

# Referensi Cepat TypeScript

Type, interface, generics, utility type

## Tipe Dasar

### Primitif

```
let name: string = "Alice";
let age: number = 25;
let active: boolean = true;
let data: null = null;
let x: undefined = undefined;
```

### Tipe Khusus

<b>any</b>	Nonaktifkan pengecekan tipe
<b>unknown</b>	any yang type-safe (harus di-narrow sebelum dipakai)
<b>void</b>	Tidak ada return value
<b>never</b>	Fungsi tidak pernah kembali (throw / infinite)
<b>object</b>	Tipe non-primitif apa pun

## Array & Tuple

### Array

```
let nums: number[] = [1, 2, 3];
let names: Array<string> = ["a", "b"];
let matrix: number[][] = [[1, 2], [3, 4]];
```

### Tuple

```
let pair: [string, number] = ["age", 25];
let rgb: [number, number, number] = [255, 0, 0];

// Named tuples (labels for readability)
type Point = [x: number, y: number];
```

## Interface

### Mendefinisikan & Menggunakan

```
interface User {
  name: string;
  age: number;
  email?: string; // optional
  readonly id: number; // immutable
}

const user: User = { name: "Alice", age: 25, id: 1 };
```

### Memperluas Interface

```
interface Employee extends User {
  role: string;
  department: string;
}
```

### Index Signature

```
interface StringMap {
  [key: string]: string;
}

const env: StringMap = { NODE_ENV: "prod" };
```

## Type Alias

```
type ID = string | number;
type Point = { x: number; y: number };
type Callback = (data: string) => void;
```

## Interface vs Type

<b>interface</b>	Bisa di-extend dengan <b>extends</b> , mendukung declaration merging
<b>type</b>	Union, intersection, mapped type, tuple

## Union & Intersection

### Union Type

```
type Status = "loading" | "success" | "error";
type ID = string | number;

function print(val: string | number) {
  if (typeof val === "string") {
    console.log(val.toUpperCase());
  }
}
```

### Intersection Type

```
type Named = { name: string };
type Aged = { age: number };
type Person = Named & Aged;
// Person has both name and age
```

### Discriminated Union

```
type Shape =
  | { kind: "circle"; radius: number }
  | { kind: "rect"; w: number; h: number };

function area(s: Shape): number {
  switch (s.kind) {
    case "circle": return Math.PI * s.radius ** 2;
    case "rect": return s.w * s.h;
  }
}
```

## Fungsi

### Parameter & Return Bertipe

```
function add(a: number, b: number): number {
  return a + b;
}

// Arrow function
const greet = (name: string): string =>
  "Hello, ${name}!";

// Optional & default params
function log(msg: string, level?: string): void {}
function log(msg: string, level = "info"): void {}
```

### Function Overload

```
function parse(input: string): number;
function parse(input: number): string;
function parse(input: string | number) {
  return typeof input === "string"
    ? parseInt(input)
    : input.toString();
}
```

### Rest Parameter

```
function sum(...nums: number[]): number {
  return nums.reduce((a, b) => a + b, 0);
}
```

## Generics

### Fungsi Generic

```
function identity<T>(value: T): T {
  return value;
}

identity<string>("hello"); // explicit
identity(42); // inferred: number
```

## Interface Generic & Constraint

```
interface Box<T> {
  value: T;
}

const box: Box<number> = { value: 42 };

// Constraints
function getLen<T extends { length: number }>(
  item: T
): number {
  return item.length;
}
```

## Enum

```
enum Direction { Up, Down, Left, Right }
let d: Direction = Direction.Up; // 0

enum Status {
  Active = "ACTIVE",
  Inactive = "INACTIVE",
}
let s: Status = Status.Active; // "ACTIVE"

// const enum (inlined at compile time)
const enum Color { Red, Green, Blue }
```

## Type Guard

### Guard Bawaan

```
// typeof
if (typeof x === "string") { /* x: string */ }

// instanceof
if (err instanceof Error) { /* err: Error */ }

// in
if ("name" in obj) { /* obj has name */ }
```

### Custom Type Guard

```
function isString(val: unknown): val is string {
  return typeof val === "string";
}

if (isString(input)) {
  input.toUpperCase(); // narrowed to string
}
```

### Assertion Function

```
function assertDefined<T>(
  val: T | null
): asserts val is T {
  if (val === null) throw new Error("null");
}
```

## Utility Type

<b>Partial&lt;T&gt;</b>	Semua properti opsional
<b>Required&lt;T&gt;</b>	Semua properti wajib
<b>ReadOnly&lt;T&gt;</b>	Semua properti readonly
<b>Pick&lt;T, K&gt;</b>	Pilih properti K dari T
<b>Omit&lt;T, K&gt;</b>	Hapus properti K dari T
<b>Record&lt;K, V&gt;</b>	Objek dengan key K dan value V
<b>Exclude&lt;T, U&gt;</b>	Tipe di T yang tidak ada di U
<b>Extract&lt;T, U&gt;</b>	Tipe di T yang juga ada di U
<b>NonNullable&lt;T&gt;</b>	Hapus null dan undefined dari T
<b>ReturnType&lt;T&gt;</b>	Tipe return fungsi T
<b>Parameters&lt;T&gt;</b>	Tipe parameter fungsi T
<b>Awaited&lt;T&gt;</b>	Buka tipe Promise

# Referensi Cepat TypeScript

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## Contoh Utility Type

```
interface User { name: string; age: number; email: string }  
  
type UserPreview = Pick<User, "name" | "email">;  
type UserUpdate = Partial<User>;  
type UserMap = Record<string, User>;  
type CreateUser = Omit<User, "id">;
```