Stulz CyberAir 3PRO DX - ASD241A:

- Precision air conditioning unit for indoor installation for the air conditioning of IT equipment, data centers, telecommunications equipment and other operation-critical applications.
- Compact, ready-to-use circulating air conditioning unit (room air conditioning unit) with integrated microprocessor control.
- Standard functions: cooling mode, dehumidification mode

- CyberAir 3PRO air conditioning units comply with the applicable technical rules and standards and have CE certification.
- The unit is **manufactured in Germany** in an ISO 9001 / ISO 14001 certified company and thus includes the appropriate inspection, testing, and quality assurance steps, during the production process, up to the delivery.
- Continuous protection of all ESD-sensitive components due to manufacturing/production according to EN 61340-5-1 (protection of electronic devices against electrostatic phenomena).

- Version: A (air-cooled, direct expansion with scroll compressor); an open refrigerant circuit.
- Must be connected to an external condenser for operation.

- **Refrigerant: R410A**

- the units consists in the delivery state of a complete, functional construction unit that includes all the necessary components for the operation of the indoor unit.

Principal features:

- CyberAir 3PRO air conditioning units are especially designed for maximum cost effectiveness and energy efficiency with maximum availability and reliability.
- high cooling capacity per footprint; Unit dimensions and integrated, functional components optimised for small, medium and large rooms
- safe, energy-saving control functions and reliable monitoring of proprietary STULZ microprocessor system
- practice-related, up-to-date design conditions, for refrigeration operation without latent portion and based on the ASHRAE recommendations
- very low noise emission in operation without disturbing tonal noise portions
- high flexibility in air flow and unit cooling capacities; wide variety of options and adaptation to customer-specific requirements possible
- accessibility of all maintenance-related main components from the front

Air circuit:

- Air direction „Downflow"
- Air inlet (air intake/return air) into the A/C unit on a large surface from above
- Vertical, turbulence-free air flow through the unit from top to bottom
- Flow order: Air filter - Heat exchanger - EC fan

- internal arrangement of all flow-related components and sheet metal parts optimised for low air-side pressure losses and full-surface incident flow of the heat exchanger or filter surfaces for high performance and efficiency values
- EC fans are positioned vertically in the lower third of the unit. Incident flow area, impeller diameter and motor design perfectly matched to the internal unit design for lowest power consumption and maximum air volumes.

- Air discharge (supply air) out of the unit to bottom into the raised floor

- Standard control mode: Return air
- A combined temperature/humidity sensor integrated in the intake area of the air conditioning unit; positioning inside the unit for turbulence-free and optimal incident flow
- Designed as a digital humidity and temperature transmitter
- Accuracy at +25°C: ± 0,4K temperature; ± 3% relative humidity (20…80%)
- Other control modes optionally available: Room air, Supply air

Construction, frame, housing:

- unit consists of a single, closed construction unit at delivery; harmonised colouring of all sheet metal parts visible from the outside.
- stable, welded floor frame in unit colour, to compensate all vertical and horizontal forces.
- housing and frame parts consist of a vibration-free, self-supporting design optimised for low transport and operating weight.
- connection of the individual sheet metal parts and components either by means of stainless steel screws or high-strength blind rivets made of galvanised steel
- frame parts are made of galvanised steel or high-quality powder coating, therefore completely zinc thread-free construction
- interior sheet metals for highest stability and optimum air conduction
- easy access to all components which are relevant for installation and maintenance

Panelwork:

- the unit is delivered with all sides closed, panels and doors can be removed on all sides.
- back- and side panels are firmly screwed.
- all visible parts of sheet steel with a high-grade plastic powder coating
- the panelwork is executed with doors at the unit front, all doors open to the same side for easy access to all maintenance relevant parts.
- the doors are assembled to the unit frame with lockable security fasteners which prevent from unauthorized access to the units.
- panelwork and door insulation with insulation material of 25mm thickness
  - fire classification is B-s1, d0 according to EN 13501-1, (hardly inflammable, self-extinguishing)
  - chemical-free and UV-proof
  - no mould fungus according to DIN IEC 68

- resistent against house dust mites and vermins, non-provoking allergies decay-proof
- sound absorbent features > 5 kN/m^4 according DIN52213
- toxicologically recognized as safe according to Öko-Tex standard 100
- detergent-proof
- thermal isolation characteristics until WLG 0,040 (040) DIN 52612

Unit colour:

- Panelwork and visible sheet steel parts in STULZ anthracite grey
- Controller front top in Stulz telegrey 4 (RAL 7047)

Version A/refrigerant circuit:

- The air-conditioning unit is equipped with an open refrigerant circuit and the basic version consists of the following components:
  - Fully hermetic scroll compressor
  - High-performance evaporator with large surface area
  - Receiver with safety valve and shut-off valve
  - Filter dryer with screw connection
  - Sight glass with humidity indicator
  - Electronic expansion valve
  - Shut-off valves in the hotgas and liquid lines
- Dehumidification by reduction of refrigerant mass flow via the expansion valve and/or speed reduction of the EC fans

- the scroll compressor cooled by suction gas is installed in the unit with anti-vibration mounts ensuring a low level of vibration and noise.
- High operational reliability due to integrated oil management system as well as current- and temperature-dependent internal motor cut-out.
- The compressor is robust and maintenance-free, achieves a high efficiency and therefore enables stable, energy-efficient operation of the refrigerant circuit.
- Each compressor is protected by a high-pressure switch with manual reset and a low-pressure switch with automatic reset, and features a low-pressure management integrated in the A/C unit's control system to prevent excessive condensation pressure or insufficient evaporation pressure.

- Evaporator design with internally corrugated copper core pipes with pressed-on aluminium fins and a self-supporting frame of aluminium.
- The fins also feature a hydrophilic coating, which increases corrosion protection and encourages any condensate to drip into the aluminium condensate tray, even at higher air speeds or in case of dehumidification.
- The evaporator's size, internal circuits, fin distance and location in the unit have been optimised to ensure maximum utilisation of the heat exchanger surface area and thus high sensible cooling capacity at low air-side pressure drops.

Pipework:

- Internal unit pipework of copper, routed for optimum absorption and dissipation of possible vibrations and optimised on low pressure loss.
- Suction gas line and injection line insulated diffusion resistant to prevent the formation of condensate and loss of heat
- Piping grounded for potential equalisation
- Special pipe supports are used to absorb the load on the pipework, and for thermal decoupling.
- Several Schrader valves are integrated at easily accessible points for maintenance purposes.

Pipework connections:

- pipework (hotgas and liquid line) ends with soldering connections for connection to customer's on-site pipework.
- connections can be locked separately.
- the pipework ends inside the unit pointing downwards in the front right area.

Tube insulation:

- insulation is CFC-free; UV-proof, non-ageing and water-proof
- classification according to EN 13501-1: building material class BL-s3,d0 (hardly inflammable)
- self-extinguishing, non-dropping, non-fire-conducting
- insulation will be glued full-surface on the valves and other critical points.
- resistant against most of the chemicals (with application in chemical environment please indicate type of chemicals).
- thermal conductivity at 0°C: 0,033 W / m x K
- water vapour transfer coefficient ; $\mu \geq 10.000$

Radial fan with EC motor

- the A/C unit is equipped, depending on the construction size, with one or more direct driven, single inlet radial fan(s) with EC motor of the newest generation.
- compact construction achieved through direct fitting of impeller and motor rotor
- the EC radial fan is optimised for trouble-free use in precision A/C units and is characterised by a long service life, high efficiency levels in full - and part-load and low noise operation.
- the impeller/EC-motor combination exceeds the requirements of the ErP directive 2005/32/EC; Selection of materials for impeller and EC motor in terms of environmental impact, sustainability (e.g. no use of rare earths) and recyclability
- High performance impeller:
  - the impeller consists of a durable composite material (PP plastic GF40, fibreglass-reinforced), which allows a profiled blade geometry and a 3 dimensionally formed fan blade
  - the double backward curved blades are UV and corrosion-resistant and colorfast.
  - the special shape of the impeller allows a high circumferential speed and thus a

high speed the same as an aerodynamically optimised air flow through the fan.
    - thus, a high air flow resp. a high power density with low turbulence and therefore low noise is reached.
- EC motor:
    - compact, electronically commutated motor (EC) with high efficiency, long service life and made for safe operation
    - wear-resistant and maintenance-free ball bearing, brushless commutation, insulated bearing system to avoid bearing currents
    - motor speed infinitely variable by means of control signal 0-10VDC by integrated electronics, control directly from the control system of the A/C unit
    - integrated error relay, evaluation of alarm output
    - global applicability due to motor design in frequency-independent multi-range voltage
    - touch current according to IEC 60990 <= 3.5mA
    - Motor current limitation, soft start, blocking and overtemperature protection for motor and electronics as well as undervoltage and phase loss detection, integrated for safe operation
- impeller/EC-motor combination statically and dynamically balanced in two planes (G 6,3 according to ISO 1940) for a low vibration operation
- part of the radial fan system is an inlet nozzle made of plastic, which ensures an optimum inlet air flow for low air-side pressure drop and thus contributes to the efficiency and low noise.

Air filter:

- located on suction side in the unit, position directly on heat exchanger
- large filter surface, small pressure loss, long service life and easy replaceability from the front
- filter class according to ISO 16890: ISO Coarse 80% to ePM10 70%
- **filter class according to EN 779: F5**
- filter version with solid frame, fully combustible, metal-free
- classification according to EN 13501-1: E (normally flammable), self-extinguishing
- filter material made of synthetic, completely recyclable micro spunbond with tight, fixed fold spacing for maximum filter surface
- filter depth 47mm
- filter monitoring by differential pressure switch installed in the A/C unit's electric box with optical and acoustic warning
- with "Filter-Control Management" software (integrated in the unit's control system) for constant volume flow also in case of a soiled filter

Electric cabinet/Electrics:

- electric cabinet (electric box) integrated in the A/C unit for accommodation of all high voltage and control components; design according to EN 60204-1; protection class: IP20
- located in upper front area of the unit; accessible for maintenance exclusively from the front

- clear and space saving structure of all high voltage and control components
- consistent separation of high voltage and control elements to avoid EMC interferences
- all three-phase consumers protected against overload and short circuit by circuit breakers according to IEC/EN 60947-1
- completed wiring of motor circuit breakers, contactors and control components in wiring ducts
- top hat rail or busbar system for high voltage components
- filter monitor
- installed main switch (3 poles) operable from the outside, design as load disconnector
- main power supply provided by customer, cable pull relief provided

Feeding direction:
- feeding of the main power supply from bottom
- feeding of the external control lines from bottom

Microprocessor/Control:
- the A/C unit is equipped with a **controller developed by STULZ** and optimized for use in A/C units on the hardware and software side.
- in the basic version, the A/C unit is supplied with an IO controller installed in the electric cabinet and an EBUS expansion board (plus possibly equipment-dependent number of additional expansion boards), which can be used for A/C unit's control.
- power supply: 24V (+15%/-15%) VAC by transformer
- interfaces/IO controller connections:
  - I/O board interface: EIA485 (RS485)
  - service, download and printer interface: EIA232 (RS232)
  - 4 analog inputs: signal current 0-20 mA or 4-20 mA or signal voltage 0-10 V
  - 11 digital inputs: 24 VAC/DC (+24V = no alarm); status display via LED's
  - 4 analog outputs: 0-10 VDC; maximum load 20 mA
  - 7 digital outputs (relais with two way contact): 24 VAC, max. 6A, status display via LED's
- EBUS expansion board:
  - EIA485 (RS485) IO bus for internal communication between IO controller and internal components (e.g. electronic expansion valve)
  - EIA485 (**RS485**) **BMS** bus for communication with a building management system per **Modbus RTU** (max. 250 data points) or for connection to an optional protocol converter
- all unoccupied digital and analog inputs or outputs of the IO controller can be freely assigned, e.g. for the connection of auxiliary alarms or external signals and their designation with freely configurable texts.
- Basic features/functions:
  - serial RS485 interface for connection to user interface (HMI)
  - automatic or manual start after power loss
  - unit start time delay and start delay for individual components adjustable

- adjustable alarm delays and alarm priorities; configurable alarm relevance
- 1 x common alarm
- manual operation of individual components
- **automatic start of standby units in case of failure and additional load; runtime equalization**
- **sequencing of all IO controllers connected to the internal IO bus; sequencing can be divided in up to 20 independent zones**
- **adjustable sequencing time**
- event log, recording of alarms, warnings, failures the same as unit starts and stops (200 events with time and date)
- temperature- and humidity recording up to 1440 data points, freely scalable within 1 to 60000 minutes (ring buffer/data logger)
- day and night operation
- service warning according to pre-set time intervals
- capable for communication by **Modbus RTU protocol**

- Control and monitoring of the following functions and all operationally relevant components (depending on the selected options):
  - cooling, dehumidification, (re-)heating, humidification
  - control and supervision of limit values for temperature and humidity of return air and/or supply air including rule-based averaging when using more than one similar sensor
  - compressor(s), compressor speed (only for units with speed-controlled compressor), expansion valve
  - runtime equalization and sequencing between compressors in units with 2 refrigerant circuits
  - winter start operation
  - high and low pressure monitoring the same as condensation pressure control
  - energy-saving speed control of the EC fans depending on the temperatures, humidity and/or pressure-dependent (differential pressure control)
  - standby management
  - function and speed of EC fans
  - control valve(s)
  - directe or indirect free cooling
  - filter monitor incl. filter control management
  - reheat(s)
  - humidifiers, water detector, conductivity measuring device
  - phase monitoring, UPS operation
  - dry coolers, pumps

<u>Documents and delivery:</u>
The A/C units are dispatched with the following documents:

- operation instructions manual
- manual for the controller system
- wiring diagram including electric data sheet and cable list
- refrigeration diagram resp. piping diagram

- replacement parts list
- CE - declaration of conformity
- test certificate of final function and safety test

Packaging of the A/C unit standing on a wooden pallet, secured against slipping and mechanical damage.
The installation, the commissioning, the final function check and the instruction of the operator are not part of the delivery volume.

Outside condenser KSV037A22p, air-cooled

Permissible refrigerants: R410A
Sound level: S

one condenser per refrigerant circuit, consisting of:

- corrosion-resistant self-supporting housing made of aluminium, protection class IP 44
- coil made of copper tubes with pressed-on aluminium fins.
- axial fan with grid cage in corrosion-resistant, water-proof execution, maintenance-free
- completely wired, controlled by a speed controller with pressure sensor in the hotgas line
- main switch for connection to power supply, water jet-proof according to IP 65.

A Schrader valve is located in the hotgas line for connecting a pressure gauge to adjust the speed controller by maintenance personnel.

Technical data:

- voltage supply: 230/1/50-60 V/Ph/Hz
- number of fans: 2
- max. operating pressure: 40 bar

Speed controller

- adjustment of the pressure for maximum speed
- switch for behaviour below the proportional range (cut off/minimum speed)
- adjustment range: 16 to 39 bar
- proportional range: 8 bar (fix)
- minimum speed: 45% (50Hz) / 35% (60Hz)
- ambient temperature: -45 to +55°C
- protection: IP 54

Condenser supports are supplied unassembled and need to be fitted on site.

Electrical heating

- to ensure a constant room temperature, e.g. during dehumidifying operation
- single-stage electrical heating, **capacity 1x 6kW** (on/off control, controlled by the A/C unit's controller)
- each heating stage protected against overload and short circuit through circuit breakers in the electric cabinet of the unit
- easy access for maintenance purposes

- position downstream the heat exchanger related to the airflow
- each stage consisting of 3 finned heating bars (material: heating bars 1.4306, fins 1.4306), designed for low casing temperatures and stable, long-life operation the same as optimum heat transmission to the air
- one overheat protection for each stage (trigger temperature: 60°C to interrupt the control circuit) with integrated, automatic restart

Steam humidifier 8 kg/h

- steam humidifier, installed ready for use in the unit for the entirely automatic production and delivery of odourless, demineralized and germ-free steam
- proportional humidification capacity control, pre-adjustable in the range 25-100%
- position in the heat exchanger unit of the A/C unit, easy access for maintenance purposes and cylinder exchange
- steam cylinder with 3 electrodes, water pressure: 1-10 bar
- maximum steam capacity: 8kg/h
- operation is carried out with non-treated tap water (conductivity range: 125 - 1250 µS/cm, total hardness: 100 - 500 mg/l $CaCO_3$)
- max. supply water temperature: 40°C
- including inlet and outlet solenoide valve as well as level sensor
- including inlet connection hose, length 680mm, diameter 3/8"
- protected against overload and short circuit through circuit breakers in the electric cabinet of the unit
- humidifier control board with microprocessor integrated in electric cabinet incl. indication of the humidifier capacity and alarms by LED flash cycles as well as the preadjusted humidifier capacity
- automatic water draining for maximum service life of the steam cylinder, manual draining available
- monitoring and alarm forwarding by the control system of the A/C unit
- distribution of steam via a steam distributor lance made of copper. Lance position behind the heat exchanger

Water detector incl. solenoid valve

consisting of:

- 2-way solenoid valve
- printed circuit board (installed in the electrical box)
- water detector

The water detector must be installed in the raised floor on site, the solenoid valve is located in the supply water line of the humidifier. If the detector triggers an alarm is transmitted to the controller, the humidification is switched off and the solenoid valve is closed.
To prevent a failure by deposits and calcification the valve is opened with a humidification request only.

- operating voltage 24VAC
- sensitivity adjustable between 10kOhm and 500kOhm

2-way solenoid valve :
- connection G 1/2
- currentless closed

Power supply for condenser fan or external consumer

- power supply for max. 10 A, 1 x 1 - ph
- safety cutout with possibility for connection, **mounted in the electric box**

This option needs to be selected twice for dual-circuit units!

Temperature control 1ph condenser fan (single circuit unit)

- temperature control of all condenser fans and evaluation by a free alarm input of the C7000
- alarm message with reset at C7000, no shut-down of condenser fans
- control line to the condenser must be provided by customer.
- depending on the unit equipment an additional digital extension board may be required.

additional sensor for water detector

- Sensor elektrode for water detector
- maximum 4 sensor elektrodes can be connected in parallel to a water detection module
- maximum cable length 200m

Additional sensor

- additional **temperature/humidity** sensor
- **to measure the room air** or supply air conditions
- with casing
- dispatched loose

Control for external damper

- terminal in the electrical box of the A/C unit **for the control of the actuator SM 24**

Shutdown by external fire alarm with reset at the controller terminal

- unit shutdown by external signal "fire alarm"
- input of the fire alarm signal by on-site voltage-free contact on terminals integrated in the E-box of the unit
- alarm indication at the controller terminal
- an alarm reset is necessary before the restart of the unit
- (the operator terminal is not part of the delivery)

Smoke detector (dispatched loose)
Consisting of:
- fixing device and **detector with optical sensor and heat sensor**
- automatic and manual function check
- separate fire and fault indication LED
- voltage supply 24VAC
- signal 24VAC max. 2A
- EN 54 standard

The smoke detector completes the option "shutdown by external fire alarm" and is dispatched loose for the installation outside the unit.

C7000Advanced-Terminal
Additional **user-interface for C7000-Control System: Graphic display and BMS-Connectivity**
Technical data of the terminal:
- Voltage supply: 24 VAC
- Power consumption: 14 VA
- Fuse 2 A slow
- Operating temperature: 5°C ... 40°C

Features:
- Large backlit LCD display
- LCD display located at a height of 1.55m
- Navigation via 5 keys
- Operation of up to 19 C7000 IO-Controllers via Windows technology
- Redundant user-interface by usage of up to 19 C7000AT
- Menu in 12 languages
- Visual and acustic signals of events
- Alarm transfer via SMS and E-mail (additional options required)

Interfaces:
- RS232 - Service Port (Sub-D 9) for configuration
- RS485 - for internal Stulz I/O-Bus
- RS232 or RS485 for connection to BMS

WIB 8000

Visualization and operation of Stulz A/C unit by PC with web browser:
- no Java-Script
- no cookies
- **X-HTML** only
- well designed pages by efficient application of CSS
- internationally valid graphical buttons for the most important functions
- storage of the individual language and temperature unit preference by favorites/ book marks in the user's browser.
- language of displayed page can be changed by one click

- display of temperature values can be changed between °C and °F by one click
- 14 languages (extendable on request/order)
- display of all worldwide character sets by UTF-8
- designations can be given individually by the user for :
  - the WIB 8000 itself
  - each of the two busses
  - each connected unit
  - each of the 20 adjustable zones
- automatic update of the unit name if existant for C7000 IOC during the bus configuration
- automatic generation of standard unit names während during the bus configuration, if no unit name has been stored in the controller.
- access via 3 authorization levels:
  - read only
  - read and write unit data
  - read and write unit data and administrate WIB 8000
- administrator can modify all 3 passwords.
- data log for up to 5 data points per unit for all Stulz units:
  - interval for each bus can freely be defined
  - interval for sending the data logs by e-mail can freely be defined (automatic transfer in case of memory shortage).
  - tabular display by web surface
  - download by web page
  - automatic sending by email
- Alarm display for all connected A/C units:
  - signalization by flashing icons on the web page
  - tabular display of the alarm list by web page
  - download of the alarm list by web page
  - notification by email to up to 5 receivers, selectable according to week day and time
- Unit overview:
  - tabular overview of connected units with data which is relevant for a support request
  - download of this table by the web page
- complete configuration via web page, further access not necessary.
- possible use of customer logo saved externally from the WIB 8000, on top of the web page.
- reboot after the configuration has been changed without cutting the power supply by the administrator http access.

- **Monitoring of Stulz A/C units by SNMP**
  - access to all data points.
  - community freely adjustable.
  - **Up to 6 SNMP trap receivers as IP address or name** (DNS Server required)
  - current data points for „Plug and Play“ recognition are supported and can be freely adjusted by the administrator.
  - all alarms of connected Stulz A/C units are signalized by TRAP message.
  - Trap- port and community freely adjustable for each of the 6 receivers.

- SNMP interface can be switched off by administrator.

- **Email notification** :
  - for alarms:
    up to 5 receivers can be selected according to time and week day
    receiver freely definable
    subject freely definable (important for email-> SMS services)
  - for event log:
    receiver freely definable
    forwarding according to freely adjustable interval or in case of memory shortage in the file system.
  - for data log:
    receiver freely definable
    forwarding according to freely adjustable interval or in case of memory shortage.
  - for event display (potential free input):
    freely definable email texts for exceeding the threshold values
    subject freely definable
    receiver freely definable
  - SMTP port freely adjustable
  - SMTP server address as IP address or name (DNS server required)
  - authentication methods for email server (freely adjustable):
    none
    DIGEST MD5
    CRAM MD5
    LOG IN
    PLAIN
    automatic selection

- Alarm treatment:
  - regular request of alarm data points of all connected controllers (interval freely adjustable) and immediate signalization by **HTTP, SNMP, email** (see above).

- **Sequencing function**:
  - for maximum 64 units
  - can be subdivided in 20 zones
  - unit zone assignment can be made across the busses
  - commutation according to time interval (freely adjustable)
  - use of additional capacity by standby units in case of alarm (selectable alarm groups)
  - use of additional capacity by standby units in case of overload (zone or unit measured values)
- Supply voltage: 24V AC/ DC +/- 10%
- RTC with battery supply in case of power failure (standard CR2032 cell)
- potential free (digital) input: Low 0-9V DC; High 9-30V DC
- 2 galvanically separated RS485 (EIA485) bus connections for the STULZ bus.
  - capacitive earthing for each bus connection (screen).
  - one integrated termination resistance for each bus connection (can be switched on)

- commutable bias (high / low) for each bus connection
- simple installation on DIN rail
- automatic earth contact (ESD and capacitive earthing) to DIN rail
- installation in A/C unit

Non-return valve

- non-return valve to be installed in the liquid line
- to prevent a reverse flow of liquid refrigerant to the condenser
- for units of design A
- delivered loose

Condensate-pump (hot water resistant), delivered loose

For fully-automatic removal of condensate, if condensate evacuation by gravity is not possible.
The condensate pump is delivered loose with the A/C unit to be installed by the customer on site.

- automatic operation with start, stop, and safety switch (floating switch); including non-return valve
- thermal fuse with automatic restart
- alarm message overflow protection (normally close)
- power supply 230 V/50-60 Hz
- power consumption: 157 W; 1,5 A
- reservoir volume: 4,0 l
- degree of protection: IPX1
- dimensions (H x L x W): 205 mm x 300 mm x 150 mm
- weight (empty): 3,6 kg
- maximum medium temperature: 100 °C
- including connection cable: length 2,0 m
- including adapter for hose connection provided by the customer

The power for the condensate pump can either be supplied by the e-box incorporated in the A/C unit or has to be provided by the customer on site.

Technical data:	**max. volume flow:**	**900 l/h**
	max. delivery head:	**6,0 m**
	volume flow at 4,0 m:	**450 l/h**