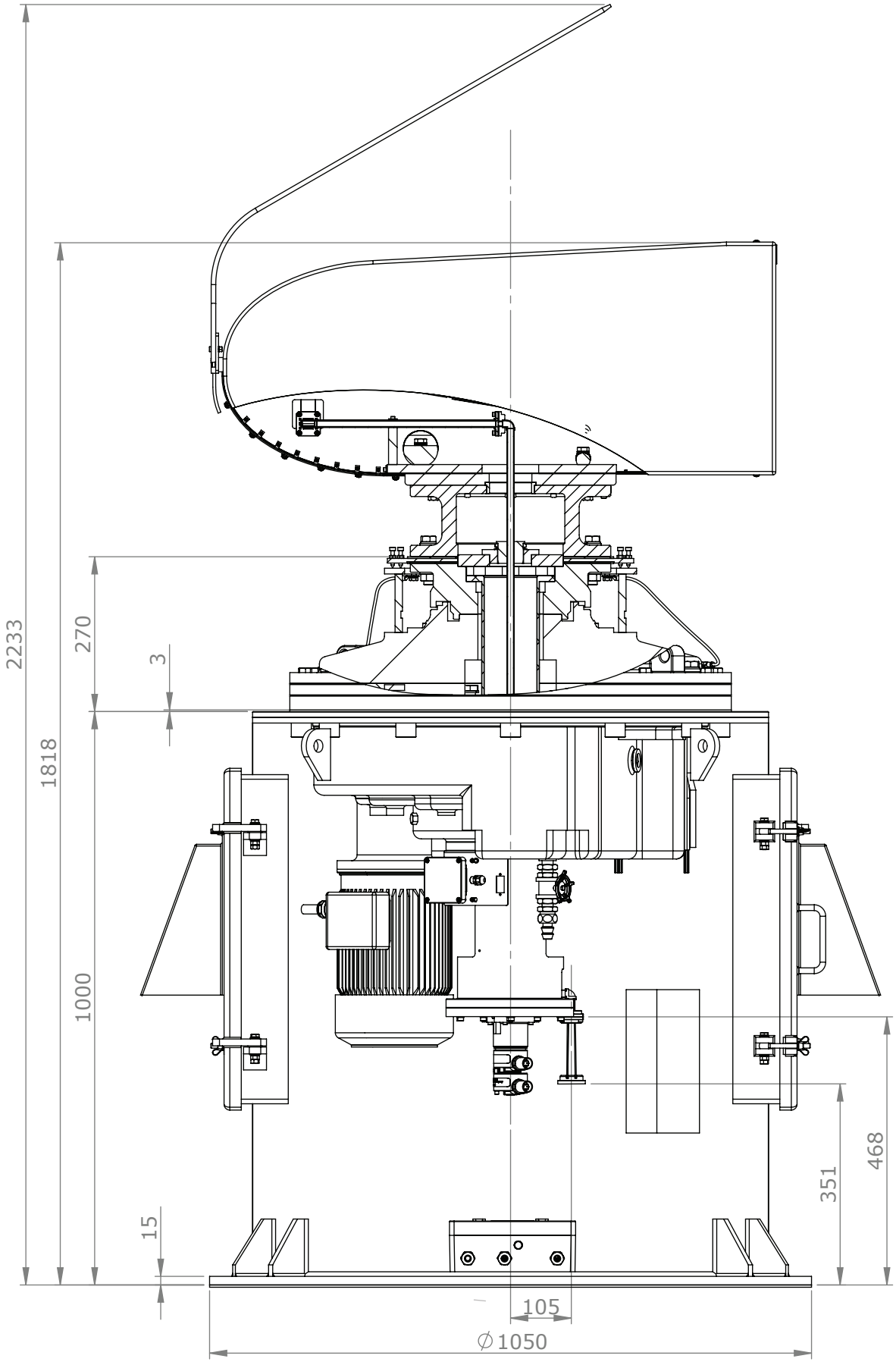


SIDE VIEW



BOTTOM VIEW

Title:	Outline radar antenna system type SGX38.0H21-IC2
CHL NETHERLANDS B.V. Katwijk-The Netherlands	Issue: a
	Issue date: 6-8-2010
	Sheet: 1 of 1
	Drawing number: C2010016-1



Title: Cross section radar antenna system type SGX38.0H21-IC2

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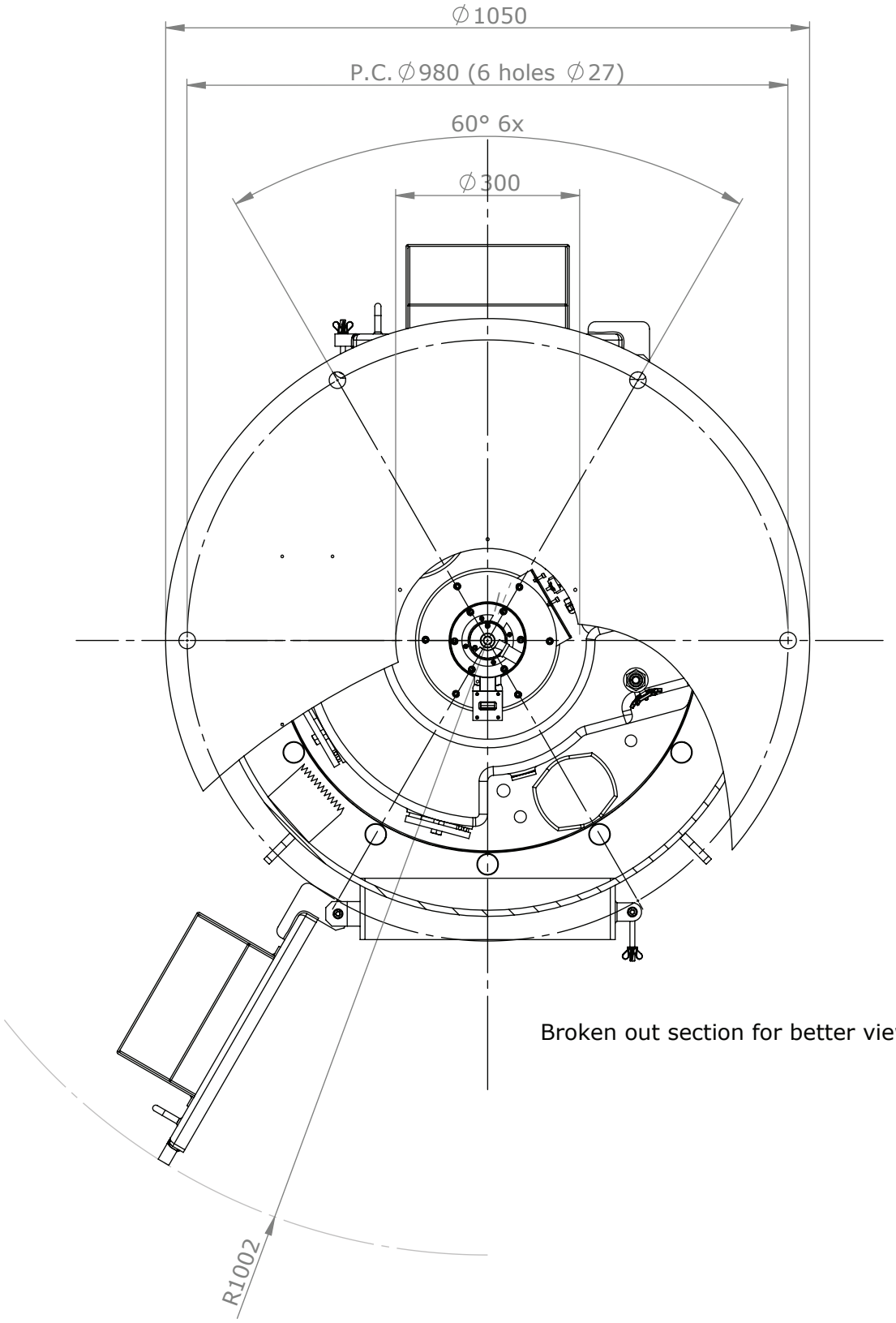
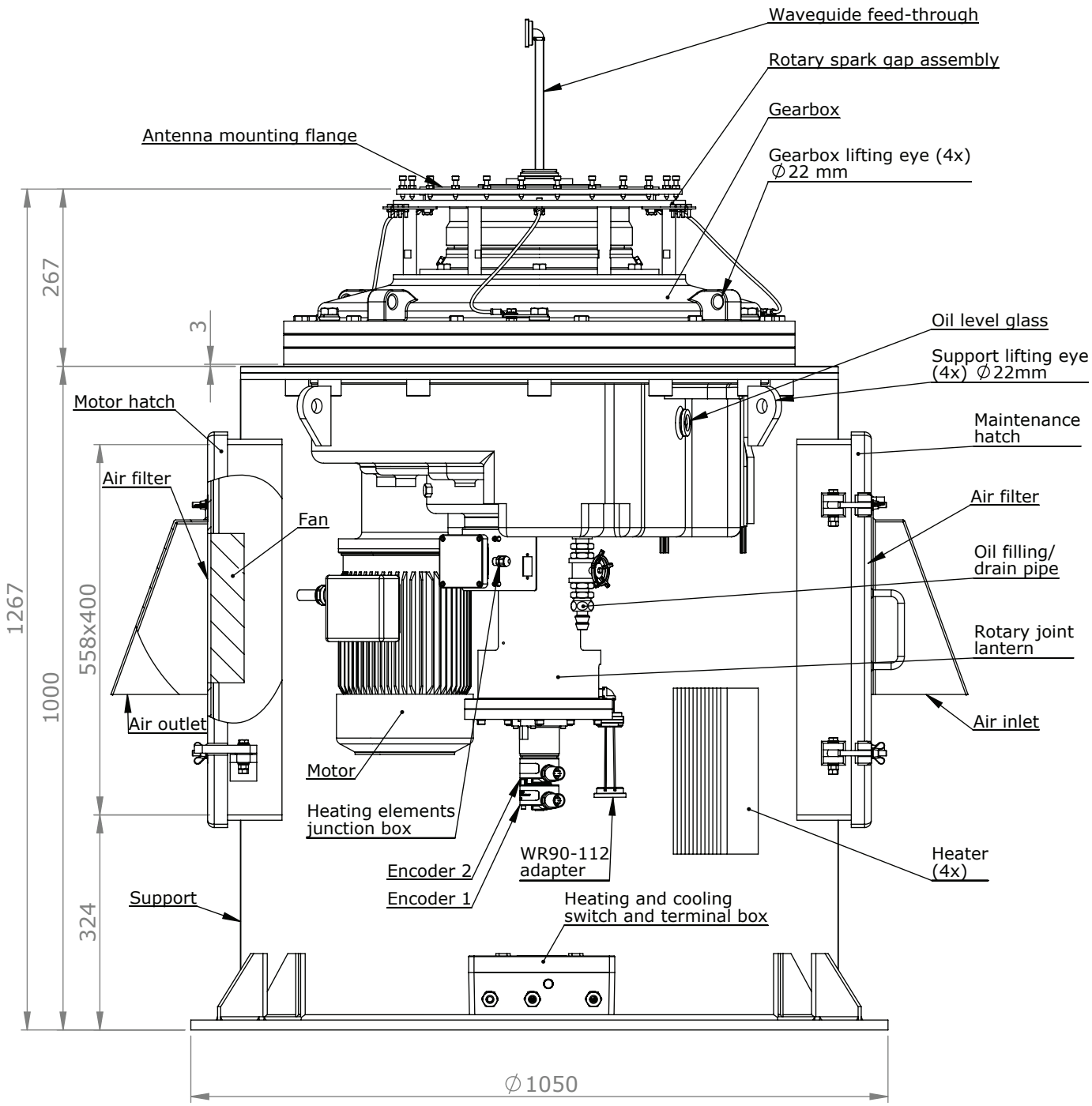
Issue:	a
Issue date:	6-8-2010
Sheet:	1 of 1
Drawing number:	C2010016-2

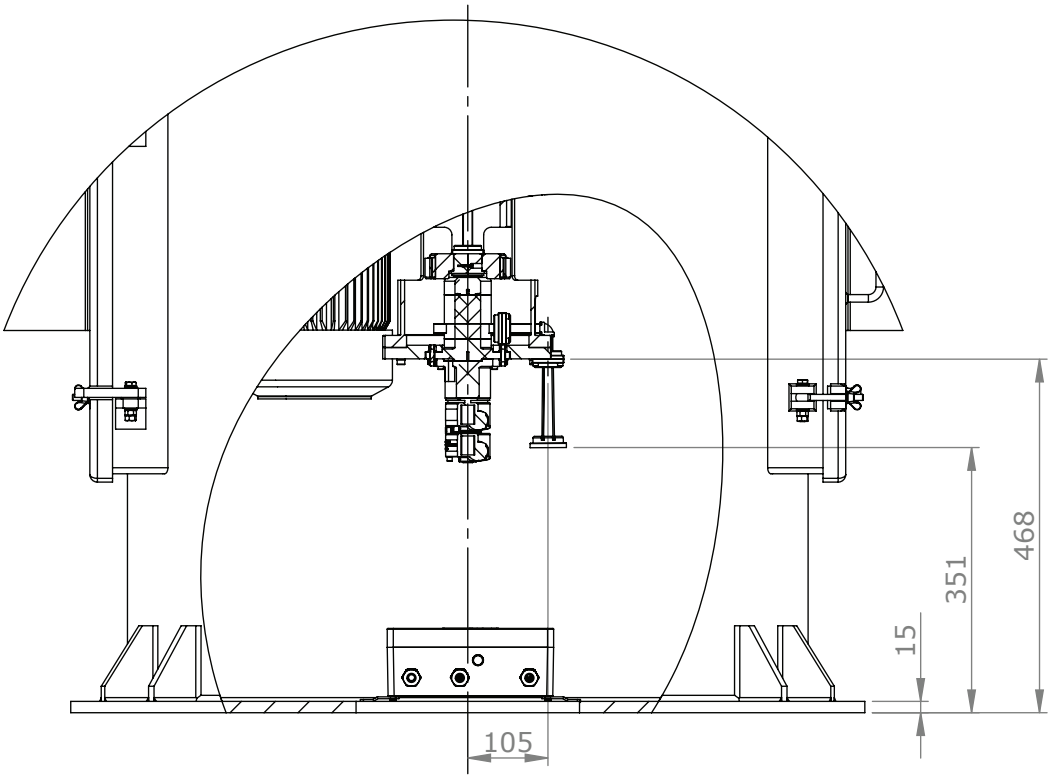


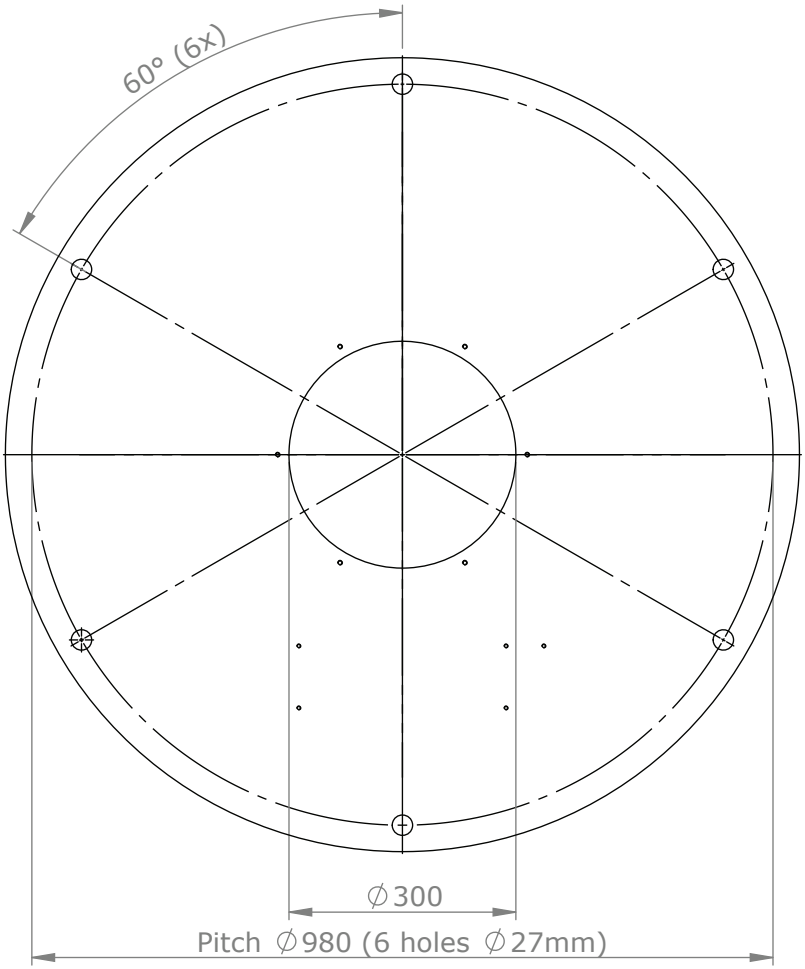
Broken out section for better view

CHL	Title: Bottom view ATU type ST2 on support	
CHL NETHERLANDS B.V. Katwijk-The Netherlands	Issue: a Issue date: 6-8-2010 Sheet: 1 of 1	
	Drawing number: C2010016-3	



CHL	Title: Cross section ATU type ST2 on support	
CHL NETHERLANDS B.V. Katwijk-The Netherlands	Issue:	a
	Issue date:	6-8-2010
	Sheet:	1 of 1
	Drawing number:	C2010016-4





CHL	Title: Hole or threaded ends pattern for mounting support	
CHL NETHERLANDS B.V. Katwijk-The Netherlands	Issue: a	
	Issue date: 6-8-2010	
	Sheet: 1 of 1	
	Drawing number: C2010016-12	